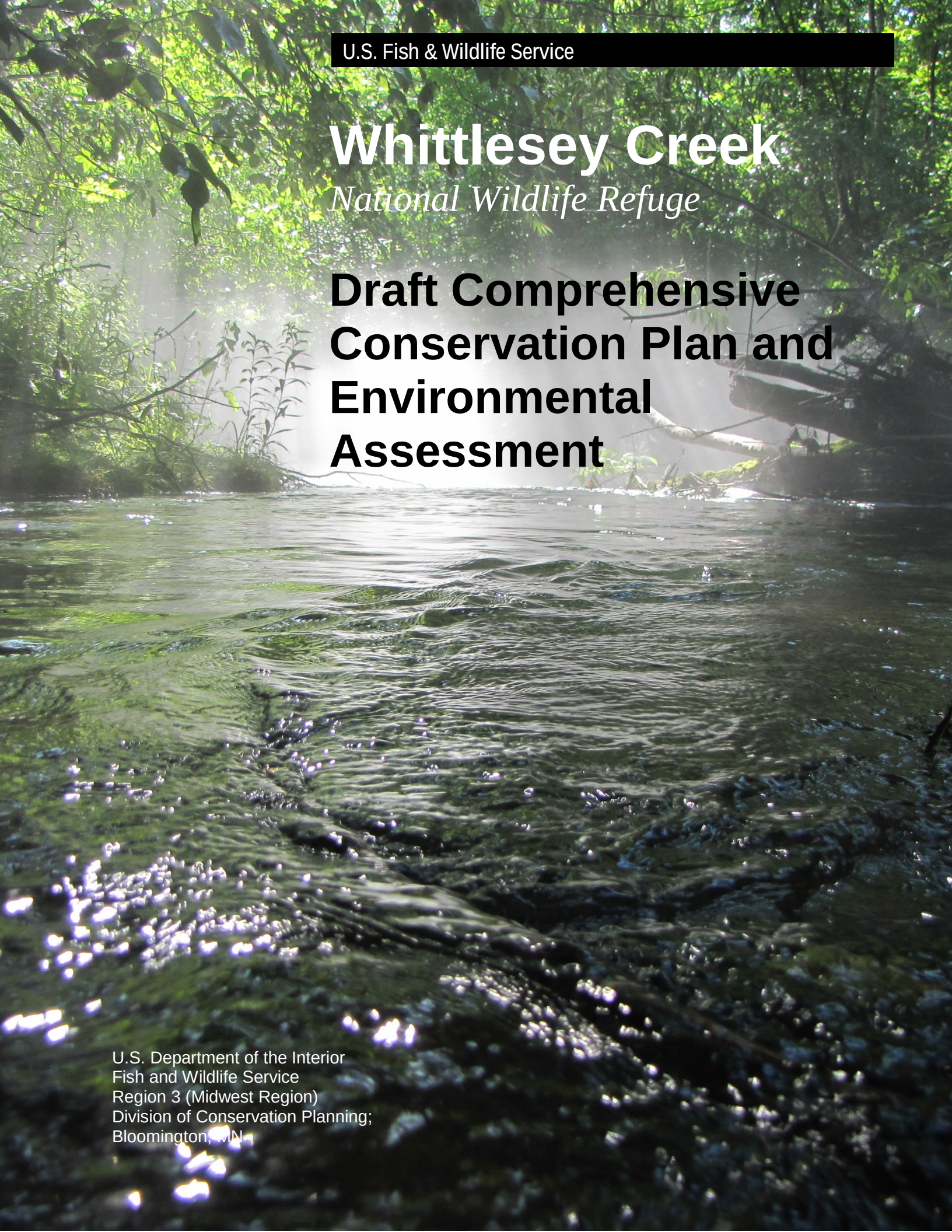

U.S. Fish & Wildlife Service

Whittlesey Creek

National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment

U.S. Department of the Interior
Fish and Wildlife Service
Region 3 (Midwest Region)
Division of Conservation Planning;
Bloomington, MN

The mission of the U.S. Fish & Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Comprehensive Conservation Plans provide long-term guidance for management decisions; set forth goals, objectives and strategies needed to accomplish refuge purposes; and, identify the Fish and Wildlife 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.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

5600 American Boulevard West, Suite 990
Bloomington, Minnesota 55437-1458

IN REPLY REFER TO:

FWS-NWRS/CP

March 16, 2015

Dear Reviewer:

We are pleased to provide you with this draft Comprehensive Conservation Plan and Environmental Assessment (CCP) for Whittlesey Creek National Wildlife Refuge.

Whittlesey Creek National Wildlife Refuge is located in Bayfield County near Ashland, Wisconsin. The Refuge is part of a large wetland and floodplain complex on the south shore of Lake Superior.

The CCP will guide management of the Refuge for the next 15 years and will help the Refuge meet its purposes and contribute to the mission of the National Wildlife Refuge System. The CCP will provide both broad and specific guidance on various issues; describe a vision, goals, and measurable objectives; and list strategies for reaching the objectives.

We invite you to review and comment on the draft CCP. By sharing your thoughts, you can help ensure that the final CCP is both visionary and practical. We are hosting an open house where you will be able to ask questions and voice concerns and suggestions. This event will take place at the Northern Great Lakes Visitor Center from 3:00 p.m. to 7:00 p.m. on Tuesday, March 31, 2015. The visitor center is located at 29270 County Highway G, just outside Ashland, WI.

Written comments are also welcome anytime during the comment period and should be addressed to: U.S. Fish & Wildlife Service, Whittlesey Creek NWR, Attention: CCP Comment, 29270 County Highway G, Ashland, WI 54806. You may also send comments to us through the following web address: http://www.fws.gov/midwest/planning/whittleseycreek.

To be considered in preparing the final CCP, comments must be received by April 29, 2015.

We look forward to continuing the dialogue on the future of the Refuge, and thank you for your continued interest in keeping this Refuge a special place for wildlife and people.

Sincerely,

Jeanne Holler

Jeanne Holler
Chief, Division of Conservation Planning

Whittlesey Creek

National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment

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Executive Summary

Introduction

The U.S. Fish and Wildlife Service (FWS, Service) has completed a Draft Comprehensive Conservation Plan and Environmental Assessment (CCP) that describes proposed goals and objectives to guide management of Whittlesey Creek National Wildlife Refuge (NWR, Refuge) for the next 15 years.

Whittlesey Creek National Wildlife Refuge (NWR, Refuge) was established in 1999 to protect, restore, and manage coastal wetland, floodplain forest, and spring-fed stream habitat on the south shore of Lake Superior near Ashland, WI. The Service currently owns 304 acres in fee title out of 540 acres authorized along lower Whittlesey Creek and 47 acres of easements out of 1,260 acres authorized in the 12,000-acre Whittlesey Creek watershed.

Restoration of native coaster brook trout is a high priority for the Service and its partners. Migratory birds and many other fish and wildlife species also benefit from protection and restoration of habitat on the Refuge and throughout the watershed. The Service is a partner in the multi-agency Northern Great Lakes Visitor Center (NGLVC, Visitor Center, Center), which offers many opportunities for the public to become more connected with the natural world. The Center also serves as headquarters and contact station for the Refuge.

Refuge Goals

Wildlife: Protect, restore, and maintain a diversity of wildlife species native to naturally functioning Refuge habitats, with special emphasis on coaster brook trout and migratory birds.

Habitat: Preserve, restore, and enhance the native habitats of Whittlesey Creek and its watershed.

People: Provide a diverse audience with opportunities to experience high quality, wildlife-dependent activities and to understand and appreciate a natural functioning landscape.

Issues Addressed

The major Refuge management issues identified during the Whittlesey Creek NWR planning process represent input from the public, other agencies and organizations, and Service staff. The issues focused the planning effort on the most significant topics and were critical in framing the various alternatives considered. More information about the specific issues addressed in this CCP is included in chapters 2 and 3. The five primary topics are:

- Restoring a self-sustaining coaster brook trout population in Whittlesey Creek.
- Providing habitat for migratory birds.
- Setting priorities for stream, floodplain, wetland, and watershed restoration.
- Enhancing public opportunities for hunting, fishing, wildlife observation and photography, environmental education, and interpretation on the Refuge.
- Service participation in the Northern Great Lakes Visitor Center partnership.

Alternatives Considered

Four issue-based management alternatives were developed and evaluated. The primary differences between the alternatives are related to: (1) habitat restoration priorities, and (2) Service involvement in the NGLVC. Under all four alternatives, the Refuge would continue to participate in the Whittlesey Creek coaster brook trout restoration program. More details are included in Appendix A: Environmental Assessment.

Alternative A

1. Opportunistic restoration
2. Maintain Visitor Center involvement

Alternative B

1. Refuge and watershed restoration
2. Maintain Visitor Center involvement

Alternative C

1. Watershed restoration
2. Expand Visitor Center involvement

Alternative D:

1. Refuge restoration
2. Reduce Visitor Center involvement

Proposed Future

The planning team has selected Alternative B as the preferred alternative for future management of Whittlesey Creek NWR. The detailed objectives and strategies found in Chapter 4: Future Management Direction were developed based on this recommendation. Key elements include:

- Continue to participate in the interagency coaster brook trout program on the Bayfield Peninsula of Lake Superior, with Refuge responsibility for restoration of brook trout habitat in Whittlesey Creek.
- Develop and implement new criteria to prioritize and integrate all stream, floodplain, wetland, and watershed restoration activities to maximize fish and wildlife benefits. Emphasize use of existing sediment, hydrology, and climate models. Work with partners to determine priorities.

- Continue to use and improve current methods of logjam and culvert design and installation. Review road and bridge infrastructure; work with local governments to repair deficiencies.
- Restore forest blocks in conjunction with riparian restoration projects to benefit migratory birds. Continue to use and improve current tree planting methods.
- Restore historic seasonal wetland basins in the floodplain.
- Work with U.S. Forest Service, Natural Resources Conservation Service, Wisconsin Department of Natural Resources, Bayfield County Land and Water Conservation Department, and others to develop a more comprehensive watershed-based partnership. Collectively secure funding to implement high-priority projects. Expand partnerships with local governments and landowners.
- Maintain current Service involvement in the NGLVC. Keep Refuge office on-site. Participate in partnership events when consistent with Refuge purposes. Develop cooperative agreement to clarify the Service's role and responsibilities.
- Continue the hunting program. Open the Refuge to fishing in accordance with state regulations.
- Continue to develop Refuge-specific education and interpretive programs; expand themes to include the watershed/trout connection.
- Add foot trail from NGLVC boardwalk to Coaster Classroom.

Chapter 1: Introduction and Planning Background

In this chapter:

1.1 Introduction
1.2 Purpose of and Need for Plan
1.3 Refuge Establishment and Purposes
1.4 Refuge Vision and Goals
1.5 Legal and Policy Framework
1.6 Other Conservation Initiatives

1.1 Introduction

Whittlesey Creek National Wildlife Refuge (NWR, Refuge) was established in 1999 to protect, restore, and manage coastal wetland and spring-fed stream habitat in Bayfield County near Ashland, WI (Figures 1-1 and 1-2). The Refuge is part of a large wetland and floodplain complex on the south shore of Lake Superior. The U.S. Fish and Wildlife Service (FWS, Service) currently owns 304 acres in fee title out of 540 acres authorized along lower Whittlesey Creek and 47 acres of easements out of 1,260 acres authorized in the 12,000-acre Whittlesey Creek watershed. The Refuge is located entirely within the town of Barksdale.

Restoration of coaster brook trout, an adfluvial (lake-run) brook trout native to Lake Superior, is a high priority for the Service and its partners. Migratory birds and many other fish and wildlife species also benefit from protection and restoration of stream, wetland, and forest habitat on the Refuge and throughout the watershed. The mouth of the creek is a favorite spot for waterfowl hunters.

Whittlesey Creek NWR is a partner in the multi-agency Northern Great Lakes Visitor Center (NGLVC, Visitor Center, Center), which offers opportunities for the public to become more connected with the natural world through environmental education, interpretive programs, special events, exhibits, and hands-on exploration. The Center also serves as headquarters and contact station for the Refuge.

1.2 Purpose and Need for Plan

The purpose of this Comprehensive Conservation Plan (CCP) is to guide management and administration of Whittlesey Creek NWR for the next 15 years and to help ensure that the Refuge meets the purposes for which it was established, contributes to the overall mission of the National Wildlife Refuge System (NWRS, Refuge System), and adheres to Service policies and other mandates. The CCP describes the desired future condition of the Refuge and provides guidance for management actions and decisions. The CCP addresses significant issues, sets goals and measurable objectives, and outlines strategies for reaching those objectives. The planning process informs and involves the general public, state and federal agencies, and non-governmental organizations who have an interest, responsibility, or authority related to the Refuge.

In addition, the landscape continues to undergo changes that affect habitat and wildlife, new threats to the Refuge are emerging, new laws and policies have been put in place, and new scientific information is available. Therefore, updated management guidance is needed that reflects these changes to help achieve Refuge goals for habitat, wildlife, and people.

Figure 1-1: General Location of Whittlesey Creek NWR

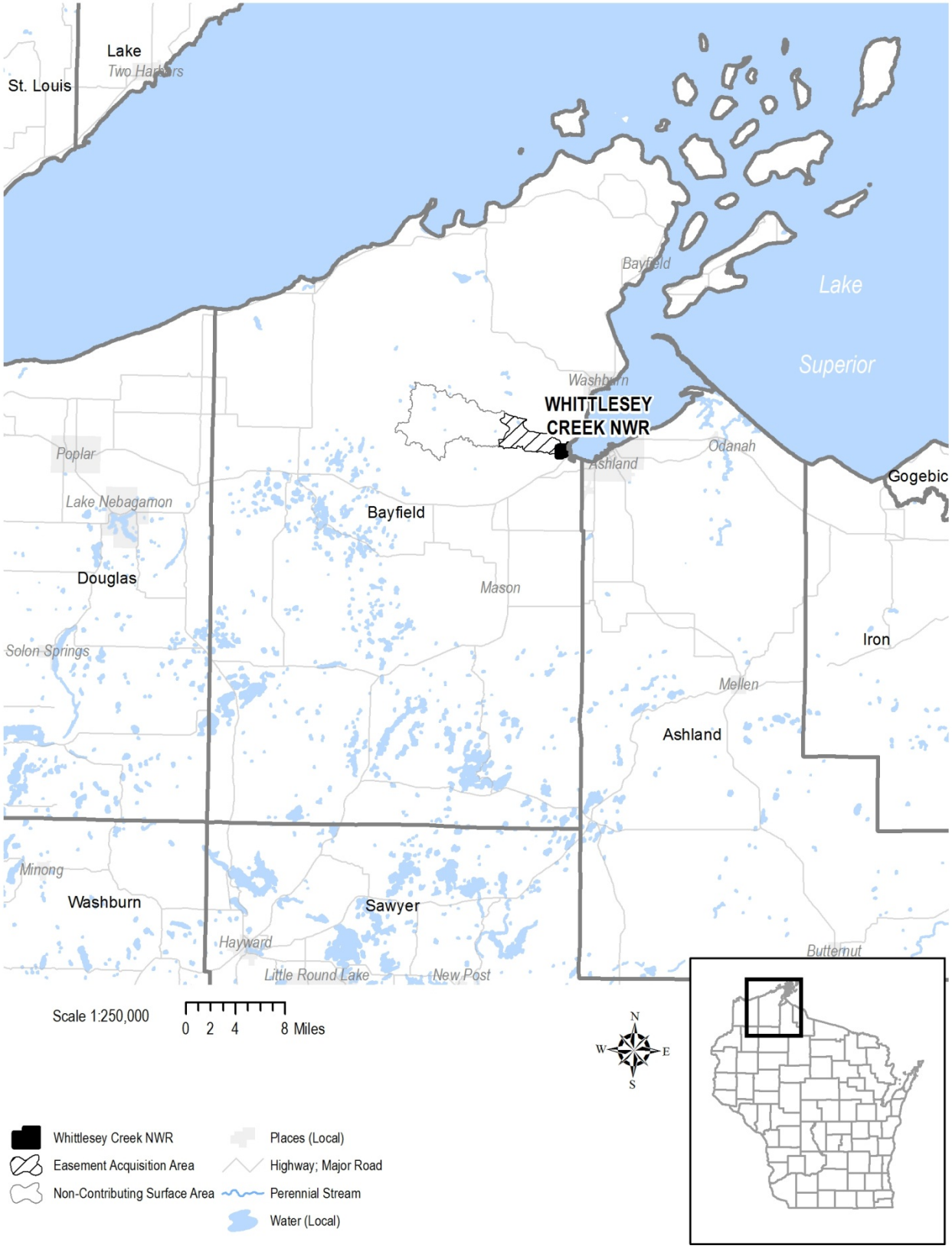
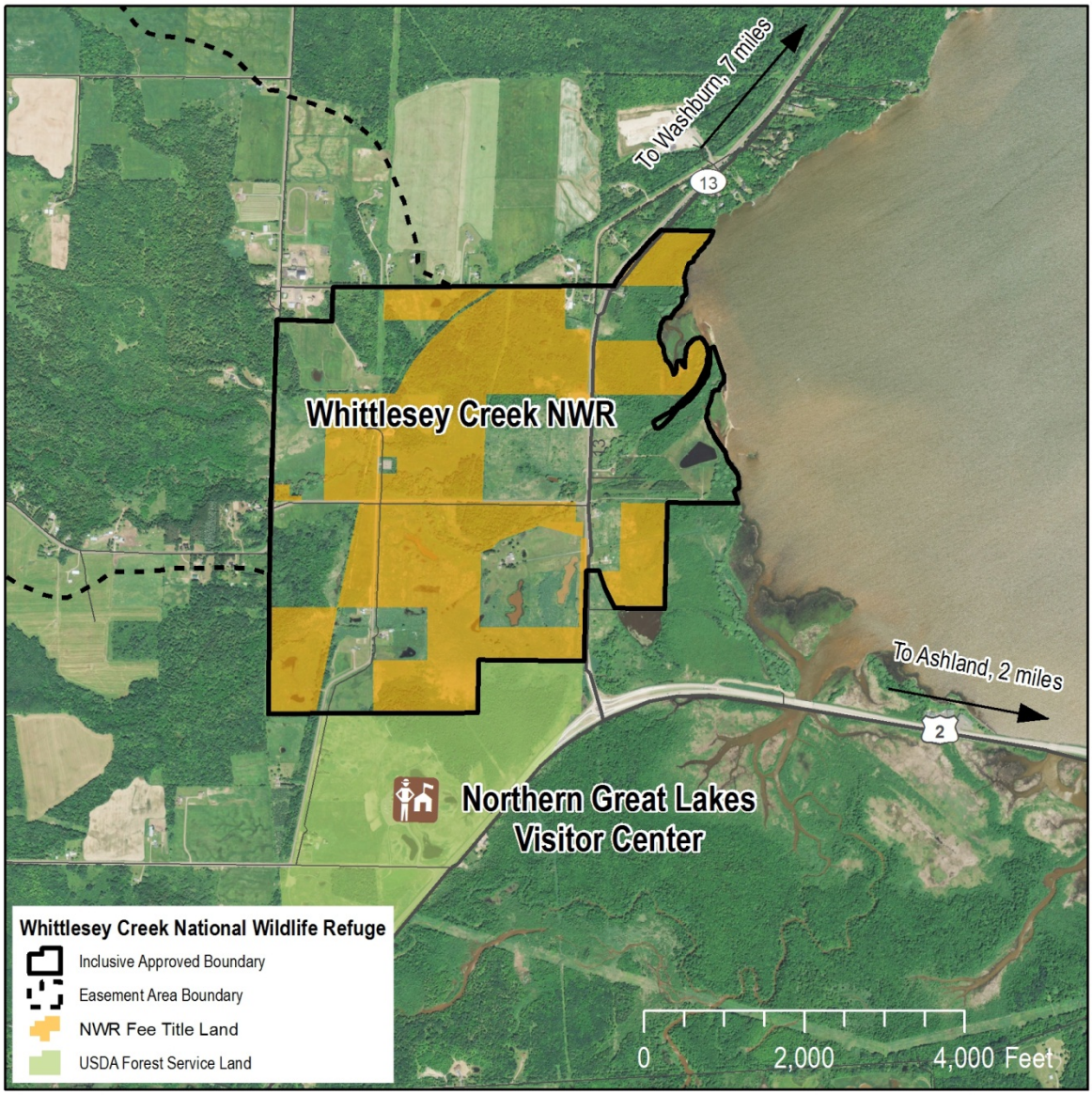


Figure 1-2: Whittlesey Creek National Wildlife Refuge



1.3 Refuge Establishment and Purposes

Whittlesey Creek NWR was officially established on September 30, 1999, when the first tracts of land were purchased by the Service. Historically, the landscape had been dominated by forests, streams, and wetlands that provided rich habitat for fish, waterfowl, and other wildlife, but the system had degraded significantly due to land use changes including logging, agriculture, and residential development long before 1999. The coaster brook trout, once abundant in the Lake Superior basin, had disappeared entirely from most of its historic range, including Whittlesey Creek.

Whittlesey Creek and its watershed had been the focus of conservation activity since at least the 1940s when livestock fencing and willow plantings were used to reduce erosion. Concerns

about flooding, stream changes, and loss of fish habitat were noted again in the 1950s (Red Clay Interagency Committee, 1960) and led to some watershed improvements designed to reduce erosion, sedimentation, and flood flows. Measures included plantings, farm pond construction, fencing to protect stream banks from livestock, and redirection of the lower mile of Whittlesey Creek, which previously had been straightened and rerouted by the U.S. Army Corps of Engineers (USACE).

In the late 1980s, a portion of the lower Whittlesey Creek floodplain was proposed for development into an 18-hole golf course. Development began with spreading of fill, fairway shaping, and construction of four ponds. Eventually the golf course project faltered but it prompted a coalition of environmental and government groups to propose permanent protection and restoration of the area as a national wildlife refuge instead. The proposed boundary included the last unprotected piece of a large coastal wetland and floodplain complex with spring-fed tributary streams at the head of Chequamegon Bay.

By then, Whittlesey Creek was recognized as having potential for restoration of coaster brook trout. In their joint management plan *Fish Community Objectives for Lake Superior* (Busiahn 1990), the agencies responsible for managing Lake Superior's fisheries called for re-establishing depleted stocks of brook trout by "management of habitat for spawning and rearing via habitat inventory, protection, and restoration of degraded habitat," expressly including tributary streams.

Whittlesey Creek also had been designated as an Outstanding Resource Water and as a Great Lakes Community stream by the state of Wisconsin and was a priority watershed in the state's non-point-source pollution abatement program (Wisconsin Department of Natural Resources [WDNR], 1996).

The new Refuge was approved by the Service in January 1998. The authorized boundary included fee title purchase of up to 540 acres of coastal wetlands, floodplain, and limited uplands along Whittlesey Creek and up to 1,260 acres of conservation easements within the watershed. Congress appropriated $650,000 in fiscal year 1999 to begin land acquisition. Grants and donations provided additional funding.

An interim CCP, written prior to Refuge establishment, provided an overview of future management until a final CCP could be completed. As an interim plan, it did not provide extensive detail but answered questions commonly posed by landowners and the public regarding Refuge management and possible public uses that could occur. Goals established at the time emphasized habitat protection and restoration for migratory fish and bird species, reintroduction of coaster brook trout, managing for priority public uses, an ecosystem-based approach to management, and partnerships. The plan specifically noted that stream and wetland restoration within the Refuge boundary "would ensure permanent protection for critical spawning grounds, providing an ideal situation to begin reintroduction of coaster brook trout." These priorities have guided programs on Whittlesey Creek NWR since it was established.

Each unit of the Refuge System has one or more purposes specified in or derived from the legal instruments that established, authorized, or expanded it. Our first obligation is to fulfill the purposes of each refuge. Chapter 601 FW 1 of the *U.S. Fish and Wildlife Service Manual* provides guidance for determining refuge purposes and using them in administration and management of the Refuge System. The purposes of Whittlesey Creek NWR derive from the Fish and Wildlife Act of 1956:

". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . 16 U.S.C. 742f(a)(4) ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude. . ." 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

1.4 Refuge Vision and Goals

The vision is a descriptive picture of how the Refuge will look in the future and provides a sense of direction and purpose. From the vision flow broad goal statements, which in turn provide the framework to develop more detailed and measurable objectives that are the heart of the CCP. The vision and goals are important as reference points for keeping objectives and strategies meaningful, focused, and attainable.

Refuge Vision

Restore and enhance Whittlesey Creek and its watershed for the benefit of coaster brook trout and other native wildlife and provide wildlife-based education in collaboration with the NGLVC partners.

Refuge Goals

Wildlife

Protect, restore, and maintain a diversity of wildlife species native to naturally functioning Refuge habitats, with special emphasis on coaster brook trout and migratory birds.

Habitat

Preserve, restore, and enhance the native habitats of Whittlesey Creek and its watershed.

People

Provide a diverse audience with opportunities to experience high quality, wildlife-dependent activities and to understand and appreciate a natural functioning landscape.

1.5 Legal and Policy Framework

The Refuge is managed as part of the Refuge System within a framework of organizational setting, law, and policy. Key aspects of the framework are summarized below. A listing of other laws and executive orders that have guided preparation of the CCP and that guide future implementation is found in Appendix D: Legal and Policy Guidance.

U.S. Fish and Wildlife Service

Whittlesey Creek NWR is administered by the FWS, the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife populations and their habitats. The Service shares this responsibility with other federal, state, tribal, local, and private entities, but also has specific responsibilities for migratory birds, threatened and endangered

species, certain interjurisdictional fish and marine mammals, and the Refuge System. 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."*

National Wildlife Refuge System

The Refuge System had its beginning in 1903 when President Theodore Roosevelt designated a three-acre island off the Florida coast, Pelican Island, as a sanctuary for colonial nesting birds. Today, the Refuge System has grown to a network of more than 560 refuges and 38 wetland management districts across the country, with at least one in every U.S. state and territory.

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. The administration, management, and growth of the Refuge System are guided by the following goals:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered;
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges;
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts;
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); and
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

National Wildlife Refuge Improvement Act of 1997 and Related Policy

The National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) amended the National Wildlife Refuge System Administration Act of 1966 and became a true organic act for the Refuge System by providing a mission, policy direction, and management standards. The Improvement Act's main components include:

- A strong and singular wildlife conservation mission for the Refuge System;
- A requirement that the Secretary of the Interior maintain the biological integrity, diversity, and environmental health of the Refuge System;
- A new process for determining compatible uses on refuges;

- A recognition that wildlife-dependent public uses involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation, when determined to be compatible, are legitimate and appropriate public uses of the Refuge System;
- That these compatible wildlife-dependent recreational uses are the priority general public uses of the Refuge System; and
- A requirement to prepare a CCP for each refuge.

Compatibility Policy
No use that the Service has authority to regulate may be allowed on a unit of the Refuge System unless it is determined to be compatible (FWS, 2000a). A compatible use is a use that, in the sound professional judgment of the Refuge Manager, will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the refuge. Managers must complete a written compatibility determination for each use, or collection of like-uses, that is signed by the manager and the Regional Chief of Refuges in the respective Service region.

Biological Integrity, Diversity, and Environmental Health Policy
The Improvement Act directs the Service to "ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans." The biological integrity policy (FWS, 2001) helps define and clarify this directive by providing guidance on what conditions constitute biological integrity, diversity, and environmental health; guidelines for maintaining existing levels, guidelines for determining how and when it is appropriate to restore lost elements, and guidelines in dealing with external threats to biological integrity, diversity, and environmental health.

Wildlife-Dependent Recreation Policy
The Improvement Act identifies six priority wildlife-dependent recreational uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Congress directed the Service to grant these six public uses special consideration in the planning, management, establishment, and expansion of refuges. In addition, if determined compatible on a refuge, these six uses assume priority status over any other uses proposed or occurring on a refuge. The Service is to facilitate priority wildlife-dependent public use opportunities when they do not interfere with the ability to fulfill refuge purposes or the mission of the Refuge System. The wildlife-dependent recreation policy (FWS, 2006a) provides additional guidance for management of these uses on national wildlife refuges.

Wilderness Review

Refuge planning policy mandates that wilderness reviews be conducted through the comprehensive conservation planning process (FWS, 2000b). The criteria for wilderness designation are size, naturalness, opportunities for solitude or primitive recreation, and supplemental values. No lands within Whittlesey Creek NWR meet the criteria for wilderness established by Congress and described in Service policy (FWS, 2008a). Whittlesey Creek NWR does not contain 5,000 contiguous acres of roadless natural lands, nor does the Refuge possess any units of sufficient size to make their preservation practicable as wilderness. Refuge lands and waters have been substantially altered by humans, especially by logging, agriculture, residential development, and transportation networks.

1.6 Other Conservation Initiatives

The Service works closely with other government agencies and conservation organizations to develop and implement regional, national, and international conservation plans and initiatives. Several of these efforts relevant to Whittlesey Creek NWR are described below; their recommendations and priorities were reviewed and integrated where appropriate into this CCP.

Brook Trout Restoration

A Brook Trout Rehabilitation Plan for Lake Superior
The Great Lakes Fisheries Commission was established in 1955 by the Convention on Great Lakes Fisheries between Canada and the United States. The Commission has two major responsibilities: (1) to coordinate Great Lakes fisheries research and recommend measures that will sustain the productivity of fish species of concern, and (2) to formulate and implement a program to control sea lamprey populations in the Great Lakes.

A brook trout sub-committee of the Lake Superior Technical Committee developed this plan (Newman et al., 2003) to provide guidance for brook trout rehabilitation initiatives around Lake Superior. The goal is to maintain widely distributed, self-sustaining populations throughout their original range. The plan outlines actions needed to reach that goal under three categories: restore tributary habitat, regulate harvest, and introduce genetically appropriate strains through stocking.

Wisconsin Lake Superior Brook Trout Plan
The completion of the 2003 lake-wide brook trout plan resulted in the development of a similar plan in Wisconsin waters of Lake Superior specific to its tributaries and near-shore waters (WDNR and FWS, 2005). The goal of this plan is to “protect and improve self-sustaining brook trout populations and their habitat in Wisconsin’s Lake Superior basin and attempt to establish several populations that exhibit life history diversity (both stream resident and migratory ‘coaster’ life history types).”

The Wisconsin plan, developed jointly by the WDNR and the Service, emphasizes the importance of understanding brook trout resource requirements and the impact of human activities, and seeks to address errors in past actions that may have involved responding to symptoms of resource loss while failing to address the root problems brook trout face. The plan states that success will depend on a long-term commitment to watershed management and tributary habitat-forming processes, as well as partnerships between management agencies and citizens. Strategies are described for stream habitat and watershed health, harvest, rehabilitation stocking, genetics management, life history and management, interaction with non-native species, and outreach.

Migratory Bird Programs

Several partnership-based bird conservation initiatives have produced continental, national, and/or regional plans that help guide management decisions for refuges.

The *North American Waterfowl Management Plan* (NAWMP) began in 1986. The 2004 plan update states that its purpose is to “sustain abundant waterfowl populations by conserving landscapes, through partnerships, that are guided by sound science.” The NAWMP is

international in scope but is implemented through regional partnerships called "Joint Ventures." Whittlesey Creek lies within the Upper Mississippi River/Great Lakes Joint Venture.

Partners in Flight began in 1990 in response to growing concerns about declining populations of many landbird species. Its regional plans are based on a system of Bird Conservation Regions (BCRs). Whittlesey Creek NWR lies within the U.S. portion of BCR 12, the boreal hardwood transition zone, which extends across portions of northern Minnesota, Wisconsin, and Michigan.

The *North American Bird Conservation Initiative (NABCI)* is a continental effort to integrate all migratory bird conservation programs under one umbrella. NABCI has defined BCRs as its planning units. The U.S. NABCI Committee promotes conservation delivery via existing and new Joint Ventures nationwide, thus eliminating redundant partnership structures and separate biological planning processes. The Service is a member of the U.S. NABCI Committee.

Many bird conservation initiatives have a process for determining priority species using assessment scores based on factors such as population trends, threats, distribution, abundance, and relative density. The Service and other agencies often use these scores in developing their own lists of priority bird species. *Birds of Conservation Concern 2008* (FWS, 2008b) identifies migratory nongame bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities of the Service. The list includes three distinct geographic scales—Bird Conservation Regions, FWS Regions, and National—and uses assessment scores from the North American Landbird Conservation Plan, the U.S. Shorebird Conservation Plan, and the North American Waterbird Conservation Plan.

Wisconsin Wildlife Action Plan

Congress created the State Wildlife Grants Program in 2001 to address the unmet needs of wildlife species in greatest conservation need and required that each state develop a comprehensive wildlife conservation plan to remain eligible for federal funds through the program. These plans address the needs of a wide array of wildlife but focus primarily on Species in Greatest Conservation Need (SGCN) and their habitats. SGCN are defined as animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. Wisconsin's Wildlife Action Plan (WDNR, 2005) provides a conservation roadmap that lists 149 vertebrate and 530 invertebrate SGCN and includes a menu of over 1,700 conservation actions to help secure the future of wildlife in the state.

The implementation strategy (WDNR, 2008) identifies the most critical conservation actions and locations to meet the state's long-term goal of conserving SGCN. Whittlesey Creek NWR is part of Fish Creek Conservation Opportunity Area (COA) within the Superior Coastal Plain Ecological Landscape. The Fish Creek COA is considered a high quality wetland community of state significance. The implementation strategy for the Superior Coastal Plain lists 19 high priority SGCN and 12 priority conservation actions for the Superior Coastal Plain including:

- Protect and restore harbor and river mouth shoreline and wetland habitats.
- Preserve and maintain large expanses of sedge meadow, coastal fen, and forested wetlands along the coast and manage in the context of a mosaic of community types.

- Manage forested wetlands and fens as part of a vegetation mosaic that includes other open wetland communities, shrub swamp, and swamp conifer forest.

Partners for Fish and Wildlife Program

The Service established the Partners for Fish and Wildlife Program (PFW, Partners Program) in 1987 to work beyond the boundaries of refuges with landowners and other partners to improve habitat on private lands for fish and wildlife. The program is voluntary, relies heavily on a partnership approach, and leverages both ideas and funding from a variety of sources. Cost sharing agreements and technical assistance are important components. Service biologists work one-on-one with landowners to plan, implement, and monitor their projects.

The overall goal of Partners Program projects is to return a site to the ecological condition that likely existed prior to loss or degradation. Priority ranking is given to proposed projects that meet these conditions:

- Improve habitat for migratory birds, threatened and endangered species, inter-jurisdictional fish, marine mammals, and other declining species.
- Complement activities on Refuge System lands, or contribute to the resolution of problems on refuges that are caused by off-refuge practices.
- Address species and habitat priorities that have been identified through Service planning teams (with our partners), or in collaboration with state fish and wildlife agencies.
- Reduce habitat fragmentation or serve as buffers for federal or state conservation lands.
- Result in self-sustaining systems that are not dependent on artificial structures.

Whittlesey Creek NWR is located within the Superior Coastal Plain focus area of the Wisconsin PFW program. Priority species for the focus area are mallard, wood duck, Canada goose, blue-winged teal, black duck, American bittern, and coaster brook trout. Five-year targets include restoration and enhancement of 150 acres of wetland and 100 acres of upland, as well as removal of two fish barriers.

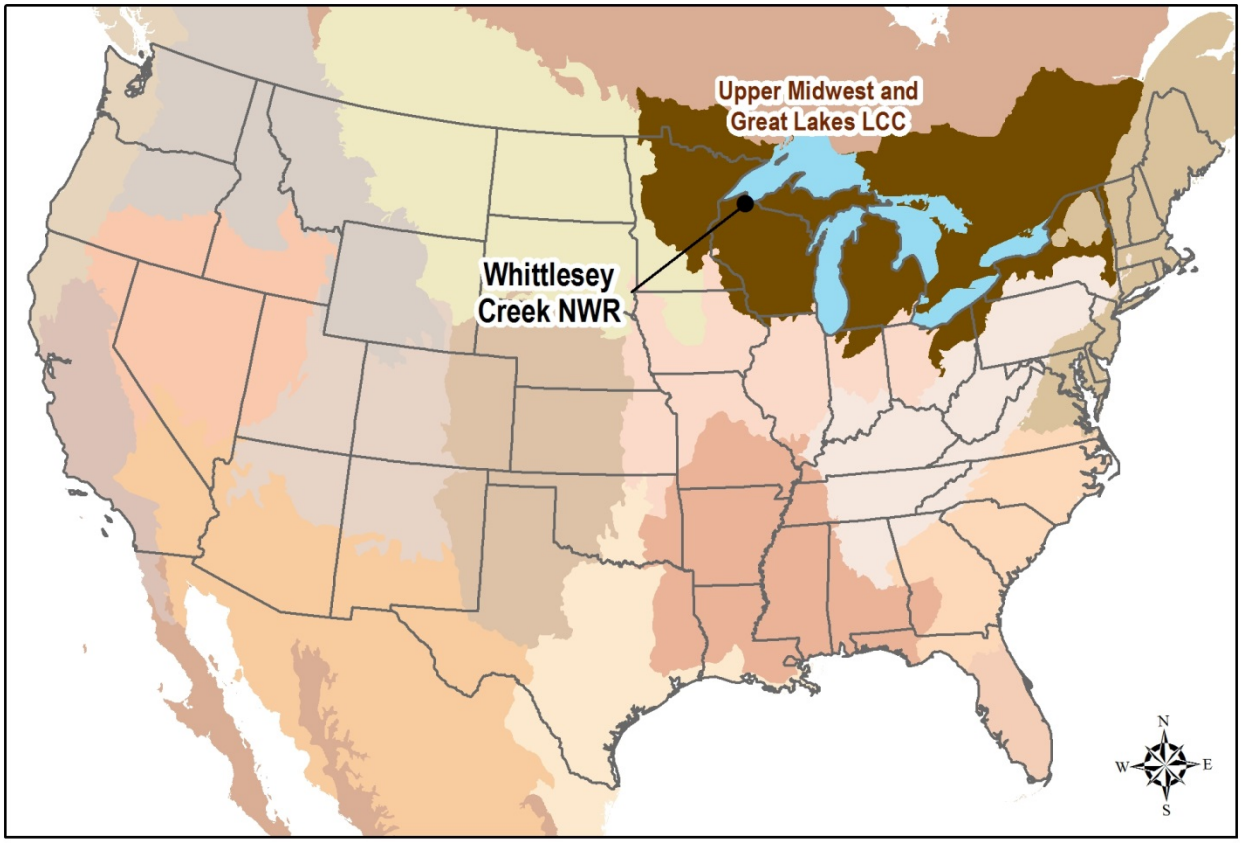
Landscape Conservation Cooperatives

Secretarial Order 3289, signed by Interior Secretary Ken Salazar in 2009, directed Department of Interior bureaus, including the Service, to stimulate the development of a network of Landscape Conservation Cooperatives (LCCs) to address landscape-scale stressors such as habitat fragmentation, genetic isolation, spread of invasive species, and water scarcity, all of which are magnified by accelerating climate change. LCC partnerships include states, tribes, federal agencies, non-governmental organizations, universities, and others. They recognize that conservation challenges transcend political and jurisdictional boundaries and require a more networked approach to ensure the sustainability of North America's land, water, wildlife, and cultural resources.

LCCs are intended to provide a strong link between science and conservation delivery and to connect site-specific protection, restoration, and management to larger goals supporting fish and wildlife populations and the natural systems that sustain them. By functioning as a network of interdependent units, LCC partnerships can accomplish a conservation mission no single

agency can accomplish alone. Each LCC operates within a specific landscape. Whittlesey Creek NWR lies within the boundary of the Upper Midwest and Great Lakes LCC (Figure 1-3).

Figure 1-3: Landscape Conservation Cooperatives



FWS Climate Change Strategic Plan

The Service's strategic plan for responding to climate change (FWS, 2010) establishes a basic framework for efforts to ensure the sustainability of fish, wildlife, and habitats and includes three key elements:

> **Adaptation**: Minimizing the impact of climate change on fish and wildlife through the application of cutting-edge science in managing species and habitats.
>
> **Mitigation**: Reducing levels of greenhouse gases in the Earth's atmosphere.
>
> **Engagement**: Joining forces with others to seek solutions to the challenges and threats to fish and wildlife conservation posed by climate change.

The plan recognizes the role of healthy ecosystems in helping fish and wildlife populations adapt to a changing climate. It also allows resource managers to be responsive as science, technology, and experience evolve over time:

> *"We will increase our adaptation efforts significantly in the near term as we respond to increasing climate change impacts. Our initial emphasis will be on reactive adaptation, as we work to build resilience in ecosystems through our management efforts and, in some cases, to buy additional time to increase our certainty regarding future landscape conditions . . . Over the long-term, however, we will work with partners to assemble the technical and institutional capability to increase anticipatory adaptation efforts, particularly as the impacts of climate change become more certain."*

Chapter 2: The Planning Process

In this chapter:

2.1 Introduction
2.2 Scoping and Public Involvement
2.3 Summary of Issues
2.4 Preparation, Finalization, and Implementation of the CCP

2.1 Introduction

The Comprehensive Conservation Plan (CCP) process for Whittlesey Creek National Wildlife Refuge (NWR, Refuge) meets the dual requirements of compliance with the National Wildlife Refuge System Improvement Act of 1997 and the National Environmental Policy Act (NEPA). Both require that the U.S. Fish and Wildlife Service (FWS, Service) actively seek public involvement in the preparation of environmental documents. NEPA also requires that the Service seriously consider all reasonable alternatives to its Preferred Alternative, including the "No Action" alternative, which represents continuation of current conditions and management practices.

Key steps in the CCP process include:

- Form the planning team and conduct pre-planning;
- Initiate scoping and public involvement;
- Identify issues and develop vision and goal statements;
- Develop alternatives and assess their environmental effects;
- Identify the preferred alternative;
- Publish the draft CCP and NEPA document for public comment;
- Revise and publish the final plan;
- Implement the CCP.

2.2 Scoping and Public Involvement

The Notice of Intent to prepare a CCP and Environmental Assessment (EA) for Whittlesey Creek NWR was published in the Federal Register dated January 17, 2013 (Vol. 78, No.12, page 3909-3910).

Internal scoping began in January 2013 when Service planning staff and staff from Whittlesey Creek NWR, St. Croix Wetland Management District, and Ashland Fish and Wildlife Conservation Office developed a preliminary list of issues, concerns, and opportunities associated with management of the Refuge. A second internal scoping session was held with the Service's Midwest Regional Office staff in Bloomington, MN in May 2013 to get input on issues from regional supervisors, biologists, planners, and other program specialists.

Public scoping began in April 2013 when Refuge staff hosted an open house event at the Northern Great Lakes Visitor Center (NGLVC, Visitor Center, Center) in Ashland, WI, to inform

the public of the planning process and to solicit their input on issues of concern. About 20 people attended. In addition, a news release was distributed to area media, informational posters were displayed in the local community, and a notice inviting public participation was sent to more than 600 names on the Refuge mailing list. Written comments were received from 11 stakeholders. The Refuge Manager also met with numerous partners to explain the importance of the CCP process and to encourage active participation. An invitation for participation and comments was also extended to partnership agency staff at the NGLVC as well as the Friends of the Center Alliance.

2.3 Summary of Issues

The following paragraphs summarize the significant issues that were identified and analyzed as part of the CCP process. They represent input from the public, other agencies and organizations, and Service staff. These issues focused the planning effort on the most important topics. They were critical in framing the objectives for the various alternatives considered and formed the basis for evaluating environmental effects. Detailed information about these issues is included in chapter 3.

Wildlife

Coaster Brook Trout

The coaster brook trout was common prior to European settlement, but numbers soon plummeted due to overharvest and habitat degradation. Conservation partners have been collaborating since the 1990s on projects to reestablish coaster brook trout in the Lake Superior basin.

The Whittlesey Creek project, begun in 2003, is a partnership between the Service and the Wisconsin Department of Natural Resources. Notable progress has been made on all four high-priority actions: improve habitat, establish protective harvest regulations, stock coaster brook trout, and assess and monitor. The goal of the experimental protocol is to reestablish a self-sustaining population of migratory brook trout in Whittlesey Creek within 30 years. The role of the Refuge is to restore suitable habitat in the creek.

Brook trout numbers have increased since the experiment began and movement into and out of Whittlesey Creek has been documented, although a breeding population has not yet been verified. Habitat restoration is incomplete and the effects of competition from non-native salmonids are not well understood. Because these fish are migratory, conditions outside the local watershed could affect the likelihood of successful coaster reestablishment within Whittlesey Creek. Climate change is a serious threat to brook trout in most of the Lake Superior basin, but Whittlesey Creek habitat is expected to remain highly suitable.

Migratory Birds

Restoration of forests and wetlands on the Refuge improves habitat for many migratory bird species, including songbirds, raptors, waterfowl, and shorebirds. Improved water quality in Whittlesey Creek benefits birds using downstream habitat at the creek mouth and in Chequamegon Bay. The Refuge is included within the boundary of the Lower Chequamegon Bay Important Bird Area.

Some additional improvements in habitat quality are possible (e.g., forest stand management), but may not be cost effective. Additional bird population benefits would be minimal because the Refuge is small and not located along a major flyway. Bird-specific management actions have not been a high priority to date. Surveys and monitoring have been sporadic due to limited resources and not always closely tied to habitat restoration activities.

Habitat

Habitat protection and restoration is underway in the creek, on Refuge wetlands and floodplains, and within the watershed, although much work remains. The habitat management plan for Whittlesey Creek NWR (FWS, 2006c) provides comprehensive guidance for habitat restoration and management on Refuge lands and conservation actions within the watershed but does not set priorities. Management actions should be focused on the highest priority projects to make the best use of limited resources and to maximize the fish and wildlife benefits of the Refuge.

Stream

Habitat activities in recent years have centered on in-stream habitat and fish passage. Large woody debris has been restored to parts of Whittlesey Creek, reducing bank erosion, providing cover for fish and invertebrates, and exposing beneficial gravel substrate. About 12 miles of in-stream habitat restoration is still needed, and none has occurred yet on either Little Whittlesey or Terwilliger Creeks. Fourteen new culverts have reduced erosion and sedimentation and improved fish access to approximately five miles of Whittlesey, the North Fork, Little Whittlesey, and Terwilliger Creeks. Additional culverts still need replacement. Five recently installed rock crossings and four runoff detention basins reduce erosion and sedimentation from watershed agricultural lands. Bridges that cross Whittlesey Creek are too narrow for the width of the stream (thus increasing velocity, erosion, and sedimentation) and should be replaced. One on a Town Road in the Refuge is scheduled for replacement during 2015. The lower mile of Whittlesey, Little Whittlesey, and Terwilliger Creeks were dredged and straightened in the 1940s and 1950s; the quality of wetland and aquatic habitat on the Refuge would improve if historic floodplain hydrology were restored.

Floodplain and Coastal Wetland

Roughly 62 acres of native conifers and shrubs have been planted in degraded riparian zones, floodplain hayfields and on the limited upland areas on the Refuge; about 180 acres still need to be planted. Planning has begun to plant sixty acres during 2015 in partnership with the U.S. Forest Service (USFS) with funding provided by the Lake Superior Landscape Restoration Partnership
(http://www.nrcs.usda.gov/wps/portal/nrcs/detail/wi/home/?cid=STELPRDB1247205).

Ditches have been plugged in some floodplain wetlands, but additional hydrologic restoration is needed. Sedge meadows would benefit from management with prescribed fire. Non-native invasive plants found on the Refuge include reed canarygrass, buckthorn, and common tansy. Early detection and treatment are critical to controlling invasives, but inventory and control efforts are limited by lack of resources.

Watershed

The Whittlesey Creek watershed has good quality surface and groundwater; the primary concern is sediment that degrades fish and wildlife habitat. Bank erosion is the main source of sediment, so consideration of the ongoing impacts of ground-disturbing activities (logging, farming, grazing, ditch and road construction, and stream channelization) and flash flood characteristics of the watershed on stream bank stability remains important. Protecting groundwater, slowing runoff, facilitating surface water infiltration, and controlling erosion in the upstream watershed are crucial to successful restoration of downstream fish and wildlife habitat on the Refuge.

Continued success depends upon strong partnerships. The Refuge is collaborating with landowners in the watershed to acquire conservation easements and implement conservation practices on private land. Defining the highest priority locations for such activities could help make the most effective use of limited funding. The USFS is an active conservation partner in the area and Whittlesey Creek watershed lies partly within the Chequamegon-Nicolet National Forest. Additional opportunities may exist to share resources and expertise with the USFS to achieve mutual objectives for protection and restoration of the watershed. The U.S. Department of Agriculture Natural Resources Conservation Service, Bayfield County Land and Water Conservation Department, Town of Barksdale, and numerous other partners are also committed to watershed protection, enhancement and restoration efforts.

Climate Change

Climate models show projected temperature increases of 5 to 11 °F in Wisconsin by the mid-21st century. Precipitation is likely to increase in winter, spring, and fall, but expected changes in summer precipitation are unclear. A fisheries model developed by Lyons et al. (2010) indicates that the effects of a warming climate are expected to eliminate brook trout habitat in many Wisconsin streams by mid-century, but Whittlesey Creek is expected to remain highly suitable. Boreal and lowland forests will be subject to increased stress and may be lost altogether in northern Wisconsin. Hardwood trees are predicted to expand their range in the state.

Climate change will interact with other stressors—including habitat loss and fragmentation, invasive species, and pollution—amplifying the challenges they pose to natural habitats and biodiversity. Through proper stewardship, protected habitats such as the Refuge can be maintained to promote the highest levels of natural resilience to change.

People

Hunting and Fishing

The Refuge offers opportunities for archery deer hunting and waterfowl hunting in designated locations. Should more or fewer opportunities be available? The small size of the Refuge and patchwork land ownership can result in trespass issues on adjacent private lands. Fishing is allowed within Whittlesey Creek waters in accordance with state regulations. The Refuge itself, however, has never been opened to fishing per Service regulations, so anglers must be in the water to fish legally within the Refuge boundary. Should streambank fishing be allowed in the Refuge?

Wildlife Observation and Photography

Ideas to enhance wildlife observation and photography on the Refuge have included new foot trails and construction of an overlook at the mouth of the creek. Additional facilities and increased visitation on such a small Refuge must be carefully evaluated to limit wildlife and habitat disturbance.

Another idea for enhancing visitor use of the Refuge was to develop a biking/hiking trail along the old railroad alignment through the Refuge. This was suggested as part of an idea to link Washburn with the NGLVC.

Environmental Education and Interpretation

Environmental education has been a high priority at the Refuge, but capabilities currently are limited due to lack of visitor services staff. The biologist provides inventory, monitoring, sampling techniques, and habitat restoration experiences to local students and participates in (NGLVC) programs that contribute to the mission of the Service. The biologist provides habitat restoration experiences to local students and participates in NGLVC programs that contribute to the mission of the Service. There is a need to define the vision and priorities for environmental education and interpretation on the Refuge, and Refuge staff participation in special events at NGLVC. The Coaster Classroom is underutilized; creative ideas are needed to make better use of this high quality Refuge facility.

Northern Great Lakes Visitor Center

The Service is a partner in the NGLVC, which is adjacent to Whittlesey Creek NWR. The partnership includes five agencies and one non-profit group: U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, Wisconsin State Historical Society, University of Wisconsin Extension, and Friends of the Center Alliance Limited—that together provide a unique combination of perspectives and opportunities. The mission of the NGLVC is to help people connect with the historic, cultural, and natural resources of the region. It also serves as Refuge headquarters and point-of-contact for Refuge visitors. The NGLVC partnership offers many opportunities for mutually beneficial collaboration and enhancement of Service identity in the region, but current Service involvement in day-to-day activities is limited. The Refuge biologist is the only staff biologist at the NGLVC and therefore assists with habitat restoration, land management and natural resources projects. Refuge staff previously included a full-time visitor services professional, but that position is now vacant, and the Refuge Manager is located several hours away.

Participation in the partnership occurs through an annual Intergovernmental Transaction Agreement between the Service and the USFS. The agreement provides a general description of the use of the NGLVC and the Service role in the partnership. The agreement does not address the Service's long-term commitment to the partnership nor does it provide clearly defined roles and expectations

2.4 Preparation, Finalization, and Implementation of the CCP

The CCP and EA are being prepared by the staff of Whittlesey Creek NWR and the Service's Midwest Regional Office. The document will be published in two phases in accordance with NEPA. The EA (Appendix A: Environmental Assessment) presents a range of alternatives for

future management and identifies the preferred alternative, which also provides the basis for the draft CCP. A public review period of at least 30 days will follow release of the draft document and will include one or more open houses to provide an opportunity for people to comment in person. Written and electronic comments also will be accepted.

Comments received by the Service will be incorporated where appropriate and perhaps result in modifications to the preferred alternative or in the selection of one of the other alternatives. The alternative that is ultimately selected will become the final CCP, which will provide a framework for managing the Refuge over the next 15 years. It will guide the development of more detailed step-down management plans for specific resource areas, and it will underpin the annual budgeting process through Service-wide allocation databases. Most importantly, it lays out the general approach to managing wildlife, habitat, and people at Whittlesey Creek that will inform day-to-day decision making and actions.

Chapter 3: Refuge Environment and Management

In this chapter:

3.1 Geographic/Ecosystem Setting
3.2 Physical Environment
3.3 Biological Environment
3.4 Socioeconomic Environment
3.5 Cultural Resources
3.6 Refuge Programs

3.1 Geographic/Ecosystem Setting

Whittlesey Creek National Wildlife Refuge (NWR, Refuge) is located along the south shore of Lake Superior near the head of Chequamegon Bay in Bayfield County near Ashland, WI. Lake Superior is the largest freshwater lake, by surface area, in the world. The mouth of Whittlesey Creek is associated with a large coastal wetland and floodplain complex that extends along the south shore of Chequamegon Bay.

Laurentian Mixed Forest

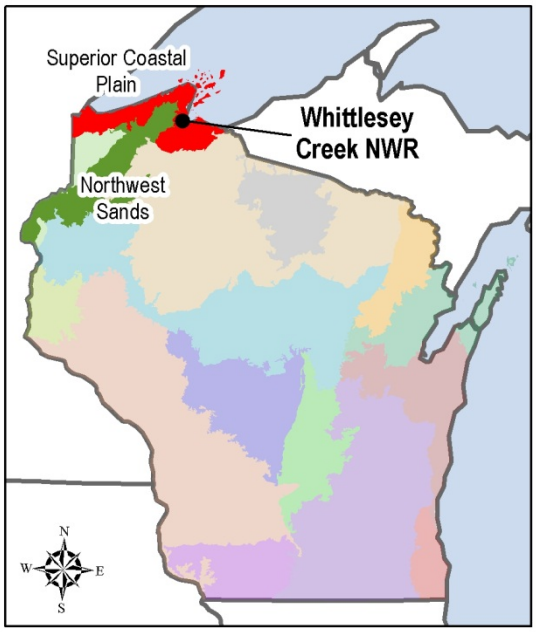
The Refuge is within the Laurentian Mixed Forest province as defined by Bailey's ecological classification system developed by the U.S. Forest Service (USFS). The Laurentian Mixed Forest province covers an extensive area along the Great Lakes and New England lowlands. Most of the province has low relief, but rolling hills occur in many places. Elevations range from sea level to 2,400 feet. Glacial features are typical of the area. This province lies between the boreal forest and the broadleaf deciduous forest and is therefore transitional. Some locations consist of mixed stands of a few coniferous and deciduous species; others are pure deciduous forest or pure coniferous forest (Bailey, 1976; Bailey, 1980).

Wisconsin Ecological Landscapes

The Wisconsin Department of Natural Resources (WDNR) has adopted a classification system that divides the state into 16 ecologically similar regions called Ecological Landscapes.

The Refuge lies within the Superior Coastal Plain, which is the northernmost Ecological Landscape (Figure 3-1). The major landform is a nearly level plain of lacustrine clays that slopes gently northward toward Lake Superior. The clay plain is separated into two segments by the more rugged Bayfield Peninsula. The mouths of many of the streams entering Lake Superior are submerged, creating freshwater estuaries. Historically, the Superior Coastal Plain was almost entirely forested with a distinctive mixture of white pine, white spruce, balsam fir, paper birch, balsam poplar, trembling aspen, and white cedar occurred on the

Figure 3-1: Wisconsin Ecological Landscapes



lacustrine clays. The present-day clay plain forest has been fragmented by agricultural use, and approximately one-third of this Ecological Landscape is now non-forested. Older forest successional stages are now rare (WDNR, 2012)

More than half of the upstream watershed (easement acquisition area) lies within the Northwest Sands Ecological Landscape. The Northwest Sands is a large glacial outwash system containing two major landforms: flat plains or terraces along glacial meltwater channels, and pitted or “collapsed” out wash plains containing kettle lakes. Soils are deep sands, low in organic matter and nutrients. Historic vegetation was dominated by jack pine and scrub oak forest and barrens. White and red pine forests were also a sizable component of the area. Current vegetation is a mix of forest, agriculture, and grassland with some wetlands in the river valleys. Approximately 64 percent of the area is classified as timberland, of which 49 percent is under public ownership. Groundwater conditions are among the least polluted and most vulnerable in the state.

Other Conservation Lands

(See Figure 3-2.)

U.S. Forest Service

The former Chequamegon and Nicolet National Forests, established in the early 1930s, were combined into the Chequamegon-Nicolet National Forest in 1998, but each national forest has retained its individual identity. The Chequamegon side of the forest covers more than 850,000 acres in Ashland, Bayfield, Sawyer, Price, Taylor and Vilas counties. About three-quarters of the Whittlesey Creek drainage basin is within the Washburn Ranger District of this national forest.

Northern Great Lakes Visitor Center
The Northern Great Lakes Visitor Center (NGLVC, Visitor Center, Center) is adjacent to the southern boundary of the Refuge on a 180-acre tract owned by the USFS. The land includes black ash swamp, sedge meadow, mature cedar and tamarack forest, restored wetlands, and other parts of the tract are managed as hayfield. NGLVC land also includes an experimental agroforestry area and a snowmobile trail.

National Park Service

The Apostle Islands archipelago includes 22 islands off the Bayfield Peninsula. The Apostle Islands National Lakeshore, a unit of the National Park System, encompasses about 42,000 acres of land, including 21 of the islands plus a 12-mile segment of shoreline on the peninsula. Most of the National Lakeshore is covered with unbroken mature second growth forest. The area is at the continental northwestern limits of the hemlock-white-pine-northern hardwood forest and contains elements of boreal forest.

Bad River Band of Lake Superior Chippewa

The 16,000-acre Kakagon and Bad River Sloughs is the largest undeveloped coastal wetland complex on the upper Great Lakes. Located east of Ashland on land owned by the Bad River Band of Lake Superior Chippewa, it is home to a variety of natural plant communities and is often called the "Everglades of the North." The Kakagon and Bad River Sloughs complex

provides important spawning and nursery areas for fish and stopover habitat for migratory birds and is the only remaining location where wild rice is abundant on Lake Superior.

This coastal wetland ecosystem is among the richest and most extensive of its kind and has received many conservation designations: National Park Service National Natural Landmark, Nature Conservancy Priority Conservation Area, Wisconsin Land Legacy Place, Wisconsin Bird Conservation Initiative Important Bird Area, Wisconsin Wetlands Association Wetland GEM, and Wisconsin Coastal Wetland Primary Inventory Site. Most recently, the Kakagon and Bad River Sloughs were recognized in 2012 as a Wetland of International Importance, or Ramsar site—the first to be owned by a tribe.

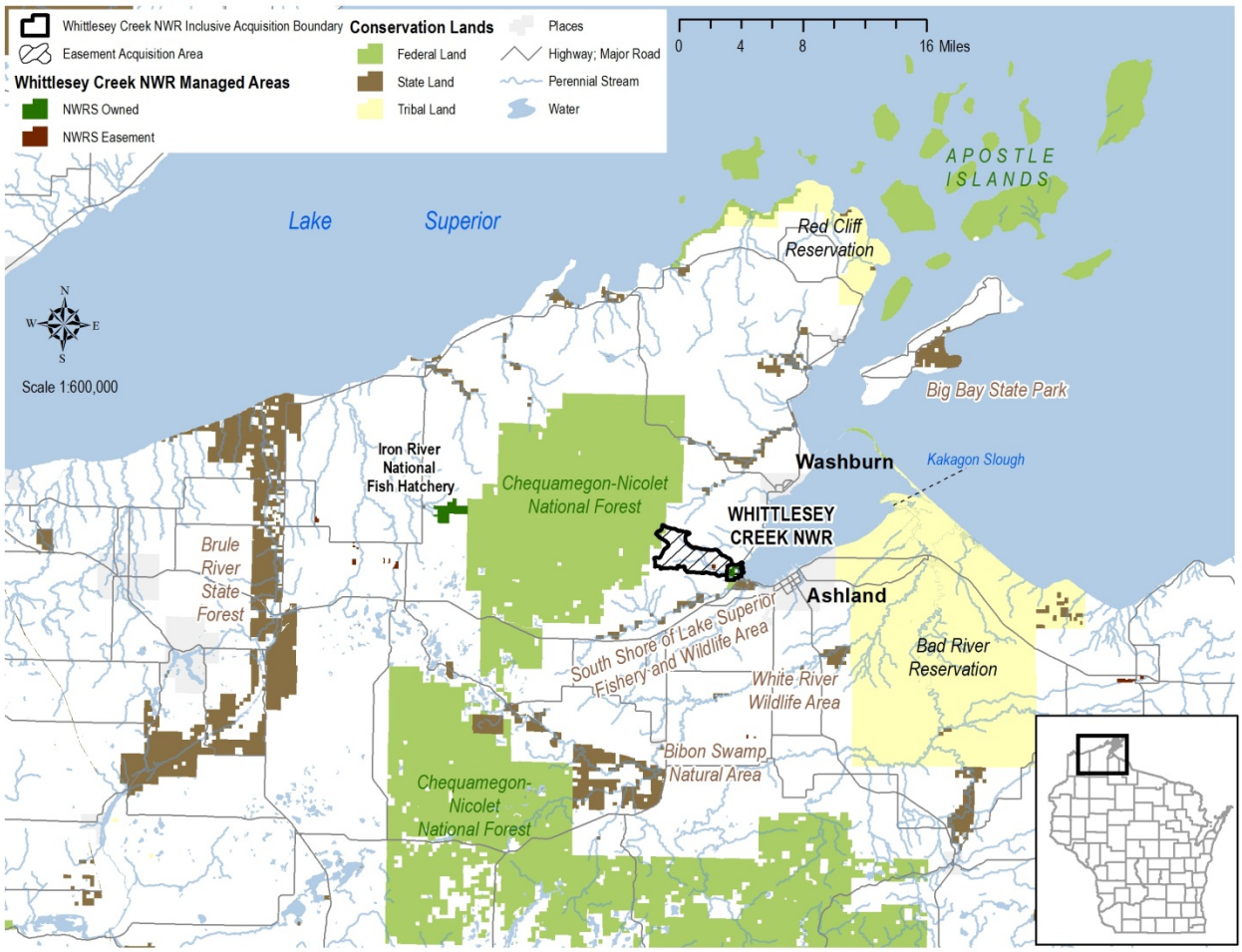
Wisconsin Department of Natural Resources

The South Shore of Lake Superior Fishery and Wildlife Area includes various properties owned and managed by the WDNR along the streams and shores of Lake Superior in Bayfield County. The goal is to enhance stream and coastal habitat to benefit flora and fauna associated with these specific areas, and to provide public recreation and education opportunities. The project spans five stream drainages and their associated coastal wetlands. Units include Fish Creek Sloughs (250 acres), Cranberry River Mouth (35 acres), Flag River (600 acres), Big Sioux River (487 acres), and Pikes Creek Slough (40 acres). WDNR owns more than 250 additional acres adjacent to the Fishery and Wildlife Area. The WDNR property borders the Refuge and includes coastal wetlands along Chequamegon Bay at the mouth of Fish Creek.

City of Ashland

Ashland’s 100-acre Prentice Park includes wetlands and boreal forest that are popular for wildlife viewing.

Figure 3-2: Other Conservation Lands



3.2 Physical Environment

Geology

The Lake Superior basin emerged from glacial cover between 13,000 and 9,000 years ago. During that time, ice melt formed pro-glacial lakes of changing configuration and drainage patterns. Lake Superior lies along the southern edge of the Canadian Shield, a region of complex geological history dominated by granite and sandstone overlain by glacial till. The red lacustrine clay soil underlying Whittlesey Creek and adjoining watersheds is a result of deposition that occurred when the level of Lake Superior was considerably higher than today (FWS, 1998).

Three main geologic features define the Whittlesey Creek watershed—Bayfield Group, Copper Falls Formation and Miller Creek Formation. The Bayfield Group is Precambrian bedrock, consisting mostly of sandstone, siltstone, and locally abundant shale and conglomerate. The Bayfield Group is overlain by the Copper Falls Formation of sandy till that is up to several hundred feet thick. It is thickest along the central spine of the Bayfield peninsula and thins toward Lake Superior. The Miller Creek Formation overlies the Copper Falls Formation and Bayfield Group up to about 1,100 feet above sea level (500 feet above Lake Superior). It is

dominated by glacial lake clay deposits, although some areas have layers of sandy relict shoreline (Lenz et al., 2003).

Topography

The topography of the watershed is relatively flat in the lake plain near Lake Superior, but steeper upstream, increasing in elevation from about 600 feet to about 1,200 feet in less than 10 miles. The hills are rolling except for the confined stream and tributary valleys, which are very steep in the upper and middle section of the watershed. The slopes flatten out considerably about one-half mile west of the western Refuge boundary. Floodplains that connect Little Whittlesey, Whittlesey, and Terwilliger Creeks are relatively level with a gentle slope toward Lake Superior and a 20-foot elevation drop over one mile (FWS, 2006c).

Soils

Soils below about 1,100 feet above sea level (500 feet above Lake Superior) within the watershed are mostly formed in clays originating from the post-glacial lakebed of Lake Superior. Surface drainage features become evident at elevations below 1,100 feet because the red clay soils have very low infiltration rates. Runoff from the uplands quickly enters gullies, ravines, and streams, especially in the steeper, upper portions of the watershed. Alluvial fine sands are also common, being deposited in floodplains from past and present overbank floods.

Till plain and lake plain (upland) soils cover roughly one-third of the Refuge. These soils are characteristically clay loams, silt loams, or sandy loams and are predominant throughout the watershed. Poor internal drainage produces intermittently saturated conditions on the clay loams. Sandy and loamy alluvial floodplain soils cover about two-thirds of the Refuge, but are less common across the watershed. Localized areas of peat and muck are associated with springs and saturated depressions (FWS, 2006c).

Hydrology

Whittlesey Creek NWR is located along Chequamegon Bay on the south shore of Lake Superior. The surface area of the upland Lake Superior watershed is smaller than the lake itself, resulting in very short drainage systems into the lake. The coastal areas of Chequamegon Bay include the largest and most significant wetlands in the Lake Superior basin.

Chequamegon Bay.

Three streams flow through the Refuge and empty into Chequamegon Bay: Whittlesey Creek, Little Whittlesey Creek,

and Terwilliger Creek. All three are spring-fed and flow year round. All three have been altered from historic conditions by erosion, sediment, channelization, and loss of large woody debris.

Lake Superior and Chequamegon Bay

The overall water level in Lake Superior has been controlled by the International Joint Commission through the Great Lakes lock and dam system since 1921, although Lake Superior water has been kept relatively stable since 1973. Water levels vary frequently, however, due to rainfall and snowmelt, annual hydrologic cycles, and natural surface water oscillations called seiches. In addition, the bottom of Lake Superior continues to rebound from the weight of past glaciers (isostatic rebound), raising the water level relative to land by about one foot per century.

The Refuge is part of a large complex of coastal wetlands and streams at the head of Chequamegon Bay. This complex is critical to the health of the Bay and its economically important fishery. Water level fluctuations in the Bay affect coastal wetland function, vegetation composition, stream flow, and sediment loading. Isostatic rebound has inundated the mouths of Whittlesey Creek and Fish Creek.

Whittlesey Creek

Whittlesey Creek.

Whittlesey Creek is the largest stream on the Refuge. Consistent groundwater input results in relatively stable water temperatures and year round flow beginning approximately one-half mile upstream of the North Fork confluence. Whittlesey Creek is listed by the WDNR as a Class I trout stream indicating sufficient natural reproduction to sustain populations at or near carrying capacity with no stocking of hatchery trout. Water quality is good (Stromberg, 2012). Whittlesey Creek sometimes carries a heavy load of sand and silt. The silt and fine sand are usually carried out to Lake Superior while the coarser sand is deposited in the stream, degrading habitat. The channel slope flattens considerably near the mouth at Lake Superior. The North Fork of Whittlesey Creek has an average slope of 0.02, whereas the average slope of Whittlesey Creek below the confluence with the North Fork is 0.005 (Lenz et al., 2003).

Following significant floods in the 1940s, the U.S. Army Corps of Engineers (USACE) dredged the lower 4,500 feet of Whittlesey Creek, removed the meanders, and redirected the flow straight east into Lake Superior from Highway 13 in an effort to dewater and stabilize the floodplain. The Red Clay Interagency Committee redirected the channel to its present location in 1958 because sand deposits had filled the previous dredging. Their report noted that the new channel lowered the water level in the floodplain by 30 inches (Red Clay Interagency Committee, 1960). Another result of these activities was a straight shallow stretch of stream lacking significant habitat diversity.

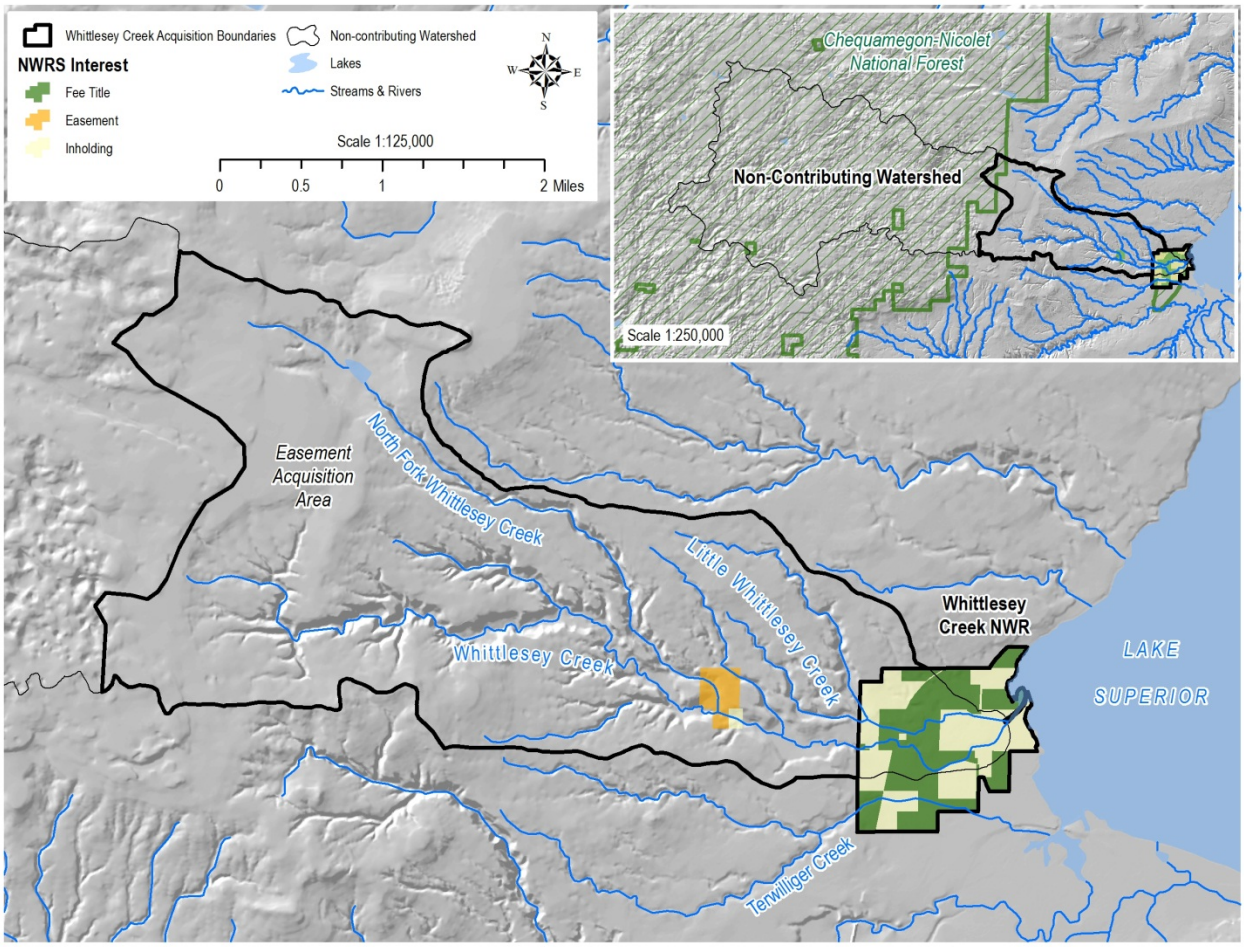
The Red Clay Interagency Committee initiated watershed improvements in the 1950s to reduce flows, erosion, and sedimentation from stream banks, road ditches, and farm fields. Projects

included fencing livestock away from streams, vegetating stream banks and road ditches, constructing farm ponds, and planting trees. In 1991, Whittlesey Creek was designated a "priority watershed" under the Wisconsin Nonpoint Source Pollution Abatement Program. The 1996 management plan identified strategies to improve the watershed health of Whittlesey Creek and supported partnership efforts to protect and improve fish habitat (WDNR, 1996). Special funding was available for 10 years to provide local landowner assistance and to demonstrate best management practices to reduce upland runoff, stabilize stream banks, and enhance in-stream habitat.

Whittlesey Creek Basin

The Whittlesey Creek drainage basin, as delineated based on topography, covers about 24,000 acres, but only about 4,700 acres of the Whittlesey Creek drainage basin contribute surface water to Whittlesey Creek (Figure 3-3).

Figure 3-3: Watershed, Streams, Topography



The non-contributing portion of the basin is in the Bayfield Highlands and is composed of sandy deposits with no surface drainage features. This non-contributing basin does not contribute surface water or groundwater to Whittlesey Creek (Lenz et al., 2003). Nearly the entire non-contributing basin is located within the Chequamegon-Nicolet National Forest.

The 4,700-acre surface-water-contributing area includes Whittlesey Creek, the North Fork, and numerous small tributaries. This is the area commonly referred to as the Whittlesey Creek watershed. The upper reaches generally have sloping plains in the uplands and deeply incised valleys. The elevation changes from 1,100 feet mean sea level (msl) at the upper end, to about 600 feet msl at Lake Superior. Because the Refuge is located at the mouth of Whittlesey Creek, stewardship of upstream watershed lands directly and indirectly affects Refuge lands.

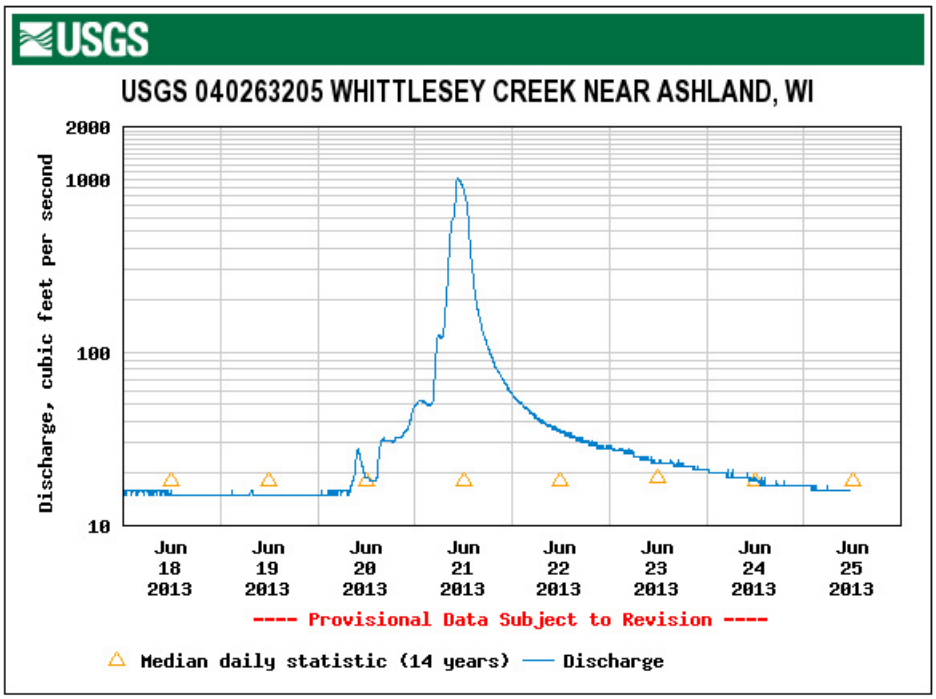
Unflooded section of Whittlesey Creek on the Refuge.

Flooded section of Whittlesey Creek on the Refuge.

Surface water generally moves as sheet flow until reaching a ditch or gully leading to the stream channel network. The gullies and channels are generally steeply sloped, so water passes rapidly through the basin. Soils of the surface-water-contributing basin are dominated by red clays that give water little chance to infiltrate. Land cover and infrastructure changes have altered historic surface water patterns, redirecting overland flow, increasing flood power, destabilizing stream banks, and increasing sediment load. The result is a very flashy stream that peaks quickly within 24 hours of a large rainfall or snowmelt. Base flow in Whittlesey Creek is a consistent 17 to 18 cubic feet per second (cfs), with flood peaks of over 500 cfs. On June 21, 2013, a record 1,010 cfs peak was observed at the gaging station near the mouth following unusually heavy rains on saturated soils.

Modeling results indicate that changes in land cover in the surface-water-contributing basin would have minimal effects on average annual runoff, but would affect Whittlesey Creek flood peaks (Figure 3-4). Converting the entire surface-water-contributing basin to forested land cover would reduce 100-year flood peaks by 12 to 14 percent, potentially reducing sedimentation on the Refuge. If the basin were developed into 25 percent residential land or returned to the intensive agriculture of the 1920s, flood peaks would increase by up to 12 and 18 percent, respectively (Lenz et al., 2003).

Figure 3-4: Hydrograph



Whittlesey Creek Groundwater

Water flow on the Bayfield Peninsula is defined by the three main geologic features: Bayfield Group, Copper Falls Formation, and Miller Creek Formation (see Geology section above). These features have resulted in two groundwater systems: deep flow and shallow flow.

The deep flow system moves through the sandy Copper Falls Formation and into the Bayfield Group, discharging to Lake Superior and to deeply incised streams such as Whittlesey Creek. The main discharge area along Whittlesey Creek is near the North Fork confluence. This groundwater discharge provides the steady surface water flow at relatively constant temperature in the downstream reaches of Whittlesey Creek. Upstream of the North Fork confluence, Whittlesey Creek has little or no base flow; flow is from surface runoff and a small amount of perched groundwater from the shallow flow system (Lenz et al., 2003).

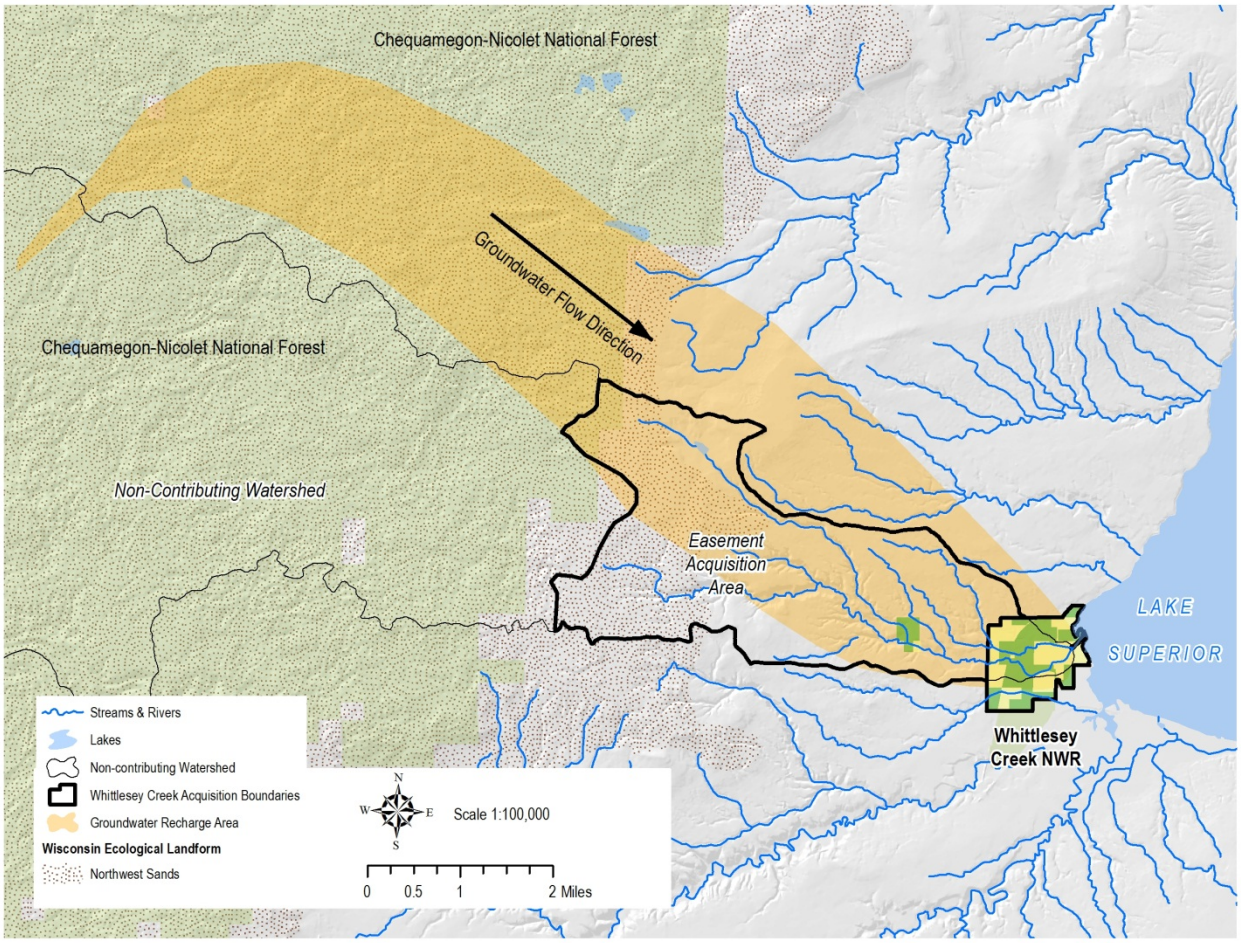
The shallow flow system is difficult to delineate but probably includes much of the area underlain by the Miller Creek Formation. It receives less recharge than the deep system because the Miller Creek Formation is less permeable than the Copper Falls Formation. Some groundwater from the shallow system discharges to Whittlesey Creek and some likely recharges the deep system. Alternating layers of sand and clay in the Miller Creek Formation can result in isolated, perched water separated from the deep system by 100 feet or more. These perched areas provide some discharge into the upper stretches of Whittlesey Creek but not enough to sustain year-round surface water flow (Lenz et al., 2003).

Lenz et al. (2003) delineated the area that contributes groundwater to Whittlesey Creek including both the deep flow system and the non-perched part of the shallow system. The two-dimensional surface of the groundwater-contributing area is about 14,000 acres. Part of it overlaps the surface-water-contributing area, but much of it lies to the northwest within the

Chequamegon-Nicollet National Forest. About 90 percent of the base flow to Whittlesey Creek originated as recharge through the sandy Copper Falls formation, the permeable deposits in the center of the Bayfield Peninsula. Only about 10 percent of base flow was from recharge through the clayey Miller Creek Formation. Median travel time of particles modeled from the stream back to the water table was about 94 years (Figure 3-5).

The most likely land cover change for the Whittlesey Creek groundwater-contributing area is logging of forests in the sandy zone. Logging can increase recharge by reducing interception and evapotranspiration. According to simulations, if logging in the ground-water-contributing area resulted in a 25 percent increase in recharge, the base flow of Whittlesey Creek would increase by about four percent (Lenz et al., 2003).

Figure 3-5: Groundwater



Little Whittlesey Creek

Little Whittlesey Creek is a short drainage with low base flow within the Whittlesey Creek watershed. Like Whittlesey Creek, some of the Refuge portion of Little Whittlesey was channelized in the 1940s. Little Whittlesey flows into the coastal wetland near the mouth of Whittlesey Creek, but original land survey maps suggest that it historically emptied into

Whittlesey Creek in Reach 2. When the Refuge was established, this stream had been degraded by intensive grazing and by limited development along its banks (FWS, 1998).

While area residents describe Little Whittlesey as a once productive brook trout stream, minimal population assessment data exist with few young-of-the-year coho and brook trout captured. Recent observations have noted the presence of at least a few spawning class coho salmon, although Little Whittlesey Creek is not listed as a designated trout stream (WDNR, 2002), indicating its low habitat value for trout compared to Whittlesey Creek. No habitat assessments have been conducted.

Terwilliger Creek

Terwilliger Creek lies south of Whittlesey Creek. After passing through the Refuge, Terwilliger flows under Highway 2 and empties into Fish Creek Sloughs. The watershed is about 1,400 acres. Original 19th century land survey maps suggest that Terwilliger Creek historically was a tributary of Whittlesey Creek. Like the other two Refuge streams, the lower segment of Terwilliger was straightened in the 1940s. When the Refuge was established, this stretch was described as the most degraded portion of the creek (FWS, 1998).

No fishery or habitat assessments have been conducted. Terwilliger is closer to being a cool water stream than a coldwater stream, although a few young-of-year salmon and small localized populations of brook trout sometimes are found near springs. Creek chubs, small northern pike, and a few other species are present. Terwilliger is not known to provide significant spawning habitat for salmonids and is not listed as a designated trout stream by the WDNR (2002).

Climate

The climate of northern Wisconsin along Lake Superior is moderated by the lake, creating longer spring and fall seasons, cooler summers, and increased precipitation when compared to inland areas. The average annual temperature over the last 30 years is about 40 °F, averaging 10 °F in January and 67 °F in July. The area averages 40 days with temperatures below 0 °F and six days above 90 °F.

Average annual precipitation is about 30 inches with the greatest amount falling from June to September. Average annual snowfall is 58 inches, which typically falls from November through March. The average growing season is from May 18 to October 1 (135 days).

Climate Change

Information in this section comes primarily from the publication *Wisconsin's Changing Climate: Impacts and Adaptation* (WICCI, 2011). The Wisconsin Initiative on Climate Change Impacts (WICCI) began as a collaborative project between the University of Wisconsin and the WDNR but has since grown to include representatives from other state and federal agencies, tribal organizations, businesses, and non-profit groups. WICCI scientists have analyzed the historical climate of Wisconsin and are developing and refining models of future climate change. They also are assessing the potential impacts of climate change on natural and human systems across the state including wildlife habitat, water resources, forestry, agriculture, tourism, infrastructure, and human health. The focus is on developing practical information for public and private decision-makers at all levels that will aid in determining appropriate climate change adaptation strategies.

Climate change will interact with and exacerbate other stressors—including habitat loss and fragmentation, invasive species, and pollution—amplifying the challenges they pose to natural habitats and biodiversity. Through proper stewardship, protected habitats can be maintained to promote the highest levels of natural resilience to change

Temperature and Precipitation

On an annual average, Wisconsin warmed about 1.1 °F between 1950 and 2006; the northwestern part of the state has warmed a bit more than the rest. Winter temperatures have risen most significantly. Statewide, winter temperatures have increased 2.5 °F, while increases of 3.5 to 4.5 °F have occurred in northwestern Wisconsin. Summer and fall temperatures have changed the least. Nighttime temperatures have increased more than daytime temperatures.

These temperature changes are likely to intensify into the future. The average mean projected warming rate is about four times greater than what has been observed since 1950. The warming is projected to be largest in winter, with projected increases of 5 to 11 °F by the mid-21st century across Wisconsin, and the greatest warming in northwestern Wisconsin. By mid-century, the growing season in Wisconsin is expected to lengthen by one month.

Wisconsin as a whole has become wetter since 1950, with a 10 percent average increase in annual precipitation. Most of the increase has been concentrated in southern and western Wisconsin. Northern Wisconsin has become drier, annually averaging one to two inches less precipitation over that period. It is unclear whether these trends are due to climate change or represent natural variation in rainfall over Wisconsin.

Projections of future precipitation are less certain than projections of temperature, with considerable disagreement among climate models. However, the models do indicate a 75 percent probability that annual average precipitation in Wisconsin will increase. The models are in considerable agreement that precipitation will increase during winter and show a fair level of confidence that spring and fall precipitation will increase. However, climate models do not agree on how precipitation patterns are likely to change in the summer. By mid-century, Wisconsin will likely have two or three additional intense rainfall events (at least two inches in a 24-hour period) per decade, about a 25 percent increase in frequency.

Hydrology

Temperature and precipitation changes will affect Wisconsin's water cycles, with impacts on lakes, streams, groundwater, and wetlands. Spatially, the state will not be affected uniformly. Differences in the characteristics of a place—such as variations in land use, soil type, groundwater characteristics, and runoff and seepage—can confound the influence of climate change, leading to a wide range in system responses. Some of the expected hydrologic responses to climate change in Wisconsin include:

- Increased average surface water and groundwater temperatures;
- Shorter periods of ice cover on lakes and streams;
- Increased evapotranspiration rates during the longer growing season;
- Increased number of freeze-thaw events;
- More groundwater recharge due to increases in winter and spring precipitation;
- Changes in recharge and discharge patterns as more precipitation falls as rain or snow;

- Increased number of high water events causing flooding.

Coastal Wetlands
Although many uncertainties remain, the current scientific consensus is that the average water level of Lake Superior will be slightly lower by the end of the century, although water levels will fluctuate widely around the average. The combination of warmer temperatures and reduced ice cover will contribute to greater evaporation, which eventually is expected to exceed the increases in precipitation. Continued increases in temperature, changing lake levels, and increased upland runoff and flooding are expected to affect the food web, plant community composition, and overall quality of coastal wetland habitats. Plant diversity will likely decrease and boreal wetland species could be lost altogether in northern Wisconsin. Increasing temperatures could give weedy plant species a competitive advantage.

Coldwater Streams
Potential effects of climate change that can affect coldwater streams include rising water temperatures, altered groundwater recharge and stream base flow, and an increase in large runoff events from heavy storms. Models show that all coldwater habitats and fish species in Wisconsin will be reduced because increases in air temperature produce increases in water temperatures in nearly all coldwater streams.

Stream vulnerability will vary geographically across Wisconsin and within regions because differences in the characteristics of streams and their watersheds lead to variance in the capacity to buffer changes in water temperature. In undisturbed watersheds with sufficient groundwater input, for example, streams may be well buffered to climate change impacts, while those in urbanized watersheds or agricultural areas may be more vulnerable.

Federal, state, and academic partners are using local data on climate, land use, hydrology, and stream characteristics to study potential impacts of climate change on coldwater streams that are part of the Great Lakes system Lyons et al., 2010; Mitro et al., 2010). Current data indicate that streams on the Bayfield Peninsula are more likely than many other parts of Wisconsin to retain high quality coldwater habitat, and Whittlesey Creek conditions are expected to remain highly suitable for brook trout.

Forests
A warming climate will reduce suitable habitat and increase stress in boreal forest species currently at the southern edge of their natural range in Wisconsin, such as aspen, white birch, white spruce, black spruce, balsam fir, jack pine, and red pine. Lowland forests of black spruce and tamarack (*Larix laricina*) in northern Wisconsin are sensitive to changes in water tables and snow cover; less snow could cause freezing of fine root systems and changes in the water table could flood or dry the shallow wetland soils needed to establish seedlings. Hardwood trees, such as hickory, black oak, and black walnut are predicted to expand their range within the state as temperatures rise. Species under increased stress will be more susceptible to damage from insects and diseases.

Wildlife
The earlier arrival of spring is altering the timing of seasonal activities such as reproduction and migration for many plants and animals. For example, Canada geese now arrive in Wisconsin a month earlier than in the 1930s, cardinals begin singing 22 days earlier, and robins arrive nine days earlier. Different species are responding to climate change at different rates, which can lead to negative impacts such as lack of food if birds reach their summer breeding grounds

before their insect prey have hatched. Some species will be forced out of Wisconsin as habitat conditions change. Others may be unable to make the move to new areas and will face population declines.

Cold temperatures and deep snow cause physical stress in white-tailed deer that can lead to high death rates. Projected winter warming will reduce this source of mortality and could lead to larger deer herds with increased impacts on croplands, forest, and native vegetation. Deer populations also may be exposed to more diseases due to changing temperature and precipitation patterns. The American marten, a state-endangered species now found only in very small numbers in the northern counties, relies on snow cover for insulation during the winter, but the predicted 40 percent loss of snow cover during the next half century could permanently eliminate the marten in Wisconsin. Rodents and other small mammals, a major food source for martens and fishers, also rely on snow cover to survive the winter and could face permanent population declines.

The wood frog, found across most of Wisconsin, can freeze during the winter, but cannot endure temperatures lower than 21 °F. Snow cover is important to the wood frog for thermal insulation. The species also needs temporary ponds close to woodlands for successful breeding, but wood frogs rarely travel more than a mile so cannot move away from widespread drought conditions. Reduced snow cover and more variable precipitation patterns are expected to have substantial impacts on this species over the next half century. This fate will be shared by many amphibian species and other poor dispersers that, in turn, are food sources for birds, reptiles, and small mammals.

Fish

Coldwater species are at risk as air and water temperatures increase. Brook trout in particular are especially sensitive to environmental changes and have a narrow temperature range in which they can successfully live, feed, and reproduce. Wisconsin is at the edge of the range of native brook trout. If their distribution shifts north due to the habitat effects of climate change, Wisconsin will lose many of its brook trout populations in the coming decades.

Climate change models indicate that higher temperatures will threaten the viability of brook trout populations throughout Wisconsin. Initial models predicted that brook trout would be completely lost from Wisconsin streams under the worst-case scenario, and even the best-case scenario predicted 44 percent less brook trout habitat by mid-century (Mitro et al., 2010). Second generation modeling now underway incorporates improved data on precipitation and groundwater influences. The initial results still do not look favorable for brook trout overall, although not as bad as first generation models predicted (John Lyons, personal communication). Whittlesey Creek is still projected to remain highly suitable for brook trout, even as coldwater habitat is lost in many other locations, so may become more important as one of the last remaining sites in the area (Lyons et al., 2010; Mitro et al., 2010).

Warmwater fish species such as smallmouth bass, largemouth bass, black crappie, and channel catfish will benefit from rising Wisconsin stream temperatures, but the length of stream habitat that warmwater fish are projected to gain is much less than the length of habitat coldwater fish stand to lose.

3.3 Biological Environment

Resources of Concern

The management direction of each national wildlife refuge is driven first by the purpose(s) and statutory mandates of the Refuge, coupled with species and habitat priorities that are also known as resources of concern (FWS, 2010). Priority resources of concern guiding fish, wildlife, and habitat management programs on Whittlesey Creek NWR were established as part of the Refuge's habitat management plan (HMP) (FWS, 2006c). Four habitat types were identified, along with associated species of concern that have limiting attributes associated with that habitat type (Table 3-1).

Table 3-1: Whittlesey Creek NWR Priority Resources of Concern

	Priority habitats			
Priority species	Coldwater stream	Lowland forest/shrub	Riparian forest	Coastal Wetland
Coaster brook trout	x			
Wood turtle	x		x	
Water shrew	x			
Northern waterthrush		x		
Northern black currant		x		
Marsh horsetail		x		
Veery		x	x	
Black duck				x
Common mudpuppy				x
Sora rail				x

Coldwater Streams
Coldwater streams that pass through the Refuge (Whittlesey, Little Whittlesey, and Terwilliger Creeks) are described under the "Hydrology" heading in Section 3.2 of this Comprehensive Conservation Plan (CCP). Associated species of concern are coaster brook trout *(Salvelinus fontinalis*), wood turtle (*Clemmys insculpta*), and water shrew (*Sorex palustris*).

Coaster brook trout depend on accessible coldwater streams for resting, feeding, spawning, and nursery, and are very sensitive to in-stream habitat degradation. The state-endangered wood turtle prefers lowland habitats associated with medium to fast current streams with sand or gravel substrates; they often nest in sandy stream banks. The water shrew requires coldwater streams with high water quality and abundant cover such as rocks, logs, or overhanging stream banks.

Lowland Forest and Shrub

Lowland forest and shrub are found mainly in the floodplain and coastal wetland areas of the Refuge, as well as other public lands at the head of Chequamegon Bay including the NGLVC (USFS), Fish Creek Sloughs (WDNR), and Prentice Park (City of Ashland). Dominant plant species include willow (*Salix spp.*), speckled alder (*Alnus rugosa*), white cedar (*Thuja occidentalis*), trembling aspen (*Populus tremulouides*), black ash (*Fraxinus nigra*), and red maple (*Acer rubrum*). Important functions of this habitat type are floodwater storage, primary production, and wildlife habitat. Species of concern are northern waterthrush (*Seiurus noveboracensis*), veery (*Catharus fuscescens*), northern black currant (*Ribes hudsonianum*), and marsh horsetail (*Equisetum palustre*).

The northern waterthrush favors wooded stream banks during breeding season and prefers nest sites in exposed root masses of fallen trees. The veery uses large patches of swampy forest, especially with a shrubby understory. Northern black currant is found mostly in shaded to partly shaded areas of cold conifer swamps; it is found on the Refuge at the edge of a conifer and black ash swamp. Marsh horsetail is found along Terwilliger Creek; it usually is found in moist settings in variable habitats including fens, alder thickets, sedge meadows, and bog and swamp margins.

Riparian Forest

Riparian forest was separated from lowland forest because of stream interface and the functions riparian vegetation provide for hydrology and habitat. Mature trees will fall into the stream and create habitat for aquatic species. Roots help to keep banks stable. Overhanging vegetation helps keep the water cool and provides cover for fauna. Non-native crack willow (*Salix fragilis*) was planted in in the riparian zone in the 1940s and 1950s. Large American elm (*Ulmus americana*) dominated the Refuge riparian zone until the 1970s when Dutch elm disease nearly eliminated them. Today, few mature trees remain along Refuge creeks. Species of concern for this habitat type are veery and wood turtle.

In addition to large patches of swampy forest, the veery also likes second growth willow or alder shrubbery near water. Hatchling and juvenile wood turtles prefer alder thickets associated with shorelines, which are considered critical habitat for this segment of the population.

Coastal Wetland

Coastal wetland is found where the waters of Lake Superior influence vegetation along the shore. Most coastal wetland on the Refuge would be considered a complex of emergent marsh edged with lowland shrub. Water levels and plant communities are dynamic. Changes in Lake Superior water levels have influenced this habitat type for thousands of years. Isostatic rebound from the weight of past glaciers raises the water level by about one foot per century, flooding historic shoreline habitat and stream mouths. Shorter-term influences include natural surface water oscillations (called seiches) and variable rainfall and snowmelt. Wave and wind action rework sediments carried downstream by Whittlesey and Little Whittlesey Creeks. These wetlands assimilate nutrients, store floodwaters, and provide nursery areas for fish, frogs, and waterbirds. Species of concern are black duck (*Anas rubripes*), common mudpuppy (*Necturus maculosus*), and sora rail (*Porzana carolina*).

The black duck uses diverse habitat, favoring wooded swamps and marshes; they overwinter on the Refuge at the mouth of Whittlesey Creek and in open spring ponds. Mudpuppies typically congregate in river mouths and harbors of Lake Superior, but their status on the Refuge is unknown; they are thought to be sensitive to pesticides, including the lampricides that are used on many other Lake Superior streams. Fish Creek, adjacent to the Refuge, is treated with

lampricide about every five years. Whittlesey Creek was last sampled for larval lamprey in 2005, and none was present. Little Whittlesey and Terwilliger Creeks haven't been sampled; all three creeks are scheduled for 2015. Soras are found primarily in shallow freshwater emergent wetlands, sometimes foraging on nearby mudflats; they have been heard and seen in cattail cover on restored Refuge wetlands during breeding season.

Land Cover

Historic

The original 19th century land surveys indicate that historic vegetation of the Refuge and vicinity included three forest types. Conifer swamp extended from the mouth of Fish Creek onto property now owned by the NGLVC and up to Whittlesey Creek. Tree species included northern white cedar (*Thuja occidentalis*), black spruce, tamarack, balsam fir (*Abies balsamea*), and black ash (*Fraxinus nigra*). The white-red pine forest was located on the northern edge of the current Refuge boundary, at a higher elevation than the conifer swamp. Boreal forest was south of the conifer swamp and would have included aspen (*Populus spp.*), paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), balsam fir, red pine (*Pinus resinosa*), and white pine (*Pinus strobus*) (Finley, 1976; FWS, 2006c).

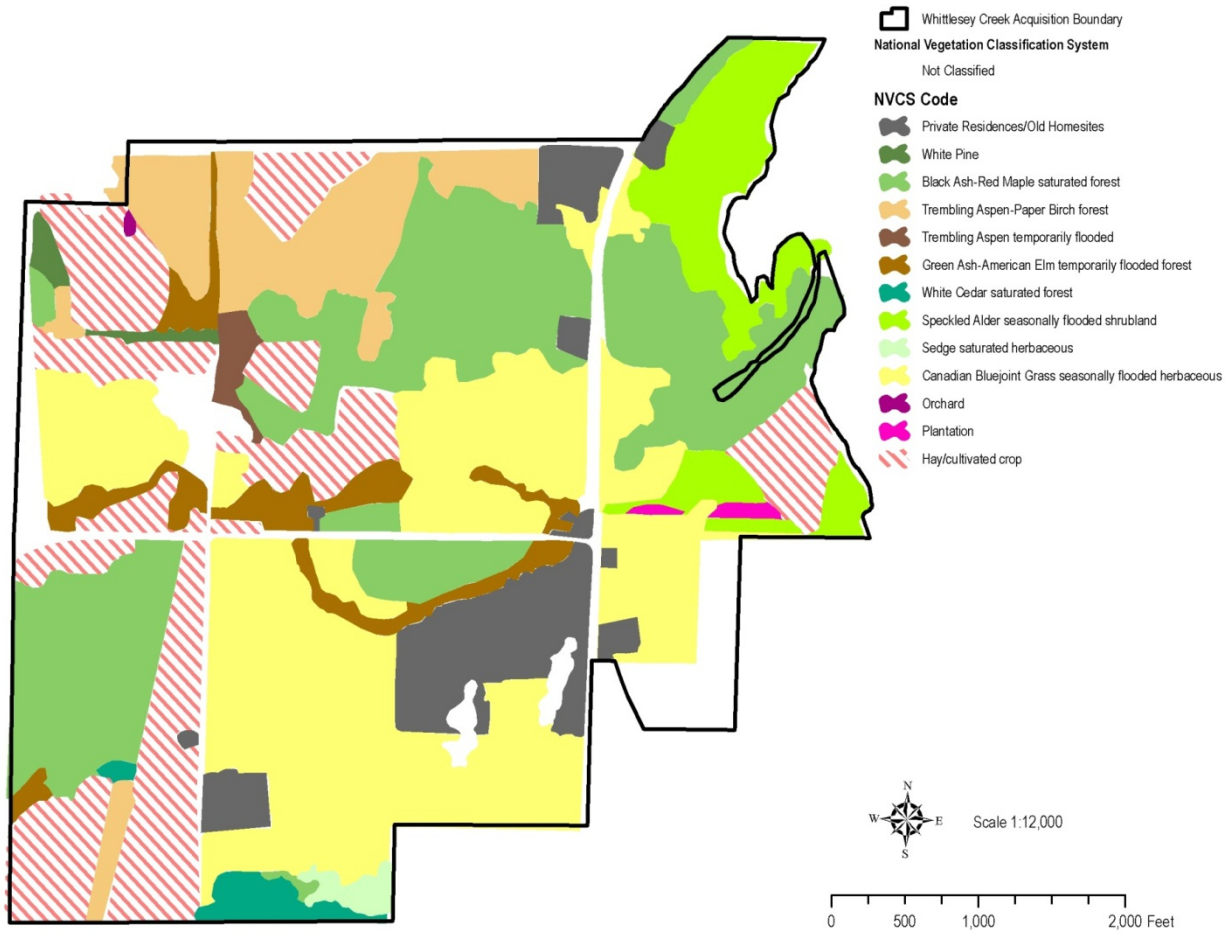
By the early 20th century, most timber had been harvested and much of the land within the current Refuge boundary was farmed or grazed. These lands probably were often too wet from floods or high groundwater to produce consistent crops. When Whittlesey Creek NWR was established in 1999, only about 90 acres were still hayed or pastured, and no annually tilled cropland remained. Most of the former farmland had regrown with water-tolerant trees and shrubs such as willows, white cedar, black ash, and speckled alder (*Alnus rugosa*). Reed canarygrass (*Phalaris arundinacea*) dominated many old hayfields.

Current

2006 Vegetation

A vegetation map of the Refuge was developed as part of the HMP (FWS, 2006c). Vegetation cover types were delineated based on aerial photographs and field surveys and followed the National Vegetation Classification System (NVCS) (Federal Geographic Data Committee, 1997) (Figure 3-6).

Figure 3-6: Refuge Vegetation Map from 2006 Habitat Management Plan



2013 Vegetation

The Refuge has not been mapped according to the NVCS since originally done for the 2006 HMP. A more general watershed-wide land cover map was developed for this document (Figures 3-7 and 3-8). As land has been acquired and haying has been greatly reduced on the Refuge, natural succession is transitioning many areas to shrubs and trees. Native conifers have been planted on approximately 62 acres, and 180 suitable acres within the acquisition boundary remain unplanted. Tentative plans include planting 60 acres during 2015.

Figure 3-7: Refuge Land Cover (2013)

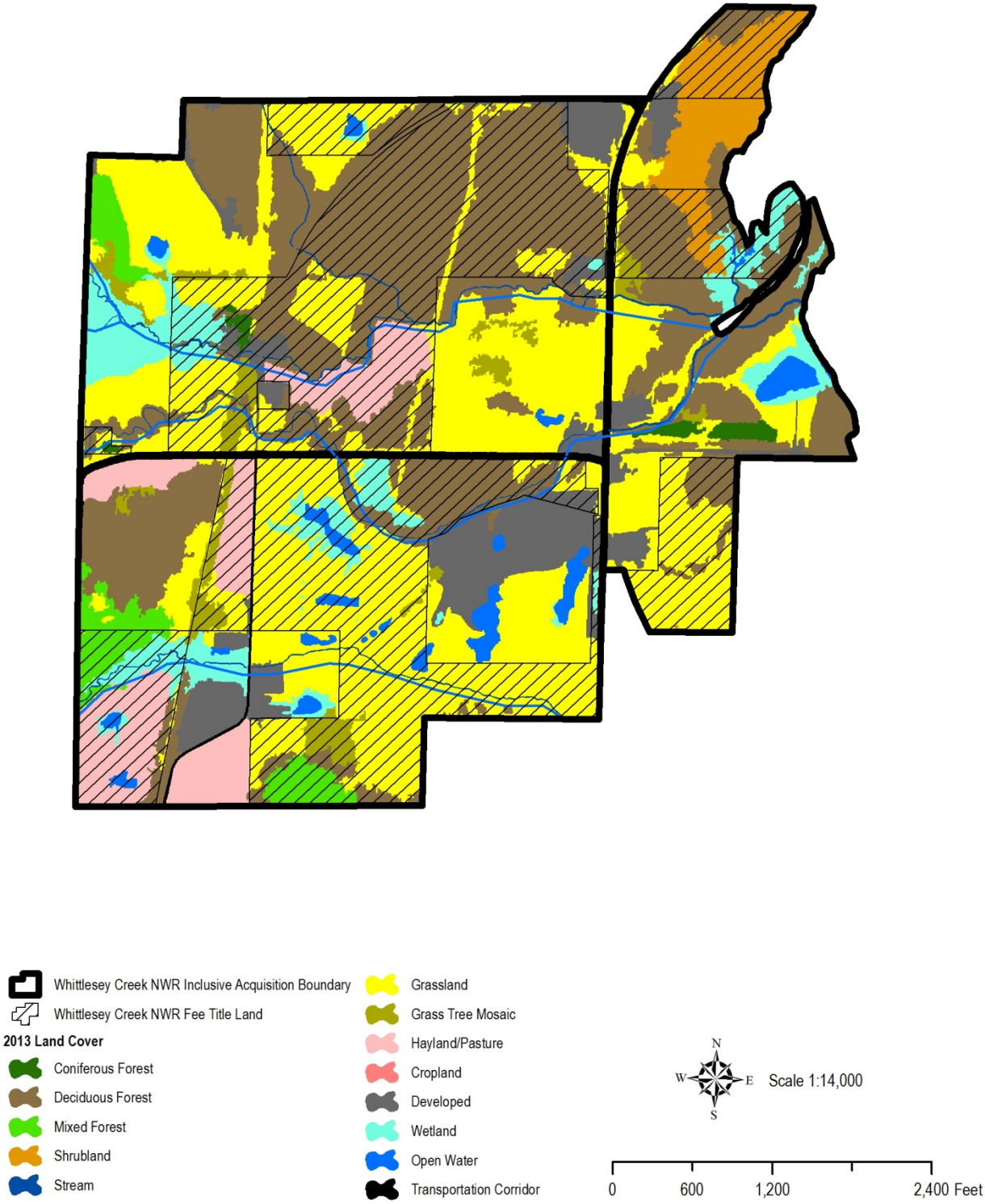
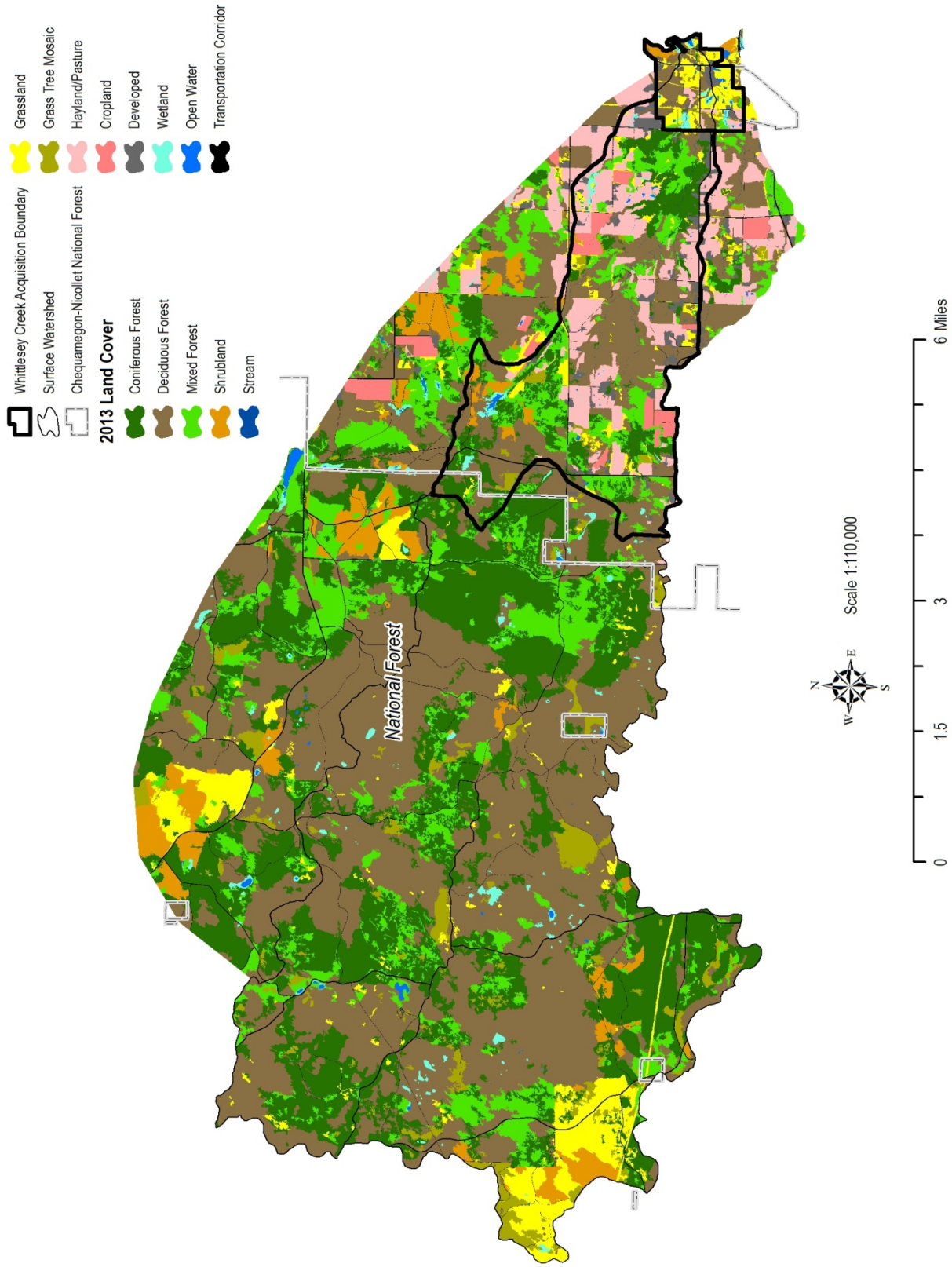


Figure 3-8: Refuge and Watershed Land Cover (2013)



Currently, watershed land cover is dominated by forests in public (USFS) and private ownership. Forest Service lands are part of the Washburn District of the Chequamegon-Nicolet National Forest. These holdings include barrens habitat. Private woodlands are owned by individuals and timber companies. Farm numbers and crop acreage continue to decline. Few dairy farms remain and animal agriculture is dominated by beef and horses. Hayland and pasture typically are not intensively managed. Annual crops include corn, soybeans, oats and wheat with acreage fluctuating based on commodity prices, crop rotations, and subsidies. Development includes farmsteads and low-density rural residential properties.

Fish and Wildlife Communities

Fish

The historic native fish community of Whittlesey Creek, like most coldwater, spring fed tributaries to Lake Superior during pre-European settlement times, consisted primarily of brook trout (*Salvelinus fontinalis*) and slimy sculpin (*Cottus cognatus*). As waters warmed slightly as they flowed downstream, and becoming influenced by the seiche of Lake Superior, native ninespine stickleback (*Pungitius pungitius*), brook stickleback (*Culaea inconstans*), common shiner (*Luxilis cornutus*), spottail shiner (*Notropis hudsonius*), blackchin shiner, (*Notropis heterodon*), blacknose dace (*Rhinichthys atratulus*), Johnny darter (*Etheostoma nigrum*), creek chub (*Semotilus atromaculatus*), and white sucker (*Catostomus commersonii*) also occurred.

Today, because of intentional or inadvertent introductions, and alterations to the habitat within the watershed, the fish community of Whittlesey Creek is dominated by non-native species. Non-native fish species found in Whittlesey Creek today include brown trout (*Salmo trutta*), tiger trout (brown trout/brook trout hybrid), rainbow trout/steelhead (*Oncorhynchus mykiss*), coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*), splake (lake trout/brook trout hybrid), and rainbow smelt (*Osmerus mordax*). Although native to the area, fathead minnow (*Pimephales promelas*), pumpkinseed sunfish (*Lepomis gibbosus*), and central mudminnow (*Umbra limi*) were not historically found in Whittlesey Creek but have recently been collected, likely entering Whittlesey Creek via flood waters from ponds being breached in the uplands within the watershed. An experiment to reestablish a self-sustaining population of native coaster brook trout in Whittlesey Creek has been underway since 2003 (FWS and WNDR, 2003).

Coaster Brook Trout

Background

The coaster brook trout (coaster) is a migratory form of brook trout found only in the Great Lakes basin. Unlike brook trout that live year round in streams, coasters spend part of their life in the Great Lakes, returning to tributary streams in late summer or fall to spawn. A few coaster populations spend their entire life in the lake, spawning in rocky areas near shore. The highly productive Great Lakes allow coasters to reach very large sizes. Coasters are not a genetically distinct brook trout, but rather some stream-resident populations appear to have the ability to produce a migratory life history when conditions are suitable. In 2009, the Service found that coaster brook trout in the Great Lakes are not eligible for listing under the Endangered Species Act (74 FR 23376).

Restoration of self-sustaining brook trout populations is a priority for many conservation agencies and organizations working in the Lake Superior basin, including the Great Lakes

Fishery Commission (GLFC), the Lake Superior Landscape Restoration Partnership, and the WDNR. Coaster brook trout is a resource conservation priority (FWS, 2002) and a species of concern for the Midwest Region of FWS (see the FWS Species of Concern web page at http://www.fws.gov/midwest/es/soc/index.html) and for Whittlesey Creek NWR (FWS, 2006c). Brook trout was selected as a surrogate species in the Upper Midwest Great Lakes geography (FWS, 2014). The interagency Whittlesey Creek brook trout restoration experiment (FWS and WDNR, 2003) is intended to serve as a model for other streams in the future.

History and Decline

Brook trout were widespread in the Lake Superior basin prior to European settlement. Most Lake Superior tributaries with cool temperatures probably supported resident brook trout year round and spawning coaster brook trout in the fall, although historic population information is limited because numbers were greatly reduced or even eliminated in some areas before any rigorous data could be collected. Newspaper articles, letters, and other reports from the latter half of the 19th century describe abundant coaster brook trout populations and document their occurrence in at least 45 streams in Ontario, 25 in Michigan, 12 in Wisconsin, and nine in Minnesota. Small numbers of coasters also occurred historically in Lake Huron and its tributaries (Enterline 2000).

During the late 19th century, sportsmen from all over North America were coming to Lake Superior to fish for coasters, which were highly valued because of their abundance, ease of harvest, bright coloration, and large size. As early as the 1880s, however, severe declines in the fishery were noted in local newspapers and were associated with a combination of excessive harvest and habitat changes caused by logging. Clear-cutting and subsequent fires left soil prone to excessive erosion. Dams were often constructed across confined stream valleys to form impoundments. These were filled with logs, dams were breached, and logs were driven downstream to sawmills. Angling success generally declined in a progression from easily reached streams to more remote streams and from lower stream reaches to upper stream reaches. Commercial harvest along the coastline accelerated the decline (WDNR and FWS, 2005).

> ". . . over to Whittlesey's Creek where that gentleman succeeded in a few hours fishing, in capturing 75 trout, while Charley raised the number to an even hundred . . ."
>
> *April 20, 1878 – The Ashland Press*

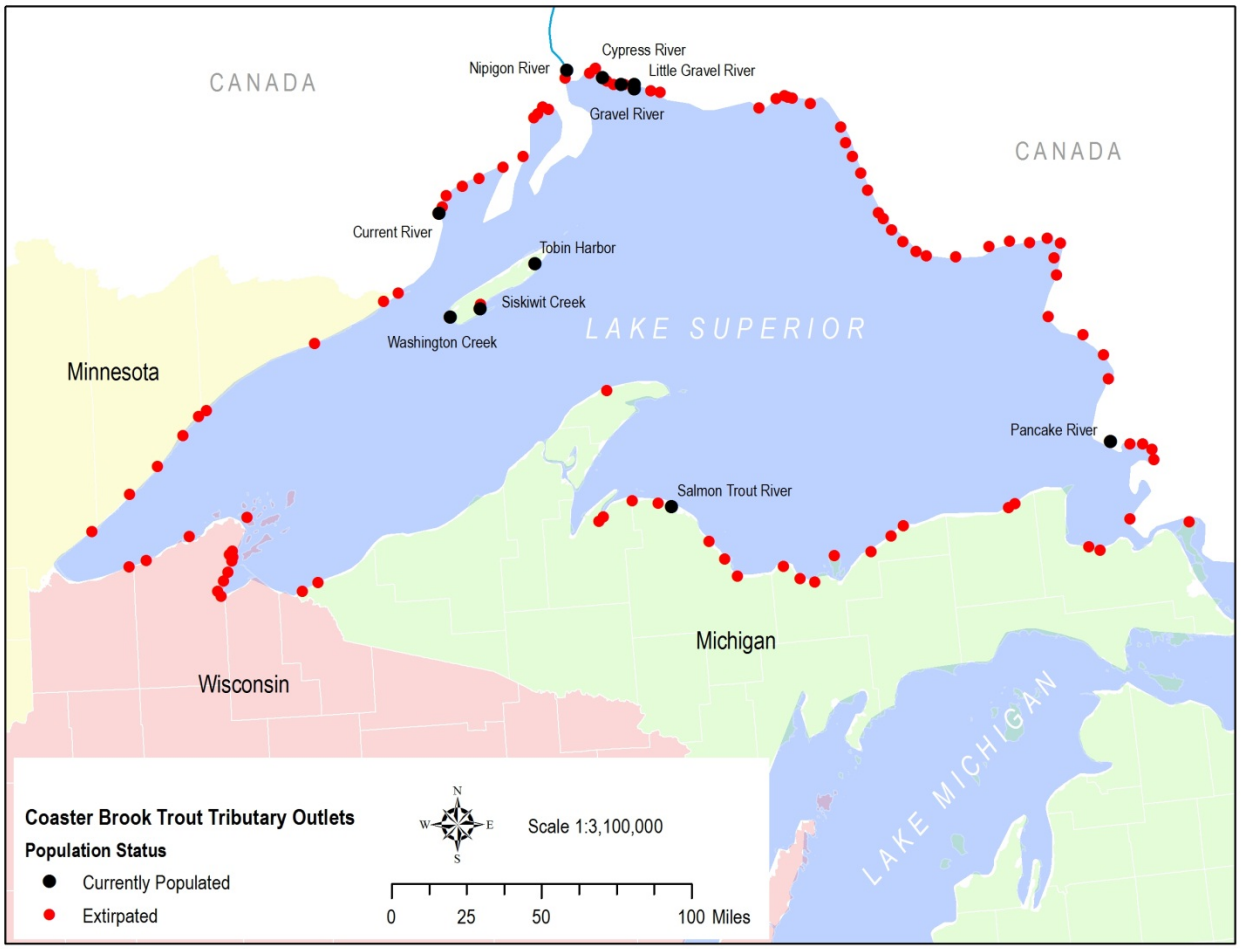
"Old-timers tell stories about the wonderful trout fishing they used to have but how now . . . good trout fishing is a thing of the past." — 1957 Red Clay Interagency Committee

The exploitation of coaster stocks and demands on their habitat continued in the 20th century. The opening of the Lake Superior basin by road, rail, and water ended the area's isolation. Brook trout habitat was degraded by logging, mining, agriculture, and stream modifications as settlement and development increased. Intensive harvest via commercial and sport fishing continued. Invasion of sea lamprey and smelt in in the 1930s, and introduction of non-native trout (late 1890s) and salmon (1950s-1970s) also may have contributed to the range-wide decline of native coasters. By 1950, viable coaster populations were reduced to a few remnants in Ontario, Michigan, and Minnesota. While the coaster form of brook trout suffered the most conspicuous losses, stream-resident brook trout populations were also greatly reduced (Newman and Dubois, 1996). Fishing success in Whittlesey Creek was described as "almost non-existent" (Red Clay Interagency Committee, 1957).

Restoration

Extensive efforts to bolster declining coaster brook trout populations began in the late 19th century, largely through stocking of various strains of brook trout in the Lake Superior basin. In Wisconsin, the first officially recorded stocking occurred in 1890 when a resort owner put brook trout in the Sioux River. Over the next 100 years, more than 23 million brook trout were stocked in Wisconsin's Lake Superior streams and near-shore waters. The first documented fish stocking in Whittlesey Creek occurred in 1916. By 1995, about 178,000 brook trout, 16,000 rainbow trout, and 114,000 brown trout had been stocked in Whittlesey Creek (WDNR and FWS, 2005) (Figure 3-9).

Figure 3-9: Historic and Current Range of Self-Sustaining Coaster Brook Trout Populations in the Lake Superior Basin



In 1956, the Red Clay Interagency Committee was formed in northwest Wisconsin to reduce erosion of clay soils in the Lake Superior basin that was causing water quality problems and reducing trout populations. Attention was focused on the Whittlesey Creek watershed as a good site for an intensive pilot study, although other watersheds also were included. Experimental erosion control methods developed and tested over the next several years included road and stream bank seeding, tree planting, livestock fence installation, and stream modifications to divert water flow (Red Clay Interagency Committee; 1957, 1960, 1964).

None of the efforts to reestablish naturally reproducing populations of coasters was successful, probably due to a combination of factors such as weak harvest regulations, ineffective stocking practices, ongoing habitat loss, and competition from non-native species. Until recently, little was known about the species, which further complicated restoration efforts. By the late 20th century, the only documented coaster brook trout populations of significant size were found in the Nipigon River region of Ontario, in some streams and near-shore areas at Isle Royale National Park, and in Michigan's Salmon Trout River.

Organizations and tribes across the basin began to recognize the need for collaborative programs that addressed all of the causes of coaster brook trout decline. In 1990, members of the GLFC developed fish community objectives for Lake Superior that seek, in part, to "re-establish depleted stocks of native species such as the lake sturgeon, brook trout, and walleye." The GLFC began documenting the status of coaster brook trout in 1993 (Newman and Dubois, 1996) and completed "A Brook Trout Plan for Lake Superior" in 1999 (Newman et al., 2003). The plan provided guidelines for rehabilitation efforts, leaving individual states and agencies responsible for developing and implementing their own action plans. The goal is to maintain widely distributed, self-sustaining populations of brook trout throughout their original habitats. Priority actions include restoring tributary habitat, regulating harvest, stocking genetically appropriate strains, building public support, researching brook trout life history, and monitoring progress. Twenty-six organizations and agencies from across the Lake Superior basin are currently involved in coaster rehabilitation efforts guided by recommendations set forth in the plan. The Ashland Fish and Wildlife Conservation Office is the Service lead for coaster brook trout research and conservation.

Both Wisconsin and Minnesota have created state-specific rehabilitation plans for Lake Superior brook trout. Whittlesey Creek is one of five priority streams named in the Wisconsin plan, which was jointly developed by the WDNR and the Service (WDNR and FWS, 2005). The Refuge was established in 1999 and the Whittlesey Creek brook trout experiment began in 2003.

Table 3-2: Timeline of Coaster Brook Trout Decline and Restoration

			1830s	1837	Ojibwe cede lands in northwest Wisconsin to United States
			1840s		
Sportsman's Paradise			**1850s**	1855	Sault Ste. Marie canal connects Lake Superior to Lake Huron
	Logging Era		**1860s**		
			1870s	1877	Wisconsin Central Railroad reaches shore of Lake Superior
Mining Era			**1880s**		Coaster brook trout decline becomes apparent
			1890s		Introduction of non-native trout begins
		Trout Stocking Era	**1900s**		
	Farming Era		**1910s**	1916	First brook trout stocking in Whittlesey Creek
			1920s		
			1930s		Smelt and sea lamprey invasions
			1940s		
			1950s		Only a few coaster brook trout populations still exist Introduction of non-native salmon begins
			1960s	1958-1964	Erosion control efforts in Whittlesey Creek watershed by Red Clay Interagency Committee
			1970s		
			1980s		
		Collaborative Restoration Era	**1990s**	1990	GLFC establishes fishery objectives for Lake Superior
				1999	FWS establishes Whittlesey Creek NWR
					GLFC completes Lake Superior brook trout plan
			2000s	2003	Whittlesey Creek brook trout experiment and evaluation begins
			2010s		Climate change models indicate Whittlesey Creek is resilient and will remain suitable for brook trout through mid-century

Migratory Birds

Land use changes and bird range expansion and contraction are evident on the Whittlesey Creek NWR as well as throughout the Whittlesey Creek watershed and Chequamegon Bay region. Oral history interviews conducted during Refuge HMP development and informal conversations with long-term residents provide valuable insights. For example, sharp-tailed grouse populations were high when forests were young, and small dairy farms were common. Snow goose migrations provided exceptional hunting opportunities, and Canada goose numbers were minimal. As is the case throughout their historic range, bald eagle populations crashed due to toxin contamination. The species is now common during all seasons and regularly breeds in the area. Sandhill crane, northern cardinal, and wild turkey were rarely seen several decades ago. Now all have well-established breeding populations.

Whittlesey Creek NWR is part of the Lower Chequamegon Bay Important Bird Area. The 2006 Refuge HMP indicates that birders and biologists have identified 271 bird species in the vicinity, including waterfowl, neotropical migrants, raptors, grassland, and shore birds. These can be found in appendix B. Wetlands, woodlands in the watershed, and agricultural grasslands

provide resting and breeding habitat for waterfowl and neotropical migratory birds. Piping plover and red knot have been a rare sighting in the spring at the mouth of Whittlesey Creek. Chequamegon Bay contains artificial nesting islands for common terns, one of two nesting locations on Lake Superior in Wisconsin and one of only five nesting sites in the state. The terns often feed on small fish in the shallows at the mouth of Whittlesey Creek. Large rafts of diving ducks, primarily lesser scaup, utilize Chequamegon Bay during migration, providing excellent fall open-water hunting. Limited numbers of overwintering American black ducks and mallards are found in the open water at the mouth of Whittlesey Creek, nearby Fish Creek, and in spring ponds.

Resident Species

Brady and Verch (2007) compiled a list of over 300 bird species that have been observed at least once in the Chequamegon Bay region since 1972. Nearly 170 are known to breed in the area. They note that this portion of Lake Superior's south shore features diverse habitats including open water, mudflats, coastal wetlands, open fields, pine barrens, shrublands and varied forest types. All of these habitats are represented in the Whittlesey Creek watershed; they support a wide variety of dependent species during breeding, migration, and winter seasons. While relative annual abundance and occurrence may be inconsistent, 90 of the species have been recorded during all four seasons. Approximately 50 species are residents but several of these are represented by very limited numbers in scattered locations.

Threatened and Endangered Species

Wisconsin's gray wolf (*Canis lupus*) population is federally listed as endangered. The gray wolf is an uncommon visitor to Whittlesey Creek National Wildlife Refuge.

The piping plover (*Charadrius melodus*) is federally listed as endangered in Wisconsin's Great Lakes watershed. It nests on bare shoreline adjacent to water. It is known to nest on Lake Superior shoreline in a few locations, including Long Island in Chequamegon Bay. There are no records of nesting pairs on or in the immediate vicinity of the Refuge. Piping plovers have been seen near the mouth of Whittlesey Creek during spring migration.

Canada lynx (*Lynx canadensis*) is federally listed as threatened in Wisconsin and is considered to be very rare with only a few recorded sightings in the past 25 years. Bayfield and Ashland counties are included in the list of counties with the highest likelihood of occurrence.

The rufa subspecies of the red knot (*Calidris canutus rufa*) is federally listed as endangered in Wisconsin. It is a rare spring migrant in the Chequamegon Bay region. It has been observed at the mouth of Whittlesey Creek, but there are no records of nesting pairs on or in the immediate vicinity of the Refuge.

Northern long-eared bat (*Myotis septentrionalis*) currently is proposed for listing as federally endangered. None of the Refuge parcels has known suitable winter habitat or suitable spring staging/fall swarming habitat. However, most have the potential to include suitable summer habitat. Monitoring via acoustic recording, initiated on the Refuge by the Service in April 2014, will help determine presence or absence of the northern long-eared bat.

3.4 Socioeconomic Environment

Demographics

Whittlesey Creek NWR is located in Bayfield County along the shore of Lake Superior in northwest Wisconsin. The population of Bayfield County was about 15,000 in the 2010 census (U.S. Census Bureau, 2013). The Refuge lies entirely within the town of Barksdale (population 723) and six miles west of the city of Ashland (population 8,216), which is the largest city in the region. Bayfield County has a total area of 1,478 square miles (946,000 acres). Nearly 50 percent of the land is publicly owned or controlled, including county, state, and federal forests, parks, and fish and wildlife areas (Bayfield County, 2010).

About 86 percent of county residents are white, and 10 percent are American Indian. About 18 percent of residents are under the age of 18, and 22 percent are over 65 years of age. The median age of Bayfield County residents increased by 17 percent between 2000 and 2010 and probably will continue to increase. More than 90 percent of the population 25 years or older has at least a high school level of education; 27 percent has a Bachelor's degree or higher (U.S. Census Bureau, 2013).

Logging, mining, and agriculture were the basis of the first period of rapid growth in northern Wisconsin in the late 19th century. With the subsequent decline of these extractive industries came declines in population. In Bayfield County, the population has never again reached the peaks attained by 1920, although the rise of the tourism and recreation industry in recent years has brought new growth. According to recent census data, more than 40 percent of homes in the county are recreational (Bayfield County, 2010).

Income, Employment, and Local Economy

Median household income in Bayfield County is just over $44,000; about 13 percent of the population has income below the poverty line. The November 2014 unemployment rate in Bayfield County was 9.2 percent, compared to 5.2 percent for the state of Wisconsin. Leisure and hospitality is the largest employing sector in the county even on an average annual basis, despite the high degree of seasonality during the fall and winter months. Prominent Bayfield County employers include Red Cliff Band of Lake Superior Chippewa, County of Bayfield, Legendary Waters Resort and Casino, Northern Lights Health Care Center, and the school districts of Bayfield and Washburn (Michels, 2011; WI Dept. of Workforce Development, 2013; U.S. Department of Labor, 2015).

Agriculture

In 2012, Bayfield County had 352 farms totaling 72,000 acres. Market value of agricultural products sold was $13.9 million, about one-third from crops and two-thirds from livestock/poultry. Harvested crops included about 25,000 acres of hay and other forage, 2,000 acres of corn, and between 250 and 800 acres each of barley, orchards, oats, soybeans, and wheat. Net income averaged $5,779 per farm. Forty-nine percent of operators had a primary occupation other than farming (U.S. Department of Agriculture, 2012).

Tourism and Recreation

Tourism and recreation is the largest industry in Bayfield County. Popular activities include hunting, fishing, bicycling, picnicking, watching wildlife, sightseeing, attending festivals and special events, camping, swimming, ATVing, and boating. In the winter, ice fishing, snowmobiling, and cross-country skiing are popular. Demand for most of these activities is expected to continue to grow, as is the number of seasonal and second homes (Bayfield County, 2010).

The county's peak population estimate for a single day in the summer of 2006 was 45,329, about three times the resident population. In addition to the 15,000 residents, this figure included 7,350 lodgers in hotels, motels, and campgrounds; almost 20,000 owners of seasonal homes; and about 2,300 one-day visitors (Bayfield County, 2010).

In 2012, visitors spent $38.5 million in Bayfield County, which supported about 600 jobs and contributed $5.3 million in state and local taxes. Bayfield County ranked 46th out of 72 Wisconsin counties in tourism impacts. Neighboring Ashland County ranked 53rd, with $29 million in visitor spending (Wisconsin Department of Tourism, 2013).

Northern Great Lakes Visitor Center

The NGLVC stimulates rural economic development by attracting visitors to the area and then directing them out to public lands and area businesses. A recent University of Wisconsin report (Hokans et al., 2013) found that about 75 percent of the 125,000 annual visitors to the Center are not local residents of Bayfield or Ashland counties. These non-local visitors spent roughly $5.1 million in the two counties in 2012. This economic impact can be measured in terms of 84 local jobs and $1.6 million in locally accrued employee compensation. The operational budget of the Center contributes almost $725,000 to the regional economy each year in employee salaries, supplies and expenses, and maintenance and upkeep.

3.5 Cultural Resources

Area History

[From Wisconsin Cartographers' Guild (1998) and Milwaukee Public Museum (2013).]

Prehistoric

Nomadic hunter-gatherers were present in Wisconsin from the earliest generally accepted cultural period, the Paleo-Indian tradition, that began about 12,000 years ago as glaciers retreated northward. These hunter-gatherers roamed widely through the boreal forest of the Midwest in search of mastodon, wooly mammoth, and other resources.

The Archaic tradition evolved as the climate became warmer and drier and cool moist boreal forest gave way to deciduous forest and savanna. Efficient hunting and gathering cultures developed, gradually becoming more sedentary and exploiting local environments for food and tools. Groups of Archaic people, for example, hammered metal tools from copper deposits in the Upper Peninsula of Michigan. There is consistent evidence of ongoing trade and other forms of interaction during this period.

Human populations increased dramatically during the Woodland period, which began about 2,500 years ago. Climate was similar to today and a broad belt of mixed deciduous and coniferous forest stretched from Lake Superior to New England. Woodland cultures began to make pottery, store food, develop small villages, and cultivate plants, although the short growing season in the north made crops unreliable there. Hunting, fishing, and gathering remained important. In many parts of the Great Lakes, particularly northern Wisconsin, wild rice was a dietary staple.

Historic

The first recorded contact between Europeans and Great Lakes Indians occurred between 1534 and 1542 when Cartier of France explored the St. Lawrence River. The French soon established colonies, alliances, and a thriving fur trade that increased competition among tribes in the eastern Great Lakes. The Iroquois tried to seize control of the fur trade through a series of wars, forcing many tribes to flee westward. Among those that made their way to Wisconsin were the Potawatomi, Ojibwe, Sauk, Fox, Ottawa, Huron, Miami, and Mascouten. Most eventually left the area, but the Potawatomi and Ojibwe stayed on. The Ojibwe became key French allies in the north. They moved according to the seasons, fishing in summer, ricing in the fall, hunting, trapping and ice fishing in the winter, and tapping maple syrup and spearfishing in the spring.

The British won control of all French possessions in Canada and the Midwest in 1763. Green Bay, La Pointe, and Prairie du Chien emerged as primary Wisconsin sites of the British fur trade. Growing U.S. –British conflicts, however, led to the War of 1812, and the British lost the region to the Americans in 1814. The American fur trade declined by the 1850s due to depleted beaver populations, Native American land cessions, and removal of tribes to reservations.

The Ojibwe ceded vast tracts of forest in northwestern Wisconsin and east-central Minnesota in the 1837 Treaty, allowing timber companies to begin cutting the extensive stands of white pine. The 1842 Treaty ceded lands rich in copper and iron in northeastern Wisconsin and the Upper Peninsula of Michigan, including the Chequamegon Bay area. The 1854 Treaty allowed the Ojibwe to live on four reservations at Lac du Flambeau, Bad River, Red Cliff, and Lac Courte Oreilles. Small reservations for the Mole Lake Sokaogon and the St. Croix Ojibwe were created in 1934. In keeping with the decentralized Ojibwe political tradition, each reservation has its own government.

Commercial logging grew rapidly in Wisconsin from the 1850s through the 1890s, encouraging settlement of the state's northern regions. Many lumber mills opened in Wisconsin, including the south shore of Chequamegon Bay. Between 1899 and 1905, Wisconsin led the nation in lumber production. The last stands of old growth pine in the state were harvested in the early 1930s.

As the timber industry declined, northern Wisconsin was touted as the ideal place to acquire cleared land and establish farms. Much of the logged area became farmland, but the short growing season, infertile soil, and poor economic conditions made farming difficult. Much of the land was declared tax delinquent by the 1940s and today accounts for many of Wisconsin's

national, state, and county parks and forests. Nevertheless, agriculture is still an important land use in the Chequamegon Bay region, including the Whittlesey Creek watershed.

Lake Superior became accessible to large ships in 1855 with the opening of the Sault Sainte Marie canal. Duluth-Superior became a leading grain port by the 1870s, but the primary cargo soon shifted to iron ore mined in Wisconsin, Michigan, and Minnesota. Enormous ore docks were constructed in Duluth, Superior, and Ashland for shipping the ore to steel mills and manufacturing plants. By the 1930s, the Lake Superior iron ranges were producing two-thirds of the world's iron ore. The iron deposits were exhausted after peaking in the 1950s.

A modest commercial fishing industry on Lake Superior during the 19th century included the Bayfield-Apostle Islands region, which had an excellent natural harbor, little industrial development, and plentiful whitefish, herring, and lake trout. The Wisconsin fishing industry steadily declined after the 1930s due to overfishing, invasion of exotic species, and industrial development and pollution. Since the 1950s, Wisconsin has worked with other states and Canada on exotic species control, environmental regulation, and fish restocking programs.

Chequamegon Bay tourism began in the mid-1800s, notably for anglers pursuing the coaster brook trout of Lake Superior. The city of Ashland was a destination for anglers from Chicago and other Midwestern cities, who arrived by train at the Chequamegon Hotel. Today, the Great Lakes retain their attraction for recreational fishing and boating.

Refuge Cultural Resources

Twenty-two sites in Bayfield County have been placed on the National Register of Historic Places, but none of these properties is located within the boundaries of the Refuge. Thirteen buildings or farmstead complexes are within the approved boundary. One of these buildings may have been the home of Asaph Whittlesey, founder of Ashland, WI in 1860, and after whom the creek was named. Also within the proposed boundaries could be the site of the cabin built in 1664 by Pierre Esprit Radisson, a French fur trader and explorer. No National Historic Landmarks are located within the Refuge. No cultural resources investigations have been conducted on the Refuge (FWS, 1998).

Cultural Resources Management

Cultural resources (archaeological sites, historic structures, and Native American traditional cultural properties) are important parts of the nation's heritage. The Service strives to preserve evidence of these human occupations, which can provide valuable information regarding interactions between individuals, as well as between early peoples and the natural environment. Protection of cultural resources is accomplished in conjunction with the Service's mandate to protect fish, wildlife, and plant resources.

The Service is charged with the responsibility, under Section 106 of the National Historic Preservation Act of 1966, of identifying historic properties (cultural resources that are potentially eligible for listing on the National Register of Historic Places) that may be affected by Service actions. The Service is also required to coordinate these actions with the State Historic Preservation Office, Native American tribal governments, local governments, and other interested parties. Cultural resource management in the Service is the responsibility of the Regional Director and is not delegated for the Section 106 process when historic properties

could be affected by Service undertakings, for issuing archaeological permits, and for tribal involvement.

The Archaeological Resources Protection Act of 1979 (ARPA) Section 14 requires plans to survey lands and a schedule for surveying lands with “the most scientifically valuable archaeological resources.” This Act also affords protection to all archeological and historic sites more than 100 years old (not just sites meeting the criteria for the National Register) on federal land and requires archeological investigations on federal land be performed in the public interest by qualified persons.

The Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of these and other cultural resource laws. The actual determinations relating to cultural resources are to be made by the RHPO for undertakings on Service fee title lands and for undertakings funded in whole or in part under the direct or indirect jurisdiction of the Service, including those carried out by or on behalf of the Service, those carried out with federal financial assistance, and those requiring a federal permit, license, or approval.

The responsibility of the Refuge Manager is to identify undertakings that could affect cultural resources and coordinate the subsequent review process as early as possible with the RHPO and state, tribal, and local officials. Also, the Refuge Manager assists the RHPO by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archaeological investigations by contractors and permittees and by reporting ARPA violations.

3.6 Refuge Programs

Biological

Fish and Wildlife Restoration and Management

Coaster Brook Trout

In response to the significant decline in brook trout numbers, and in support of the *Brook Trout Rehabilitation Plan for Lake Superior* (Newman et al., 2003) and the *Wisconsin Lake Superior Basin Brook Trout Plan* (2005) the U.S. Fish and Wildlife Service (FWS, Service) and WDNR are implementing an experimental restoration plan specific to Whittlesey Creek aimed at establishing a self-sustaining population of migratory brook trout.

The Brook Trout Rehabilitation Plan for Lake Superior (Newman et al., 2003) was adopted by the GLFC as a guidance tool for brook trout initiatives undertaken by management agencies situated around Lake Superior. The *Wisconsin Lake Superior Brook Trout Plan,* developed jointly by the WDNR

and the Service (WDNR and FWS, 2005), builds on the lake-wide plan and names five priority Wisconsin tributaries for brook trout restoration: Brule River, Bark River, Raspberry River, Whittlesey Creek, and Graveyard Creek. Overall program objectives address stream and watershed health, harvest, stocking, genetics, life history, species interactions, and outreach. Restoration and management actions are tailored to individual streams. An interagency team holds regular coordination meetings to evaluate progress and address any issues that arise.

The Whittlesey Creek experiment is the only brook trout restoration program in Wisconsin's Lake Superior basin that combines all four of the following actions:

A. Improve habitat.
B. Establish protective harvest regulations.
C. Stock coaster brook trout.
D. Assess and monitor.

A. Improve Habitat

Refuge staff has responsibility for the habitat improvement portion of the Whittlesey Creek experiment. Several hydrologic and geomorphic studies have been completed that identify watershed and in-stream stressors affecting brook trout habitat in Whittlesey Creek (WDNR et al., 1996; Trout Unlimited 2003; WDNR and FWS, 2005). Implementation of a detailed HMP for Whittlesey Creek is now underway (FWS, 2006c). The plan includes long-term restoration objectives and strategies for the Refuge, the stream, and the watershed.

B. Establish Protective Harvest Regulations

The WDNR changed angling regulations in 2003 to provide greater protection for brook trout during this experiment. Whittlesey Creek now is a "catch and release only" stream for brook trout. In addition, regulations for brook trout harvest in Lake Superior now include a 20-inch minimum size limit and one fish per day bag limit. These regulations are intended to continue for the length of the experiment.

C. Stock Coaster Brook Trout

Stocking brook trout into Whittlesey Creek has occurred frequently over the last 100 years (FWS and WDNR, 2003). No record exists of the strains used but it is generally understood that, until the 1990s, the source fish were not from the Lake Superior basin. In addition, most early stocking efforts were not accompanied by habitat restoration, protective regulations, or monitoring.

All brook trout now stocked in the basin come from strains that originated in the basin and that were known to use the lake environment. For this experiment, two strains (Tobin Harbor and Siskiwit) from Isle Royale, Michigan were stocked between 2004 and 2009. Life stages used were eyed eggs, fingerlings (1–2"), yearlings (4–5"), and adults (>8"). All life stages (except eggs) received a mark for later identification. Iron River and Genoa National Fish Hatcheries raised the fish and the Ashland Fish and Wildlife Conservation Office (FWCO) released them into Whittlesey Creek. Table 3-3 shows number, life stage, and year stocked.

Table 3-3: Whittlesey Creek Brook Trout Stocking

	2003	2004	2005	2006	2007	2008	2009
Egg		50,000		50,000		50,000	
Fingerling			20,000		20,000		20,000
Yearling		2,000		2,000		2,000	
Adult	75		50		50		50

D. Assess and Monitor

The Ashland FWCO is responsible for the assessment and monitoring portion of the Whittlesey Creek brook trout experiment. Four stream reaches were selected as index stations to be sampled each fall throughout the experiment. Pre-stocking, baseline data were collected from 2001–2003 at the four fixed index stations, and is scheduled to continue at least through 2030 to evaluate brook trout reproduction, recruitment, and survival over time.

Pre-Stocking – The 2001–2003 pre-stocking data showed an estimated 70 to 80 percent decline in brook trout numbers compared to a comprehensive survey conducted by the WDNR in 1977, confirming the need to begin an experiment to better understand what conservation and management actions are potentially needed in order to restore a coaster brook trout population. The significant decrease in brook trout numbers from 1977 to the early 2000s was possibly due to habitat changes caused by flooding during the 24 years between surveys. Coho salmon far outnumbered brook trout in all three years of baseline, pre-experimental phase monitoring. Population estimates of all trout and salmon collected during the pre-stocking phase are shown in Table 3-4.

Table 3-4: Whittlesey Creek Fall Trout Population Estimate by Year

	Young-of-year Coho*	All Rainbow*	All Brown*	All Brook
Pre-stocking Phase				
2001	1,796	78	67	68
2002	5,181	670	1,300	68
2003	18,796	1,210	79	101
Stocking Phase				
2004	6,438	4,254	57	209
2005	12,049	4,717	34	1,479
2006	6,513	3,327	37	428
2007	14,188	4,485	40	1,049
2008	8,660	3,302	46	614
2009	14,762	1,678	72	546
Post-stocking Phase				
2010	17,650	1,372	38	413
2011	12,961	2,086	63	244
2012	8,966	1,259	49	152
2013	5,279	780	30	170

Asterisk * indicates non-native species

Stocking – Annual fall surveys of the four fixed stations were completed throughout the timeframe when stocking was being conducted (2004–2009). As to be expected during a period

of regular stocking, overall brook trout numbers increased, as did the frequency of occurrence of multiple life-stages. In some years, the overall brook trout population was 10 times higher than any of the three years pre-stocking.

Post-Stocking – The post-stocking evaluation phase began in 2010 and continues to present. In comparing the past four years of catch data (2010–2013) to that of the pre-stocking baseline (2001–2003), at least three year-classes of brook trout are present. The average number of adult (age 2+) brook trout in Whittlesey Creek represents a ten-fold increase compared to that of the pre-stocking phase. The average number of yearlings (age 1) and young-of-year brook trout over the past four years represents a two-fold increase.

Life-Stage Comparison – A thorough evaluation of the contribution that each life stage stocked has made to the existing brook trout population is not yet complete. However, preliminary results indicate that of the four life-stages stocked (i.e., eyed-eggs, fingerlings, yearlings, and adults), fingerlings appeared to have the highest survival rate to the yearling, and subsequent adult stage. Survival of adult brook trout stocked was quite low, and based on telemetry and Passive Integrated Transponder (PIT) tag data of stocked adult fish, most adults either died (e.g., predation) or emigrated out of Whittlesey Creek <30 days post stocking. Due to vandalism in two of the three years of eyed-egg stockings, an accurate and thorough evaluation of this stocking strategy is not possible.

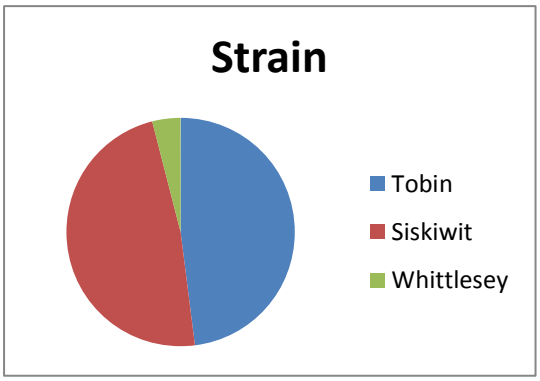
Comprehensive Fish Community Surveys – In addition to the annual surveys of the four index stations, Ashland FWCO and WDNR conducted comprehensive fish surveys of Whittlesey Creek from mouth to headwaters in 2001 (pre-stocking) and 2010 (immediately post stocking), replicating a 1977 survey completed by the WDNR. The purpose of the comprehensive survey is to obtain a more complete survey of the fish community across a broader spatial scale than what is obtained from the annual index survey of four sites. Table 3-5 shows estimates of the total number of brook trout collected at six comparable sites across the three years when comprehensive surveys have taken place. Comprehensive fish surveys of Whittlesey Creek to assess the entire fish community are scheduled for completion every 10 years through 2030.

Table 3-5: Whittlesey Creek Comprehensive Brook Trout Surveys

1997	2001	2010
184	56	413

Genetic Strain Comparisons – To establish a genetic baseline for the brook trout population that existed in Whittlesey Creek prior to the stocking phase of the experiment, tissue samples (i.e., small fin clip) were taken from fish collected from 2001–2003. During and following the stocking phase, tissue samples were taken from brook trout collected during annual assessments. Tissue samples were analyzed and assigned by the U.S. Geological Survey (USGS) Great Lakes Science Center (2004 and 2005) and the Service's Northeast Fishery Center (2006–2010) to one of three strains: Whittlesey Creek, Tobin Harbor, or Siskiwit. To date, tissue samples from brook trout collected during fall assessments from 2004–2010 have been processed. Annual and life stage variations exist with respect to strain performance, but overall it appears that the Tobin and Siskiwit strains perform equally well. Also, the Whittlesey Creek baseline population continues to be present, but in a much smaller proportion (Figure 3-10).

Figure 3-10: Genetic brook trout strains in Whittlesey Creek



Emigration/Immigration – In addition to annual monitoring of the fish community in Whittlesey Creek, a solar-powered, remote PIT tag reader was installed near the mouth of Whittlesey Creek in the spring of 2008 to monitor emigration and immigration of coaster brook trout. PIT tags were/are inserted into the abdominal cavity of all brook trout captured > 5 inches that were either stocked or collected since 2008. Eighty-nine of the 2,000 yearlings stocked in spring 2008 were subsequently detected leaving Whittlesey Creek, mostly in the spring and fall between 10:00 p.m. and 2:00 a.m. Five of the 89 have since returned to Whittlesey Creek—one in fall 2009, one in spring 2010, and three in fall 2010. Movement of brook trout originally stocked or collected in Whittlesey Creek into other streams also has been documented. Additional analysis will be completed as more data become available.

Progress Toward Goal – The overall goal of this project is to establish a self-sustaining brook trout population that exhibits a migrating life history by 2030. A population is considered self-sustaining when it supports itself via 25 breeding pairs for at least two generations after stocked fish no longer contribute to recruitment. To date, we have not achieved this goal, nor did we expect to as a sufficient amount of time post stocking has not taken place. However, all indications based on survey results to date indicate that significant progress toward achieving our goal has been made, and that the strategies identified in the experimental plan (see appendix H) should continue. We have observed a 2–10 fold increase in the number of fish present (depending on age-class), we continue to observe annual reproduction as witnessed by our collection of young-of-the-year fish in the fall, we have observed large (relative to pre-stocking) numbers of adults, and the genetics are telling us that coaster brook trout strains used during our stocking phase are performing well. Last, but certainly not least, we have documented a small percentage of the brook trout in Whittlesey Creek exhibiting migratory behavior, emigrating from Whittlesey Creek as young, immature fish returning subsequently as adults, presumably to spawn.

Habitat Restoration and Management

The HMP for Whittlesey Creek NWR has provided direction and guidance for Refuge habitat activities since 2006. The HMP includes objectives and strategies both for lands within the Refuge boundary and for upstream private lands within the Whittlesey Creek watershed, organized under four general goals (FWS, 2006c):

1. **Stream**: Restore watershed and stream hydrologic functions that improve fish and wildlife habitat within the stream and the Refuge, with an emphasis on native species.

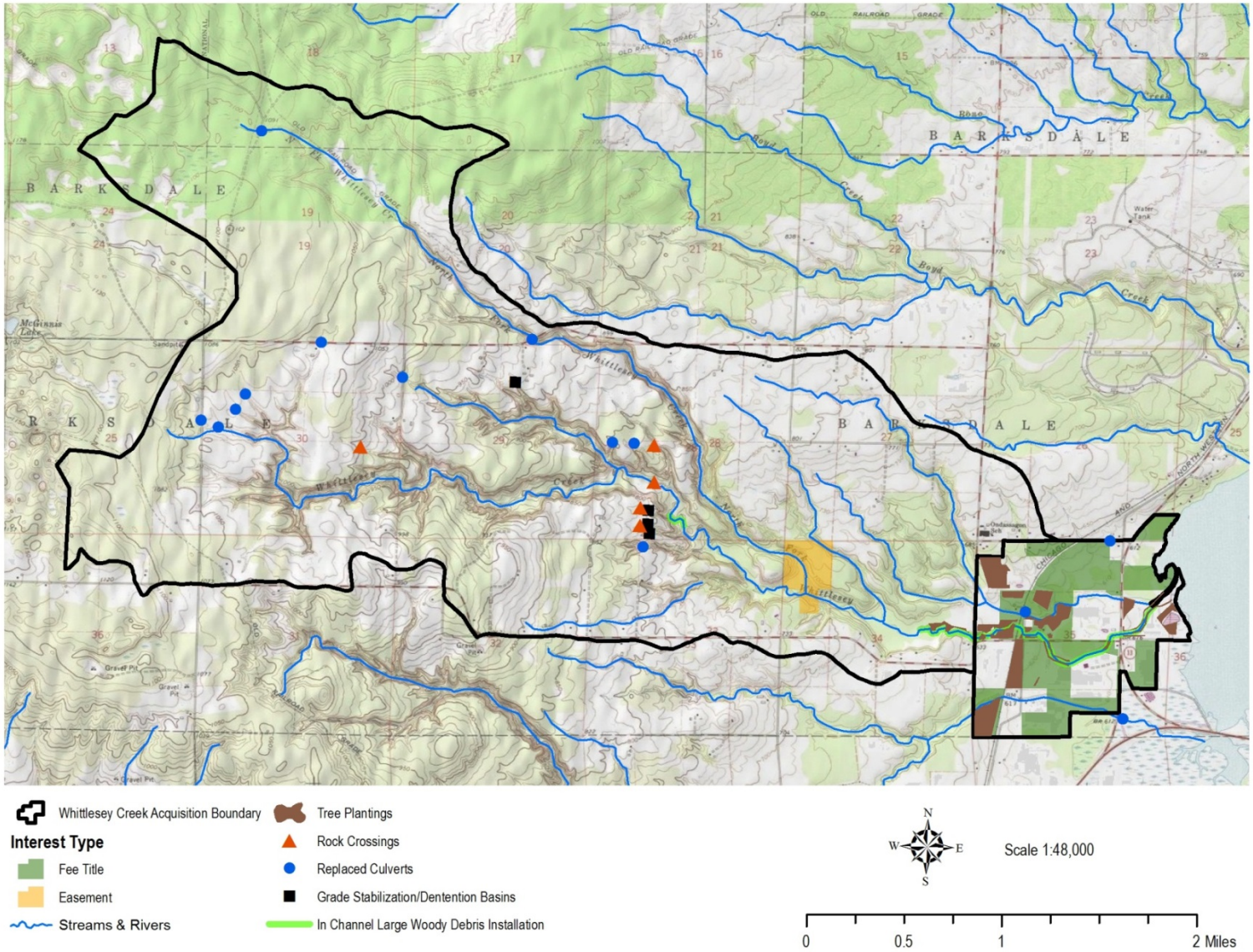
2. **Sediments**: Reduce sediment loads into Whittlesey Creek to historic (pre-European settlement) range of variability.
3. **Floodplain and wetland hydrology**: Restore to the extent possible floodplain function in the coastal wetlands and floodplains of the Refuge.
4. **Floodplain habitat**: Restore native species composition of trees and shrubs in the floodplain that will provide heterogeneous vertical and horizontal structure for migratory bird habitat.

The USGS studied the effects of land cover on flooding and base flow characteristics of Whittlesey Creek by use of two groundwater flow models (GFLOW and MODFLOW) and one rainfall runoff model called the Soil and Water Assessment Tool (SWAT) (Lenz et al., 2003). The study was done in cooperation with the Bayfield County Land and Water Conservation Department (LWCD) and the Service. GFLOW and MODFLOW showed that the groundwater contributing area did not coincide with the topographically delineated surface-water-contributing basin. Instead, about 90 percent of the base flow to Whittlesey Creek originated as recharge through the permeable sands in the center of the Bayfield Peninsula. The SWAT model indicated that changes in land cover within the surface-water-contributing basin would have minimal effects on average annual runoff for Whittlesey Creek but would affect flood peaks. The predicted reduction of flood peaks under more forested conditions could potentially cause a reduction in sedimentation near the mouth of Whittlesey Creek.

Additional information comes from a Sediment Impact Analysis Methods (SIAM) model for the Whittlesey Creek watershed developed in partnership with the USACE and USGS (USACE, 2010). The Whittlesey Creek model was developed to screen various restoration options and determine potential impacts to the sediment balance. Four scenarios were initially modeled: addition of large woody debris, reduction in peak flows in the upper reaches, floodplain reconnection in the lower reaches, and bank stabilization in the mid-upper reaches. SIAM found that restorations that affected hydraulics had the most significant effects on the sedimentation and erosion dynamics of the system. SIAM also found examples of potential unintended consequences of restoration to the sediment regime of downstream reaches. This tool can help focus restoration efforts and funding on the most feasible projects that have the greatest chance for long-term restoration success.

Recent habitat restoration activities have centered on in-stream habitat and fish passage, although progress on floodplain, wetland, and watershed restoration also has been significant (Figure 3-11).

Figure 3-11: Habitat Restoration Projects to Date



Stream

Large Woody Debris

When the Refuge was established, large woody debris had been nearly eliminated from stream channels. By 2014, more than 600 logs will be added to the lower 2.5 miles of Whittlesey Creek, slowing flood flows, protecting stream banks, providing cover for fish and invertebrates, and exposing beneficial gravel that had been buried in sediment. This portion of the creek lies mostly within the authorized Refuge boundary and was one of the most highly degraded channel segments based on quality of fish and invertebrate habitat. Many of the restoration sites are easy to access and highly visible, making them good demonstration areas for the benefits of large woody debris.

Large woody debris installation.

Another 120 logs were installed upstream near the North Fork confluence where year round base flow in Whittlesey Creek begins. This project was designed primarily for bank/bluff stabilization and erosion control rather than fish habitat but, like the downstream installations, it serves both functions. No logs have been installed yet on Little Whittlesey or Terwilliger Creeks.

Logs are installed in clusters using a large track excavator—either by placing them in trenches and backfilling, or by pushing them into the bank. Logs are cabled together and made to look like natural logjams. Contractors handle design, engineering, construction oversight, and log placement.

Northland College students, volunteers, staff from agency partners, the Youth Conservation Corps, and Refuge staff assist with cabling, seeding, and mulching. Refuge staff and contract engineers jointly determine the best locations and configurations for log clusters along the creek based on channel profile data, site visits, and professional experience. Funding has come from many sources including National Fish and Wildlife Foundation, WDNR, Bayfield County LWCD, Trout Unlimited, Great Lakes Restoration Initiative, and the FWS Partners for Fish and Wildlife program.

In-stream habitat monitoring is based on the Fish Habitat Rating System (Simonson et al., 1993) developed specifically for Wisconsin streams. The system gives a qualitative ranking (poor to excellent) of habitat suitability for coldwater fish based on measures such as channel width and depth, cover, pool area, channel substrate, and riparian buffer width. Pre-restoration data is available for 21 reference sites established in the Whittlesey Creek watershed; post-restoration data is collected by the Youth Conservation Corps (YCC) at sites that are influenced by large woody debris installation. Refuge staff is especially interested in documenting changes in channel width, depth, and substrate and thalweg depth and substrate. Results at two restored sites with good before and after data showed significant increases in average water depth and percent gravel substrate within one year of log placement (Marx, 2012). These changes indicate exposure of potential spawning substrate and improved rearing habitat for anadromous fish, including coaster brook trout.

Northland College students and Refuge staff help collect and analyze data on diversity and abundance of macroinvertebrates and fish before and after log installation. Data from the initial round of sampling show some promising signs, although a more detailed analysis is needed. The initial data has documented the invertebrate families present using samples from treatment and reference sections of the creek. The study confirmed that the addition of logs resulted in an increase in caddisfly larvae of the *Limnephilidae* family. *Limnephilidae* are often clingers that depend on larger rocky substrates for a place to cling while they wait for food to drift past. Long-term data collection may help document a shift in invertebrate communities as the habitat changes. Exposure of gravel substrates, creation of deeper pools, and increased surface area on logs in the stream are expected over time (Brunk, 2012).

Brook trout and rainbow trout have been documented using the newly created habitat, with anecdotal sightings of coho salmon, too. A longer data record is needed, however, before observed increases in fish use of restored cover, pools, and backwaters can be confirmed statistically. Refuge staff and Northland College professors plan to collect annual datasets on fish and aquatic macroinvertebrate abundance and diversity, as well as fish habitat rating for a minimum of five years post-log installation.

Culverts and Bridges

The Service and its partners have replaced fourteen road culverts in the Whittlesey Creek and Terwilliger Creek watersheds since the Refuge was established, increasing fish access to spawning habitat along about five miles of the creek. Nearly every replaced culvert has had dual benefits for stream health—improving fish passage and reducing scour and stream bank erosion. Culvert replacement also benefits local communities by reducing road flooding, washouts, and maintenance costs. Local support for the program is very strong. Several culverts still need replacement in intermittent stream reaches, along forest roads, and on Terwilliger Creek.

A well-designed culvert installation allows enough water flow at the right velocity to facilitate fish movement through it. The Bayfield County LWCD designs the new Whittlesey Creek installations, considering watershed size, flood flows, and stream alignment. Proper pipe diameter and length are important. Smaller culverts are cheaper, but undersized culverts can increase water velocity, which inhibits fish passage and increases erosion potential. The slope of the new culverts is no more than one percent and alignment is consistent with natural stream alignment. The lower 12 inches of culverts are embedded in the channel substrate to establish a natural streambed through the pipe.

Poorly designed culvert.

Well-designed culvert.

All of the bridges that cross Whittlesey Creek are too narrow and should be replaced. Narrow bridges cause downstream scour and bank erosion and create upstream backwaters that accumulate sediment. One bridge on the Refuge constricts the channel by 50 percent and is a very high priority for replacement as soon as funding becomes available. It is scheduled for replacement during 2015.

Floodplain and Wetland

Tree Planting

Trees are planted on and near the Refuge to restore the historic forest cover that will slow floodwaters, stabilize stream banks, contribute large woody debris to the stream system and forest floor, and improve habitat for fish, migratory birds, and other wildlife. The first tree planting was in 2003 as part of the National Wildlife Refuge System (NWRS, Refuge System) centennial celebration. Since then, about 60 acres total have been planted—mostly on Service fee title land, but also on some Refuge inholdings and adjacent private land.

Trees are planted in riparian zones along Whittlesey Creek, in floodplain hayfields, and on the limited upland areas. Riparian plantings occur in the same stream reaches as large woody debris restoration, usually in September when log placement is complete and weather is cooler. Hayfield plantings occur more often in spring, shortly after the frost is gone. Priority fields for planting are those that will fill gaps in forest cover, reducing habitat fragmentation.

Refuge staff uses a suite of native conifers—typically red pine (*Pinus resinosa*), white pine (*Pinus strobus*), white spruce (*Picea glauca*), and sometimes black spruce (*Picea mariana*). Tamarack, northern white cedar, and eastern hemlock (*Tsuga canadensis*) sometimes are used in lower wetter locations. Conifers are preferred based on easy availability, fast growth, and less

deer browse compared to hardwoods. Conifers also are more effective than deciduous trees at slowing the flow of floodwater. Planting assistance has come from Northland College students, other volunteers, the Conservation Corps Minnesota and Iowa, Trout Unlimited, and a local tree care service.

Newly planted trees.

Planting techniques have been refined over time. Two-year-old accelerated growth transplants are now the preferred planting stock. Accelerated growth transplants have extensive fibrous root systems, are more resistant to drought, absorb nutrients from a larger volume of soil, are more competitive with existing vegetation, grow faster in the first few years, and survive much better than the bare root or tap root trees used previously. No monitoring data is available on tree survival and growth or migratory bird use, but field observations indicate that survival of the accelerated growth transplants has been well over 75 percent so far. Annual deer repellent application on browse-susceptible species is critical until growth exceeds browse height. Aspen trees are sometimes felled along field margins to promote suckering, natural succession, and forest diversity.

Invasive brush (mostly buckthorn and honeysuckle) is controlled prior to tree planting when necessary. Trees are planted using planting bars and roots are pruned as needed to fit easily into each hole. Species are randomized across the landscape but selected for each microsite based on soil moisture and soil type. Tamarack and northern white cedar prefer wetter areas, for example, while red pine prefers higher warmer sites. White pine, northern white cedar, and eastern hemlock are especially susceptible to browse, so are cluster planted in groves of 20 to 25 trees to facilitate spraying with deer repellent. Every tree gets a slow release fertilizer tablet when planted. An average spacing of 12 feet by 12 feet is used to calculate the number of trees to order. Planning has begun to plant sixty acres during the spring of 2015 in partnership with the USFS with funding provided by the Lake Superior Landscape Restoration Partnership (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/wi/home/?cid=STELPRDB1247205).

Wetland Restoration

The Refuge and watershed historically contained many small shallow wetland basins that slowed runoff, trapped sediment, and provided habitat for wetland wildlife. Nearly all of these ephemeral wetlands were lost as fields were leveled and ditches dug to increase drainage and improve agricultural production.

Restored wetland.

Over fifty basins totaling approximately 20 acres have been restored within the Refuge's fee title and easement acquisition area. Approximately one-half are floodplain wetlands on Refuge lands and inholdings. The Refuge, FWS Partners for Fish and Wildlife

Program, Bayfield County LWCD, and the Wisconsin Priority Watershed Program have provided funding for wetland restoration projects. Refuge staff uses leaf-off aerial imagery to delineate naturally occurring basins and manmade drainage systems. Groundwater and red clay typically can be found five to eight feet or less below the floodplain, so many wetlands were restored simply by plugging the ditches that drained them. Some larger basins were excavated and dikes pushed up during restoration to hold more water. Many of the smaller basins installed during the Wisconsin Priority Watershed Program are now covered with cattails and filling with decayed vegetation. Excavation would improve structure and function since water deeper than three feet in wetlands typically does not become colonized by cattails. Water control structures have not been installed and no active water management occurs. Disposal of some spoil material, placed in the Refuge floodplain during proposed golf course development, is still needed.

No formal monitoring of wetland vegetation occurs on the Refuge. The restored wetlands are expected to provide habitat for nesting waterfowl, marsh birds such as American bittern and green heron, and other wetland wildlife, although no breeding season surveys are conducted to document wildlife use. Partnerships with Northland College professors have the potential for establishing long-term monitoring.

Watershed

A healthy Whittlesey Creek watershed is important for successful restoration of Refuge lands downstream and successful reintroduction of coaster brook trout in the creek. The Service has authority to purchase up to 1,260 acres of conservation easements from willing landowners in the watershed. Service staff also works with private landowners and other partners to design and implement voluntary farm conservation practices that slow overland flow and reduce erosion.

Conservation Easements

Two conservation easements totaling 47 acres have been purchased from private landowners so far. Each easement includes a permanent agreement between the landowner and the Service that sets forth specific restrictions on development and land use. Easements allow the landowner to continue many outdoor recreation uses on their property including hunting, fishing, walking, and quiet enjoyment. Through the easement, motorized uses or consumptive activities are restricted. Landowners do not have to allow public access through the easement. The property also remains on the tax rolls, limiting the impact to local governments. The first easement agreement was not very restrictive; subsequent agreements placed more restrictions on land use and gave the Service more management rights.

Landowners receive payment for the appraised value of their easements. Early participation in the Whittlesey Creek program has been low, but reinterpretation of the legal authority for these easements has increased the appraised values, which is expected to increase landowner interest.

Farm Conservation Practices

Rock stream crossings and detention basins are two techniques that have been used on private lands to improve the health of the Whittlesey Creek watershed. Rock crossings stabilize banks and the streambed on perennial and intermittent drainages. Several have been constructed in the watershed to minimize erosion while allowing farm machinery to cross. Detention basins help keep nutrients and sediment out of the creek. They slow runoff from farm fields and livestock operations, absorb nutrients, and allow solids to settle out before the water reaches drainage ditches and ravines. Landowners also work with the Service to implement other

conservation measures on their property including culvert replacement, in-stream log installation, wetland restoration, and tree planting.

Invasive Species

Buckthorn (*Rhamnus cathartica*) and reed canarygrass (*Phalaris arundinacea*) are currently the invasive species of highest concern that are known to be present on the Refuge. Buckthorn is most common in riparian areas, along fencerows, and in old hayfields transitioning to shrubs. Dense thickets of box elder dominate some areas. Common tansy (*Tanacetum vulgare*) is primarily found in areas that were altered during development of the proposed golf course. Knapweed (*Centaurea sp.*) is also present along roadsides and on the abandoned railroad grade that cuts through the Refuge. Buckthorn and other invasive woody plants are treated in fields and riparian areas as necessary prior to tree planting by applying glyphosate to cut stumps or girdled trunks. Prescribed fire would reduce the reed canarygrass that is dominant along the edges of floodplain sedge meadows, but treatment has been minimal due to limited resources. Burning is being proposed prior to the 2015 sixty-acre tree planting that was discussed previously. Previous coastal wetland purple loosestrife (*Lythrum salicaria*) infestations have effectively been suppressed by releasing *Galerucella spp.* beetles.

Partners in the NGLVC established an Invasive Free Zone in 2005 (defined as a 95 percent reduction of net infested acres for individual invasive species) to achieve a monitoring and maintenance mode for invasive plants and to restore native vegetation within the boundaries of the Refuge and NGLVC. Major components of the concept included comprehensive inventory and monitoring, control of all known invasives, demonstration of lessons learned, and outreach and education beyond project boundaries. A management plan (McNamara and Mlynarek, 2007) and guidebook (McNamara, 2007) for the project were completed in 2007 (McNamara and Mlynarek, 2007). Seven high priority invasive plants were chosen based on their relative abundance and relative invasiveness. Initial support was obtained for inventory, mapping, and control efforts, but national funding priorities shifted over time and the program has not been active for several years. Treatment, primarily of woody invasives, occurs intermittently as training opportunities for the National Park Service Exotic Plants Management Team and on a contract basis with Conservation Corps Minnesota and Iowa. Buckthorn and honeysuckle control is being planned for 2015 with the USFS via Lake Superior Landscape Restoration Partnership funding.

The Northwoods Cooperative Weed Management Area provides a forum to share information and resources, collaborate on planning, and cooperate on invasive species management in Douglas, Bayfield, Ashland, and Iron counties in northern Wisconsin. Supporters include state and federal agencies (including Whittlesey Creek NWR), municipalities, tribes, nonprofits, community organizations, and individuals. Recent projects have included shoreline restoration in the city of Ashland, inventory of invasive plants along town and county roadsides, and treatment of invasive plants in gravel pits that otherwise could spread seed to other locations.

Inventory, Monitoring, and Research

A separate inventory and monitoring plan is being developed that will help identify priorities. A general description of current inventory, monitoring, and research efforts follow and many of these are the result of Refuge HMP recommendations.

On-going fish survey efforts are led by the FWS Ashland Fish and Wildlife Conservation Office. Annual September mark and recapture sampling is conducted within four index stations. Refuge

staff, volunteers, and WDNR participate. Details appear in Section 3.6, D. Access and Monitor, above, and in appendix H: Whittlesey Creek Brook Trout Experiment. Additionally, to document the effects of in-channel habitat restoration, Refuge staff, YCC, and Northland College professors and students collected mark-and-recapture fish population data pre-log installation and plan to continue for a minimum of five years post-installation.

Aquatic macroinvertebrate population diversity and abundance surveys were also initiated pre-log installation and it is anticipated that they will be continued for a minimum of five years post-installation. Refuge staff, YCC, and Northland College professors and students participate.

Twenty-one in-stream habitat monitoring reference sites have been established in the Whittlesey Creek watershed. Monitoring protocol measures characteristics such as channel width and depth, cover, pool area, channel substrate, and riparian buffer width, and provides a qualitative ranking (poor to excellent) of habitat suitability for coldwater fish. Data track changes to individual metrics as well as overall qualitative ranking pre- and post-management activity. Activities include log-installation or culvert replacement, for example. Refuge staff and YCC annually complete this monitoring on a subset of the twenty-one sites.

A cooperatively funded USGS stream gaging station is located about one mile upstream from the mouth of Whittlesey Creek. Gage readings are posted at http://waterdata.usgs.gov/nwis/uv?040263205. Funding is provided by the Refuge, Ashland Fish and Wildlife Conservation Office, Bayfield County LWCD, and USGS. The gage has been operational since April 1999. Data are used for the SIAM) model that consultants rely on when engineering and designing practices such as in-channel log installations. Ideally, gage hydrographs will indicate that Whittlesey Creek is less flashy as watershed enhancement, restoration, and protection efforts proceed. USGS is responsible for all aspects of gage operation and maintenance.

Nighttime bat and bird monitoring via acoustic recording was initiated on the Refuge by Regional Office staff during 2014. Data will provide information about species presence and seasonal migration. Of particular interest is the northern long-eared bat (*Myotis septentrionalis*), currently proposed to be federally listed as endangered. Refuge staff provides the minimal required weekly maintenance.

Visitor Services

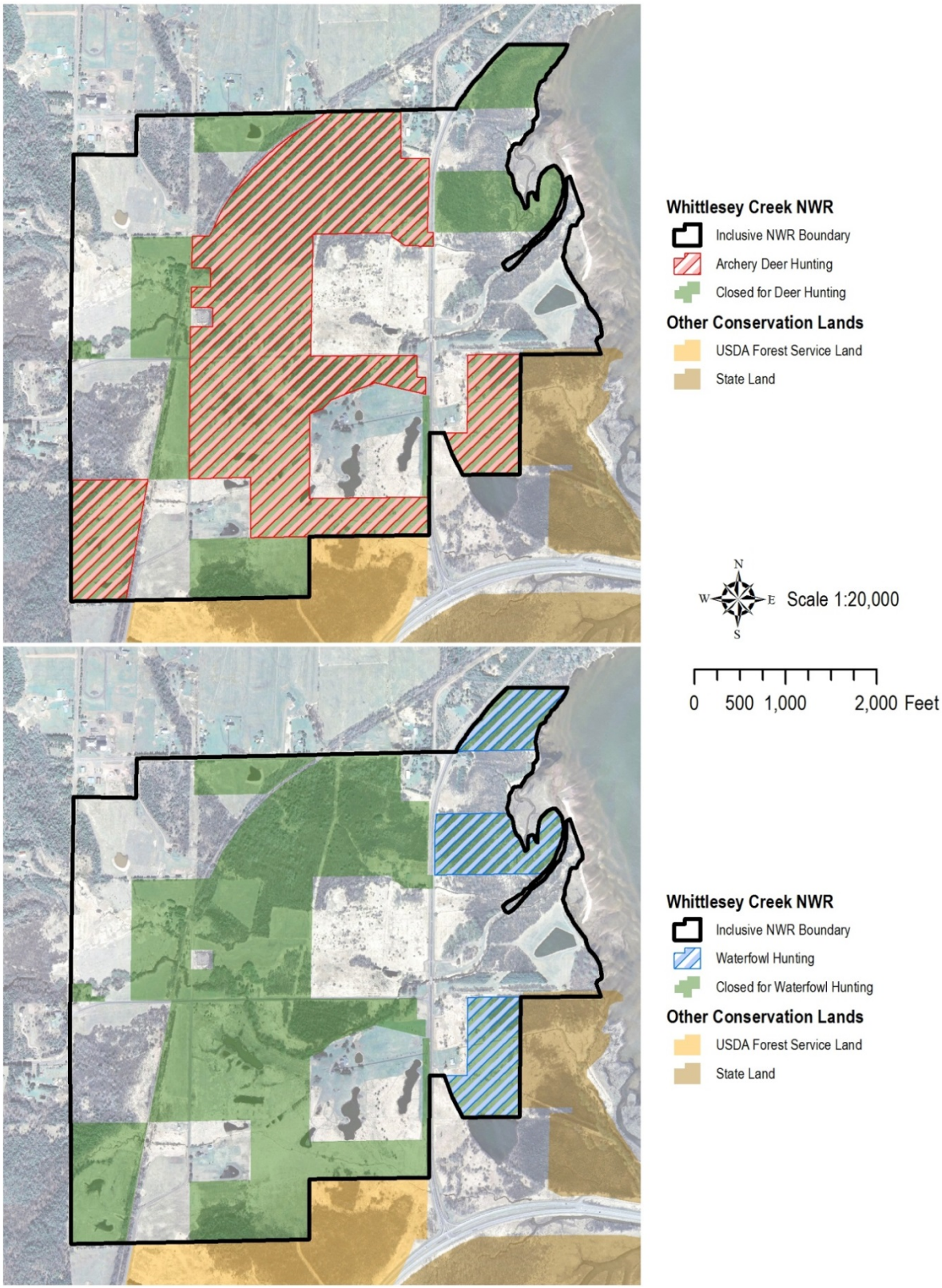
Hunting and Fishing

Archery deer hunting is allowed on the Refuge. Only tracts of land greater than 20 acres are open to hunting in an effort to avoid trespass issues with neighbors. Since safety is imperative, archery is not allowed near the Refuge Coaster Classroom or Visitor Center boardwalk adjacent to the Refuge. No Refuge-specific statistics are kept for number of hunters or number of deer harvested. The Refuge is managed as part of a deer management unit in the state of Wisconsin.

Waterfowl hunting is allowed east of Highway 13, an area that includes the shoreline of Chequamegon Bay in Lake Superior. The area is relatively small and mainly provides opportunities for shore hunting of diving ducks (Figure 3-12).

Fishing is not allowed pursuant to Refuge regulations but, according to state regulations, individuals can fish in Whittlesey Creek as long as they are able to access the creek at a legal point and stay within the creek to fish. Whittlesey Creek is a catch and release brook trout stream.

Figure 3-12: Refuge Hunting Areas



Wildlife Observation and Photography

Wildlife observation and photography are allowed on Whittlesey Creek NWR. Use varies during the year, peaking during special events at the NGLVC. Events such as the Chequamegon Bay Birding and Nature Festival in May attract birders from across the country, many of whom take advantage of Refuge programs held as part of the event. Chequamegon Bay and the associated shoreline of Lake Superior including the mouth of Whittlesey Creek offer excellent wildlife viewing opportunities. The Bay is an important migratory stopover for numerous waterfowl. The mouth of the creek is a gathering area for many migrant shorebirds, eagles, waterfowl, and other wildlife. The Refuge also provides habitat for migrating warblers, raptors, and other birds that use the Bayfield Peninsula as a staging area to cross Lake Superior.

Most of the opportunities at the Refuge are associated with roads or the Lake Superior shoreline since there is no developed trail system on the Refuge.

Environmental Education and Interpretation

Currently the Park Ranger position at the Refuge, which coordinates the environmental education and interpretation program, is being held vacant for cost savings. If filled in the future, the position will resume education and interpretation work in partnership with the NGLVC. The level of programming will be dependent on the funding provided for the position. The education program focuses on high quality programs that are tied to school curriculum and have on-Refuge and off-Refuge components.

Environmental education program.

The Refuge also has developed school-specific partnerships such as the “River of Words” program with the School District of Washburn. Through this program, Washburn fourth-graders understand what a watershed is, learn what is in their local watershed, and try new mediums to express their thoughts. The students develop a great sense of place, connection to nature, and a beginning sense of stewardship. They express what they learn through art and poetry with the help of a local artist and a local poet. Their expressions, connections, and enthusiasm spill out from every page and every project they complete during their fourth-grade year.

Interpretive programs on the Refuge and in partnership with the NGLVC will focus on wildlife or habitat related topics including duck calling contests, owls of the Northwoods, waterfowl identification, habitat restoration, and many others. Refuge programs complement the additional programs offered at the Center by other partners, which cover a wide range of topics from cultural, historic, geo-caching, local history, etc. The varied programs are representative of the various agency priorities for their individual interpretive and educational themes. For example, Service priorities are wildlife, habitat, and wildlife-dependent recreation while agencies such as the USFS have a broader mission that places more emphasis on consumptive use.

The Refuge maintains the Coaster Classroom, a 576 square foot screened-in classroom available for programs. The classroom is near a Refuge parking lot and overlooks a wetland adjacent to Whittlesey Creek. The classroom is located about two miles from the NGLVC.

Coaster Classroom.

The Refuge biologist is actively involved in educational efforts at the Refuge, participating in special events including the Birding and Nature Festival. This three-day event hosted at the Center attracts over 400 birders who enjoy programs throughout the lower Chequamegon Bay area. Several of these programs are on Refuge lands. The Refuge participates in other programs such as Kid's Fishing Day if they have a tie to the mission of the Service.

Northland College students often collaborate with the Refuge biologist for internships, completion of Senior Theses, or short volunteer terms to gain useful experience. The Refuge biologist not only acts as a guide for useful projects but also serves as a mentor to the students. The biologist provides inventory, monitoring, sampling techniques, and habitat restoration experiences to students and YCC crewmembers.

Outreach

Outreach efforts include educational opportunities related to the habitat restoration and management program. The current level of outreach for the Refuge is limited by available staff time. Various techniques have been used in the past to provide information about the Refuge to the public including Facebook, watershed newsletter, news releases, and mailings to neighbors. The Refuge also benefits from the extensive outreach completed by the NGLVC partnership. The Center maintains a website and Facebook page, both of which list Refuge programs through the partnership.

The Refuge biologist hosts several outreach programs each year including a tour of watershed projects for agency and non-profit partners and the public. The tour is a good opportunity to highlight projects and continue to engage the public and partners in the Whittlesey Creek restoration program. Since Whittlesey Creek is the site of an experimental restoration program for coaster brook trout, the extensive data collection and analysis program, habitat restoration projects, and history of fish stocking provide a great opportunity to tell the story of a comprehensive habitat and species restoration program.

Volunteers

The Refuge works with numerous volunteers to help with habitat surveys, restoration efforts, public use projects, and general maintenance. Many volunteers are students at Northland College pursuing degrees in various biological and natural resources disciplines. Students volunteer at the Refuge to gain practical experience.

Partnerships

Partnerships are the key to just about every project the Refuge completes. Partners range from agencies at the NGLVC to many agencies and organizations in the local community. The Refuge works closely with the Ashland Fish and Wildlife Conservation Office on the coaster brook trout restoration program. The Fisheries and Aquatic Resources program within the Service is responsible for coordinating the restoration project, while the Refuge takes the lead on the habitat restoration portion.

The Refuge maintains strong relationships with the town of Barksdale and Bayfield County. The restoration of coaster brook trout is a comprehensive program that combines stocking and regulations with watershed restoration. Since the Refuge is a relatively small portion of the watershed, it is important to work closely with many partners to restore the watershed. Important project elements include culvert replacement, bank and bluff stabilization, and in-stream habitat. The success of the project depends on the Refuge's partnerships with local government units, landowners, and local agencies. The Refuge has a strong partnership with the Bayfield County LWCD. The LWCD coordinates many of the projects including technical support, grant submission, fiscal management, and project oversight. Since the Refuge is a relatively small portion of the project area, these partnerships are crucial for success.

Northern Great Lakes Visitor Center Partnership

The Service is one of six partners at the NGLVC. The Center's mission is "The Northern Great Lakes Visitor Center helps people connect with the historic, cultural, and natural resources of the Northern Great Lakes Region through customer-based information, services, and educational programs." The general direction of the Center is managed through the Center's Board of Directors, which consists of one representative from each agency at the Center and a representative from the Friends of the Center Alliance, the Center's non-profit 501(c)3 friends group. The partner agencies include USFS, National Park Service, FWS, University of Wisconsin Extension, and the Wisconsin Historical Society. The Board sets direction for the Center and manages the common cost budget for the facility.

The Whittlesey Creek NWR office is located in the Center, and the Refuge, through the partnership, is able to use the classrooms, common areas, and administrative facilities to support the Refuge mission. The Refuge also has an exhibit located in the Visitor Center that acquaints visitors with the mission of the Refuge System and tells the story of Whittlesey Creek NWR. There are numerous exhibits in the Center focusing on the history of the Lake Superior Region, climate change, and the Refuge. A five-story observation tower allows visitors to look out across the Lake Superior shoreline.

The Center hosts numerous environmental education and interpretative programs each year as well as several special events. Refuge staff participates in programs and events that align with the Refuge's mission. On average, 120,000 people visit the Center each year, providing an excellent forum for education about the Lake Superior region.

Administration

Whittlesey Creek National Wildlife Refuge is managed from the St. Croix Wetland Management District (WMD) in New Richmond, WI approximately 160 miles away. A Park Ranger (currently vacant) and an FWS biologist are stationed at the Refuge at an office in the NGLVC.

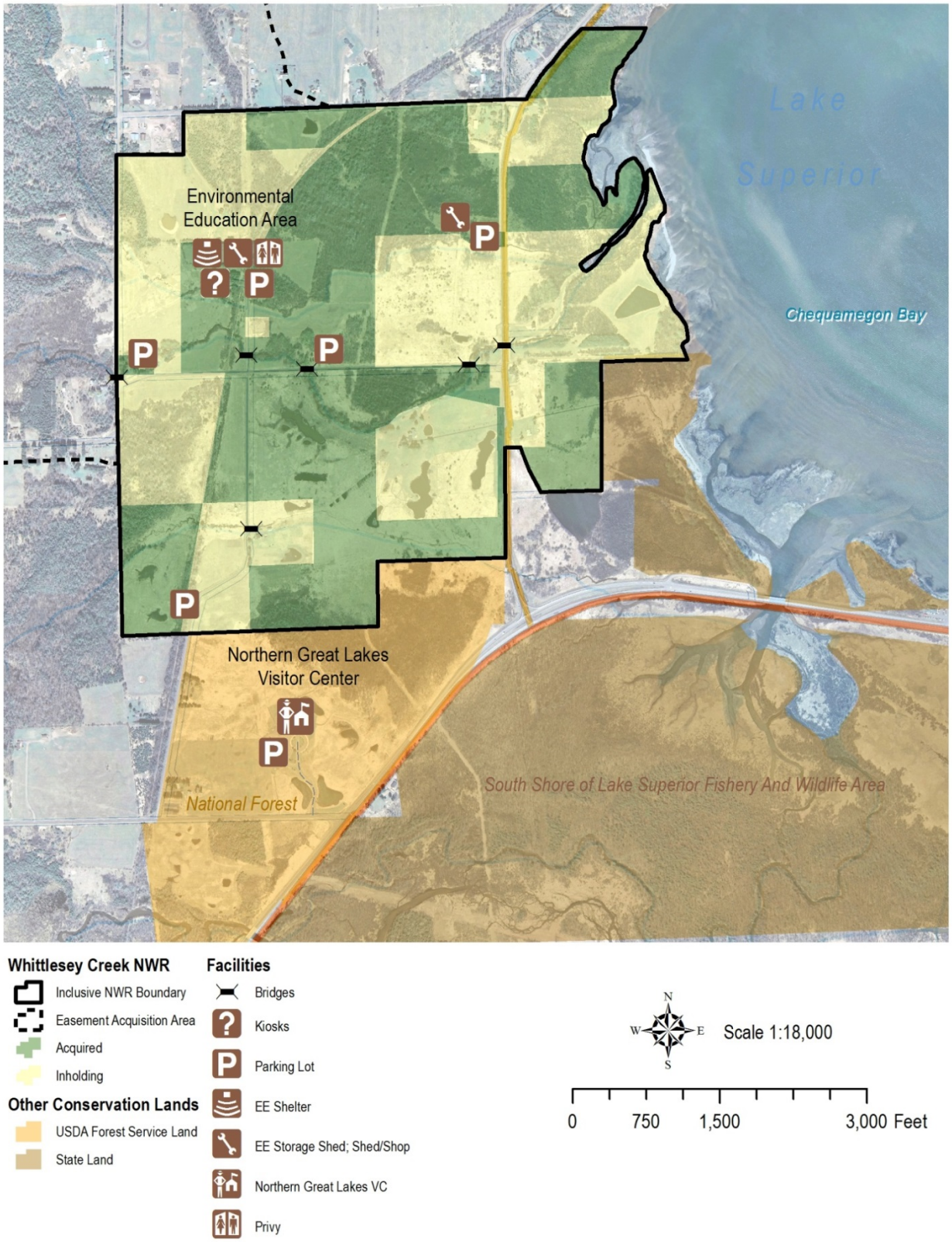
Management, maintenance, and administrative support are coordinated from the St. Croix WMD office.

Facilities
The Refuge office is located in the 32,000 square foot NGLVC, which has an exhibit area, auditorium, classrooms, and gathering areas (Figure 3-13). The Refuge has a screened-in facility for educational programming (Coaster Classroom), a small storage shed, and a pole barn for storage of equipment and supplies.

Law Enforcement
Law enforcement coverage for the Refuge is provided by the Zone Law Enforcement Officer located at Necedah National Wildlife Refuge, about 250 miles from the Refuge. Local issues needing immediate attention are handled through the Bayfield County Sheriff, local WDNR Wardens, and the U.S. Border Patrol.

Farm Services Agency Easements
When the Farm Services Agency (FSA, formerly known as the Farmers Home Administration) acquires property through default on loans, it is required to protect wetland and floodplain resources on the property prior to public resale. The Service assists the FSA in identifying these important resources. The FSA assigns a perpetual conservation easement to qualifying properties and transfers easement management responsibility to the Service as part of the Refuge System. The Refuge manages 15 FSA easements in a three-county management district. Easements are inspected each year. The Refuge and partner agencies have completed several wetland, in-channel, and riparian restoration projects on easements.

Figure 3-13: Visitor Services Facilities



Chapter 4: Future Management Direction

In this chapter:

4.1 Introduction
4.2 Objectives, Strategies, and Rationales
Habitat
Wildlife
People

4.1 Introduction

Goals are broad descriptive statements of desired future conditions. There are three goals for Whittlesey Creek National Wildlife Refuge (NWR, Refuge). Each goal is followed by a series of objectives, which are specific statements describing management intent. Beneath each objective is a list of strategies—the specific actions, tools, and techniques needed to meet the objective. Finally, rationale statements describe background, history, assumptions, and/or technical details of the objectives and strategies. Unless otherwise noted, the U.S. Fish and Wildlife Service (FWS, Service) intends to meet these objectives within the next 15 years.

Full achievement of Refuge goals will require the time and expertise of both a biologist and a park ranger. Constraints on staffing and/or funding would necessarily limit implementation of some of the objectives and strategies described below. These potential constraints and their impact on Refuge priorities are explained in chapter 5.

The Habitat Management Plan (HMP) for Whittlesey Creek NWR (FWS, 2006c) will continue to provide direction and guidance for all habitat activities as this Comprehensive Conservation Plan is implemented. HMP goals, objectives, and strategies are included in appendix C.

4.2 Objectives, Strategies, and Rationales

WILDLIFE

Goal 1: Protect, restore, and maintain a diversity of wildlife species native to naturally functioning Refuge habitats, with special emphasis on coaster brook trout and migratory birds.

Objective 1-1: Brook Trout

Continue to participate in the interagency experimental coaster brook trout restoration program on the Bayfield Peninsula of Lake Superior, with Refuge responsibility for restoration of brook trout habitat in Whittlesey Creek. Within two years, develop and implement new criteria for prioritizing and integrating all habitat restoration activities, emphasizing use of the Sediment Impact Analysis Methods (SIAM) (U.S. Army Corps of Engineers [USACE], 2010) and Soil and Water Assessment Tool (SWAT) models (Lenz et al., 2003) to maximize long-term brook trout benefits.

Strategies:

- Regularly work with implementation team to evaluate the reintroduction project and determine if the Refuge efforts are meeting the habitat restoration needs for coaster brook trout.
- Participate in meetings of brook trout interagency team to evaluate progress of the restoration program including discussions of possible population assessment alternatives.
- Support Ashland Fish and Wildlife Conservation Office's (FWCO) brook trout monitoring program in the watershed.

Rationale:
The importance of brook trout habitat enhancement, restoration and protection is well recognized. Coaster brook trout is an FWS Region 3 Species of Concern (http://www.fws.gov/midwest/es/soc/), and brook trout populations within the Great Lakes basin and inland waters are a Region 3 resource conservation priority (FWS, 2002). Brook trout is a surrogate species for riverine and riparian habitats in the Upper Midwest Great Lakes geography (FWS, 2014), and a focal species for the Lake Superior Landscape Restoration Partnership (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/az/home/?cid=stelprdb1247205).

The interagency Whittlesey Creek coaster brook trout restoration experiment is the only Wisconsin project that combines stocking, protective regulations, habitat restoration, and monitoring to gage success, therefore it is intended to serve as a model for other streams in the future. Through on-going dialogue with Ashland FWCO and by participating in interagency team meetings, the Refuge's habitat restoration efforts can address the brook trout project's priority needs and support the monitoring program.

The Refuge's habitat program is almost entirely focused on the Whittlesey Creek watershed. Others who are involved have responsibilities across a much larger area. The Refuge has successfully taken the lead to secure funding and implement numerous enhancement, restoration, and protection efforts in the watershed. Long-term relationships with project partners, landowners, and local officials have fostered necessary trust.

Support for the Refuge, habitat restoration, and the coaster brook trout experiment through funding, in-kind contributions, and various types of assistance has come from diverse sources including:

- Wisconsin Department of Natural Resources
- Trout Unlimited
- Volunteers
- Cooperating landowners
- U.S. Forest Service
- National Park Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- Great Lakes Restoration Initiative
- U.S. Geological Survey
- Town of Barksdale
- Bayfield County Land and Water Conservation Department

- U.S. Department of Agriculture – Natural Resources Conservation Service
- Fish America Foundation
- American Sportfishing Association
- National Fish and Wildlife Foundation – Sustain Our Great Lakes Grant Program
- Northland College
- Northern Great Lakes Visitor Center
- Conservation Corps Minnesota and Iowa
- Wisconsin Department of Agriculture, Trade and Consumer Protection
- Ducks Unlimited
- American Land Conservancy

Partner support will continue, and is expected to expand.

Objective 1-2: Migratory Birds

Continue to provide benefits to migratory birds through restoration of forests, wetlands, and floodplains on the Refuge and in the watershed.

Strategies:

- Restore forest blocks in conjunction with riparian restoration projects.
- Restore historic conifer community.
- Develop and conduct scientifically valid bird monitoring to answer specific management questions.
- Evaluate and, if warranted, limit human disturbance at the mouth of Whittlesey Creek. Consider migratory birds when making decisions, especially in light of our concern for disturbance at the mouth of the creek as well as potential for piping plover habitat along the shore of Chequamegon Bay.

Rationale:
Although the Refuge is relatively small, it is located in an important area for migratory birds at the south shore of Chequamegon Bay. The Bay is an important migratory bird stopover site for many species of waterfowl and shorebirds. The mouth of Whittlesey Creek is also heavily used by shorebirds, gulls, bald eagles, and waterfowl. It is also used by a small wintering population of black ducks.

Our goal is to incorporate migratory bird benefits into our habitat restoration strategy for coaster brook trout, a major priority for the Refuge. When feasible and cost effective, small changes or additions to habitat restoration projects can also provide additional benefits for other species. Restoration of forest blocks will be conducted in conjunction with riparian work to increase block size. Riparian work will also benefit bird species of concern associated with the Refuge including northern waterthrush, veery, black duck, and sora rail.

Bird monitoring would be valuable but not a high priority for expected staff resources and funding over the next 15 years. The Refuge will consider implementing surveys that provide useful data and that can be conducted by volunteers or college students at little cost to the Refuge. Whittlesey Creek NWR provides migratory bird benefits, but it is not a major contributor to overall populations.

HABITAT

Goal 2: Preserve, restore, and enhance the native habitats of Whittlesey Creek and its watershed.

Objective 2-1: In-Stream

Work toward long-term restoration (30+ years) of high quality in-stream habitat as defined in the HMP (cover, roughness, pools, gravel, fish passage) in Whittlesey, Little Whittlesey, and Terwilliger Creeks. Within 10 years, install approximately 500 additional logs on lower Whittlesey Creek and the North Fork to restore large woody debris to two miles of stream. Within 10 years, begin adding logs to Little Whittlesey and Terwilliger Creeks. Within two years, complete a comprehensive culvert survey to document locations and deficiencies. Utilize the information to rank culvert replacements to reduce erosion and sedimentation and restore fish passage on all three creeks. Prioritize additional in-stream restoration activities and locations within two years (see Objective 1-1).

Strategies:

- Continue to use and improve current methods of logjam and culvert design and installation.
- Continue to collaborate with Bayfield County Land and Water Conservation Department (LWCD), Natural Resources Conservation Service (NRCS), U.S. Forest Service (USFS), Town of Barksdale, Northland College, Youth Conservation Corps (YCC) participants and other partners to complete and evaluate restoration projects.
- Remove beaver dams at upper end of the North Fork to reestablish a free-flowing coldwater system.
- Review road and bridge infrastructure needs; work with local governments.
- Replace the bridge on Wickstrom Road within one year.
- Work with local government units to replace other deficient bridges along Whittlesey and Little Whittlesey Creeks.
- Consider Little Whittlesey and Terwilliger Creeks when determining priorities for in-stream habitat restoration.
- Document via GIS all in-stream structures, restorations, and infrastructure such as culverts and bridges in the watershed.

Rationale:
Since European settlement, land use changes such as logging, agriculture, and development of transportation networks have increased erosion, sedimentation, and flash flooding in Whittlesey, Little Whittlesey, and Terwilliger Creeks. These factors have degraded the suitability of in-stream habitat for many aquatic organisms including fish. Brook trout are especially susceptible to habitat degradation since they thrive in cold, clear streams with abundant woody cover. Culverts and bridges that are poorly designed and installed can have additional negative impacts by impeding fish passage, thereby reducing access to feeding, spawning, and nursery habitat.

Because of the logging and agricultural history of riparian areas, few large trees are naturally recruited, especially in the downstream reaches. Strategically adding logs to the stream channels can provide benefits including reducing flood power and erosion; providing cover for fish and substrate for aquatic macroinvertebrates; enhancing channel complexity by creating riffles and pools; and transporting sediment through the system. The SIAM model helps guide restoration design and focuses efforts and funding on the most feasible projects that have the greatest chance of producing long-term benefits. The SIAM and SWAT models should be rerun periodically as restorations alter conditions in the system, inputs such as land cover, precipitation, and flow change; and as new tools such as spatial and elevation (LIDAR – Light Detection and Ranging) and data become available. Utilize new and improved models as they are developed.

Visually inspecting and monitoring restoration projects facilitates modifying engineering, design and installation of large woody debris, culverts, and bridges in order to achieve habitat management objectives. Documenting existing infrastructure allows ranking of retrofit or replacement projects based on severity of deficiencies. Continuing and expanding existing partnerships provides access to diverse expertise, knowledge of the latest efficient and effective techniques, and enhances collaborative funding opportunities.

Objective 2-2: Watershed

Over the long-term (30+ years), reduce upland erosion and slow overland water flow to historic levels in the Whittlesey Creek watershed. Within one year, develop priority criteria for easement acquisition and private lands projects (see Objective 1-1). Within three years, develop and implement new watershed protection tools—including buffer strips and riparian easements—with NRCS, USFS, private landowners, and other partners.

Strategies:

- Work with the USFS, NRCS, Wisconsin Department of Natural Resources (WDNR), Bayfield County LWCD and others to develop a more comprehensive watershed-based partnership, engaging in the existing Western Lake Superior basin's Lake Superior Landscape Restoration Partnership. Collectively secure funding to implement high-priority projects. Expand partnerships with local governments and landowners.
- Work on habitat restoration projects in the defined groundwater recharge area, which includes land located outside of the topographically delineated watershed.
- Continue to acquire easements from willing watershed landowners focusing on lands in the lower part of the watershed to protect the riparian zone along the creek, especially those areas with springs that contribute to base flow.
- Enhance and restore habitat on Service easements.
- Continue to assist landowners with habitat improvements on their property through the FWS Partners for Fish and Wildlife Program and other funding sources. In the case of competing priorities, use data from the SWAT model to determine the most cost-effective projects to fund.
- Partner with NRCS and LWCD for farm program implementation in the watershed and recharge area.

Rationale:
Facilitating surface water infiltration and controlling erosion within the upstream watershed are crucial to successful restoration of downstream fish and wildlife habitat on Refuge lands. Habitat projects such as reforestation and wetland restoration as well as farm conservation efforts including improved cropping practices, grade stabilization, and installation of detention basins are among the techniques typically utilized. Easements, buffers, and setbacks that regulate land use along bluff tops and in the riparian zone can reduce bank and bluff failures and the resultant erosion and sedimentation while protecting coldwater springs that contribute to watershed base flow.

Partners are critical to watershed health since they can provide, for example, complementary expertise, resources including funding, and access to property. Assistance is often directed toward specific types of practices within board categories, and this changes over time. NRCS and LWCD typically assist with habitat and farm conservation projects. FWS, USFS, and WDNR generally only provide habitat restoration assistance. FWS can also purchase permanent conservation easements within the Whittlesey Creek watershed. It would be beneficial to formally organize those who have a stake in watershed protection, conservation, enhancement and restoration initiatives. The group should include landowners and non-governmental organizations. Potential projects should be collectively identified, ranked, and implemented by way of appropriate funding sources. A formal partnership with USFS is especially important since they own much of the watershed's land base, including a large part of the groundwater recharge area; and therefore they are critical to engage for a more comprehensive look at the watershed, its management, and restoration.

Objective 2-3: Floodplain and Coastal Wetland

Work toward long-term restoration (30+years) of floodplain function and native plant composition on Refuge lands. Within 10 years, plant native trees on all former agricultural fields and on stream banks subject to erosion. Within two years, determine highest-priority actions, locations, and timeline for restoration of coastal wetlands and sedge meadows (see Objective 1-1).

Strategies:

- Continue to use and improve current tree planting methods described in "Habitat Restoration and Management," located in section 3.6 Refuge Programs. Annual deer repellent application on browse-susceptible species is critical until growth exceeds browse height.
- Conduct targeted control of priority invasive plants during restoration projects.
- Work with partners using best available science to determine priorities.
- Build landowner support for future floodplain reconnection and restoration of stream meanders.
- Continue to acquire land within the approved Refuge boundary from willing sellers.
- Complete high priority habitat restoration projects including planting trees on remaining open fields on the Refuge, complete removal of soil piles on the golf course site, remove invasive trees from floodplain and riparian sites. Complete riparian restoration work along Whittlesey, Little Whittlesey, and Terwilliger Creeks.

- Complete seasonal wetland basin restoration by installing scrapes in the floodplain based on soils and location of historic seasonal basins.
- Consider these strategies in the overall prioritization of activities for the watershed restoration efforts.

Rationale:
Floodplain and coastal wetland habitat types provide valuable ecosystem functions by storing and slowly releasing floodwaters, promoting infiltration and groundwater recharge, assimilating nutrients, filtering sediment, and dissipating wave energy. The complex plant communities, influenced by fluctuating water levels, are utilized by diverse suites of species. The Refuge fee-title acquisition area is largely comprised of floodplain and coastal wetland habitats that have been altered to varying degrees. Logging, draining, land forming, farming, and stream channel straightening have degraded their function by altering hydrology and reducing species richness.

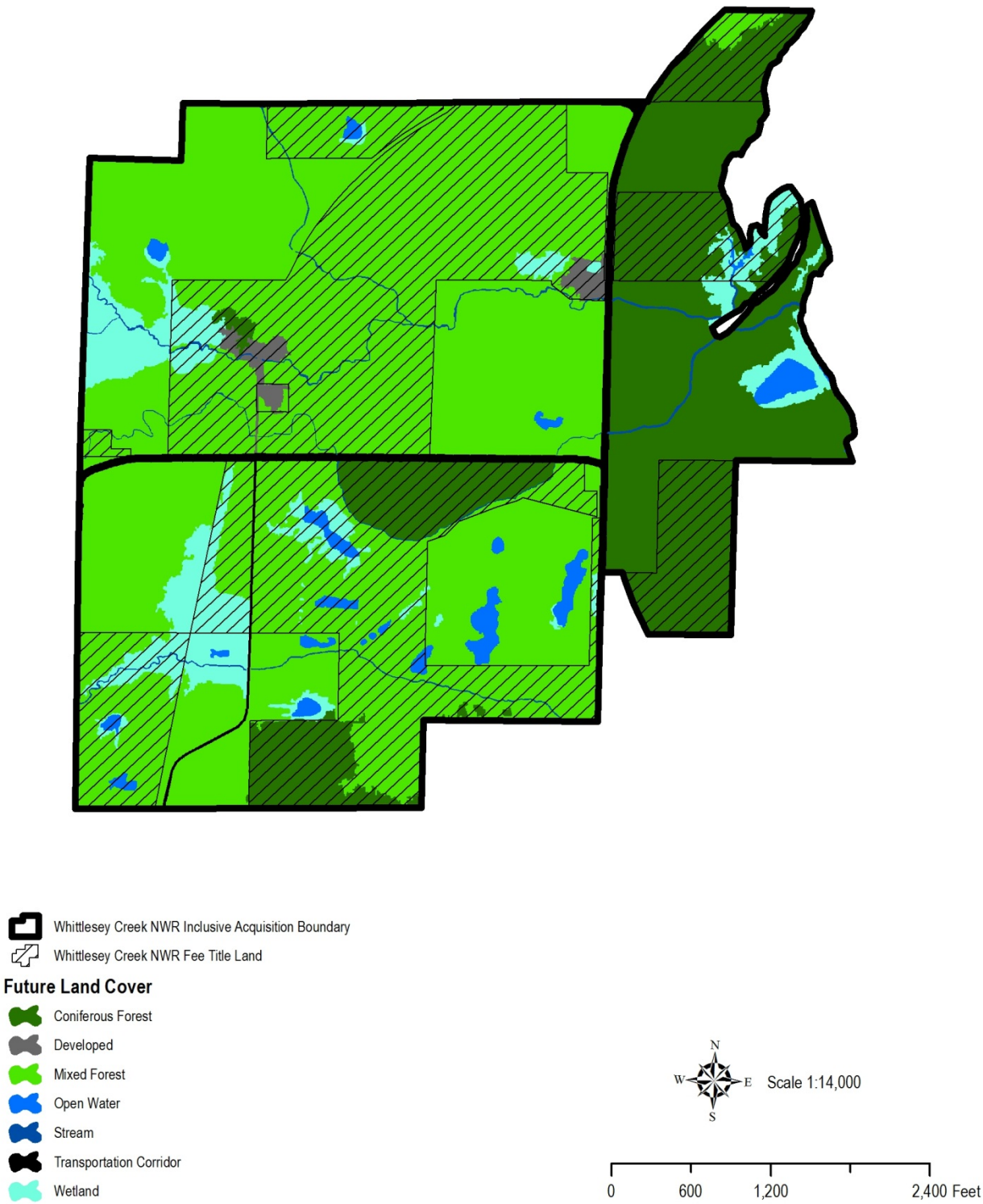
Wetland hydrology will continue to be restored by utilizing aerial imagery, evaluating soil characteristics, and ground-truthing to map drainage networks and basins. This assists with prioritizing restoration that focuses on plugging ditches and scraping seasonal basins prior to planting trees. Existing sedge meadows and moist meadow habitat will be maintained by cutting or burning encroaching brush.

Overbank sediment deposition, channel straightening, and channel incision have affected floodplain hydrology by making it more difficult for flood flows to overtop the stream banks. Floodplain reconnection by bank shaping and restoring meanders can reduce flood power and enhance floodplain function. A great deal of planning will be needed to successfully initiate floodplain reconnection and restore meanders due to mixed public-private land ownership and the existing infrastructure such as buildings, roads, culverts, and bridges. Current log installations are designed to produce sinuosity in the existing straightened channel, generating some of the benefits of meanders on a much smaller scale.

Successful forest restoration techniques continue to be used but will be modified as needed. The Refuge partners with USFS and others to expand tree planting, invasive species control, and deer repellant application and to reduce costs. Invasive plants impact native plant diversity and habitat utilization, and their competition can limit reforestation success. Therefore, priority invasives including buckthorn, box elder, and crack willow (*Salix fragilis*) will be suppressed and controlled. Cut-stump glyphosate treatment is effective for buckthorn and box elder control, minimizes herbicide use, and is a targeted application technique that reduces impacts to non-target organisms. Limited late-season foliar glyphosate treatment may be used on dense stands of buckthorn seedlings. Crack willow was planted along stream banks decades ago. These large trees are girdled and treated with glyphosate, an effective technique that also limits herbicide use. Treatment creates canopy gaps for seedlings planted underneath, provides habitat for cavity nesting birds, and contributes woody debris to the stream (Figure 4-1).

Reed canarygrass can be extremely competitive and is costly to effectively suppress or control. Trees and shrubs have been successfully established in dense reed canarygrass, ultimately providing suppression by shading. As resources allow, reed canarygrass will be suppressed by burning prior to tree planting. Restoring hydric soil conditions can control reed canarygrass and promote hydrophytic plant species such as sedges. Monitoring for purple loosestrife infestations is ongoing, with beetles (*Galerucella spp.)* introduced as needed to limit the spread and provide control of this aggressive invasive plant. Once controlled, native wetland plants quickly recolonize affected the site.

Figure 4-1: Desired Future Land Cover



Objective 2-4: Climate Change

Prioritize and integrate all restoration actions using best available science to increase ecosystem resilience and achieve long-term habitat and wildlife benefits in the face of a changing climate.

Strategies:

- Incorporate the latest information from the Wisconsin Initiative on Climate Change Impacts (WICCI) into all planning efforts.
- Utilize the latest brook trout range map models that project decline with increasing temperature over time.
- Develop a working partnership with climate change scientists at WICCI to understand actions the Refuge can take to increase ecosystem resilience on a local scale in the Whittlesey Creek watershed.
- Continue to restore habitat in Whittlesey Creek to increase the quality of coaster brook trout habitat and mitigate for the negative impacts of climate change.

Rationale:
Early climate change models predict a substantial reduction in brook trout throughout their range as temperature increases. Wisconsin may lose up to 98 percent of its brook trout habitat with a 5.5 °F (3 °C) rise in temperature. Bayfield County streams, especially Whittlesey Creek, are expected to retain suitable coldwater brook trout habitat. Additionally, watershed vegetation may change dramatically by the end of the century: boreal forest and wetland species currently at the southern edge of their natural range in northern Wisconsin could be lost altogether here; hardwood forest species are expected to expand in Wisconsin; and increasingly we will be faced with managing system transformations and may need to focus on sustaining ecological functions rather than historical assemblages of plants and animals.

Habitat enhancement, restoration, and protection efforts that are underway and being pursued on the Refuge and in the watershed are consistent with numerous plans and reports including WICCI's observations and recommendations. The WICCI indicates, "In streams that may show resilience to climate change impacts, stream habitat may be managed to create and enhance refugia from high water temperatures. For example, stream channels can be narrowed and deepened, overhead cover can be added, and deep pools can be created to provide coldwater refugia in those streams receiving sufficient groundwater input. Riparian areas can also be managed to provide shading by tall grasses or trees." Additionally, sound land management practices in a watershed, such as conservation tillage and the enrollment of environmentally sensitive land into the Conservation Reserve Program, can be used to protect the biological integrity of coldwater streams and enhance their resiliency to climate change impacts. It will be critical to continue using the latest scientific information, monitoring, management techniques, programs, and partnerships to minimize the effects of climate change.

The Whittlesey Creek watershed may prove to be an important site for testing a long-term, multi-faceted approach to reintroducing brook trout. This information could provide valuable insights for additional brook trout management efforts.

Objective 2-5: Biological Monitoring

Within three years, develop and implement a prioritized habitat and wildlife monitoring plan for Whittlesey Creek NWR. Focus on key habitat metrics that determine the success of restoration projects, and key wildlife species to verify a response to restored habitat.

Strategies:

- Complete the Inventory and Monitoring Plan for the Refuge.
- Integrate Refuge monitoring with other agency efforts in the watershed (partnerships).
- Continue to assist with Ashland FWCO electrofishing in support of the brook trout experiment.
- Continue student research and monitoring programs that contribute to Refuge objectives.
- Continue in-stream habitat restoration monitoring.
- Continue to monitor post- habitat restoration fish and aquatic macroinvertebrate populations.
- Continue to pay for gaging station in partnership with USGS, Ashland FWCO, and Bayfield County LWCD.
- Continue limited migratory bird monitoring when volunteer resources are available.
- Add new data to SWAT model and rerun every five years.
- Follow adaptive management principles, evaluating restoration work and fish survey results, to assess the effectiveness of the Coaster Brook Trout Restoration experiment.

Rationale:
Monitoring of wildlife and habitat accomplishes several purposes: it allows for evaluation of current land use and management practices, it can provide early warning of problems in the system, and it provides the foundation for future management decisions. Service policy on refuges (chapter 701 FW 2) states that we must (1) collect baseline information on plants, fish, and wildlife, (2) monitor, as resources permit, critical parameters and trends of selected species and species groups on and around Service units, and (3) base management on biologically and statistically sound data derived from such inventory and monitoring. Monitoring at Whittlesey Creek NWR will be directed at complementing the Service's overall efforts to reintroduce coaster brook trout into the watershed. Due to limited budget and personnel, we must strategically allocate resources to address the highest priority needs. Assessing questions that have the greatest impact on management decisions will be the highest priority.

A general description of monitoring for the Refuge was outlined in the HMP to provide guidance until the Inventory and Monitoring Plan (IMP) was completed. The IMP will be completed during 2015 following guidance in Service Manual chapter 701 FW 2. The general direction of monitoring will focus on stream hydrology and habitat, fish populations, and terrestrial invasive species. Student and volunteer involvement in research and monitoring on the Refuge has been critical to our success. It is important to coordinate these activities closely so that good quality data is collected, analyzed, and utilized when making management decisions.

The Refuge also funds a portion of the operation and maintenance costs of the USGS gaging station on Whittlesey Creek. This station is critical to understanding the hydrology of the creek. The data from the gaging station are also used in the Sediment Impact Analysis Methods model to help the Refuge make decisions about restoration projects on the creek and to provide input for project engineering and design.

PEOPLE

Goal 3: Provide a diverse audience with opportunities to experience high quality, wildlife-dependent activities and to understand and appreciate a natural functioning landscape.

Objective 3-1: Northern Great Lake Visitor Center Partnership

Continue the current level of involvement in the Northern Great Lakes Visitor Center (NGLVC, Visitor Center, Center) partnership. Within five years, develop a Memorandum of Understanding with the USFS that clarifies roles and responsibilities.

Strategies:

- Maintain on-site office for Refuge staff and contact point for Refuge visitors.
- Refuge manager continues to serve on NGLVC Board of Directors.
- Participate in NGLVC events that meet Refuge purposes and the National Wildlife Refuge System (NWRS, Refuge System) mission.
- Coordinate educational/interpretive programming with NGLVC programs.
- Maintain Refuge exhibit in the NGLVC.

Rationale:
The Refuge's participation in the NGLVC partnership is an efficient use of funds to allow the Refuge access to over 120,000 visitors each year as well as a high quality facility for the Visitor Services program. The Center is strategically located on the south shore of Lake Superior along the main east-west highway that connects northern Minnesota to northern Michigan through Wisconsin. The partnership is a cost-effective arrangement that allows the Service access to classrooms, exhibit space, and a trail system and a closer relationship with other federal and state agencies. The cost for a comparable facility would be much greater for the Service if housed alone. Through the Refuge exhibit and Refuge programs, visitors have the opportunity to learn about the Service.

The NGLVC is coordinated through a Board of Directors with one representative from each of the agencies and non-profits at the Center (USFS, National Park Service, FWS, University of Wisconsin Extension, Wisconsin Historical Society, and the Friends of the Center Alliance, LTD). The Board of Directors sets the general budget for the Center operations as well as coordinates some of the partnership direction for the Center.

Each agency and organization retains its individual identity, although some are more intricately tied to the operation of the Center than the Service. With the Refuge's location next to the Center, the FWS has a responsibility to complete Refuge projects that may not always relate to the mission of the Center. Where overlap exists, the Refuge plays an important role as a partner at the Center.

Objective 3-2: Welcome and Orient Visitors

Provide a welcoming, safe, accessible experience for Refuge visitors.

Strategies:

- Quarterly review and update the Refuge website to provide clear and current information about Refuge management, natural history, and visitor activities.
- Ensure that entrance and directional signs are in good condition and meet Service standards.
- Maintain existing kiosk and parking area on the Refuge.
- Provide and maintain publications that are clear and accurate and meet Service publication standards. Evaluate the best cost-effective solution for providing information to the public when they visit the Refuge. Revise the general Refuge information brochure or provide a better information source.
- Ensure that all facilities are accessible according to the standards of the Americans with Disabilities Act.
- Continue to work with the NGLVC partnership to ensure that visitors are welcomed, and understand the role of the Refuge as one of many partners at the Visitor Center.

Rationale:
Welcoming and orienting Refuge visitors contributes to a quality wildlife-dependent recreation program as identified in the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and defined in the Service Manual (chapter 605 FW 1). The ease with which the public can understand where they can go, what they can do, and how they can ethically engage in wildlife-related activities increases visitor satisfaction and creates a positive impression of the Service and an appreciation of the mission and goals of the agency.

The needs and satisfaction of visitors are known only from chance conversations with Refuge users. While Refuge-specific visitor surveys would provide better information for improving visitor opportunities, the procedures used to conduct proper visitor surveys are time consuming and costly. Therefore, basic data will continue to be obtained within the constraints of limited Refuge resources.

With the small size of several tracts of Refuge lands, the focus will be to ensure that all lands are correctly posted to avoid unintentional trespass on adjacent private lands.

Objective 3-3: Environmental Education and Interpretation

Provide Refuge-specific environmental education and interpretive programming for at least 1,000 students and 500 visitors per year. Emphasize curriculum-based environmental education packages and multiple visits by students that include hands-on outdoor experiences. At least 90 percent of teachers will report that Refuge environmental education programs support their curriculum and help to promote resource stewardship and conservation.

Strategies:

- Continue the River of Words program with fourth-grade students in the Washburn School District.

- Educate and mentor Northland College and YCC participants.
- Increase collaboration with Ashland FWCO to develop and deliver environmental education and interpretive programming.
- Expand themes to include watershed/trout connection.
- Increase use of the Coaster Classroom through partnerships with local agencies, colleges, or universities.
- Hire a park ranger or visitor services specialist to replace the position held vacant since 2011.

Rationale:
Environmental education and interpretation are both priority wildlife-dependent recreational activities, which are listed in the Improvement Act. The Refuge had an active environmental education and interpretation program until the park ranger position was held vacant for regional savings in 2011. The ability of the Refuge to capitalize on the NGLVC partnership is tied to the ability to re-hire the park ranger position. Many of the strategies can only be implemented once the vacant park ranger position is filled.

The vision for the Refuge's environmental education and interpretation program is to focus on Refuge-specific messages and where possible, partner with other agencies at the NGLVC to provide high quality programming in the natural resources field. The Refuge's approach to environmental education and interpretation has been to collaborate with other agencies at the Center when there is a clear connection to Refuge goals and objectives. Each agency at the NGLVC partnership has a different mandate and set of interpretive and educational priorities for programming at the Center. Some partner agencies are very dependent on grant funding, which can direct priorities. One value of the partnership is that between all of the agencies and organizations there are programs to address a wide variety of public interests. Through co-location, individuals who attend a program may learn about another offering, increasing the chance that they will attend a program hosted by another agency. Centralized promotion of programs by the partnership is a cost-effective method of encouraging participation in events.

Refuge programs are targeted to local schools, especially the fourth through sixth grades, with curriculum based programs like the River of Words. Environmental education and interpretation can advance awareness, understanding, and appreciation of conservation issues and the role of the Refuge and the Service in protecting and restoring fish, wildlife, and habitat.

The Refuge also participates in special events at the Center that have a tie to the Service mission. The Service is a partner in the Chequamegon Bay Birding and Nature Festival, for example, hosting several programs on the Refuge as well as providing staff for tours.

The Refuge also works closely with local high schools and colleges to provide mentorship and employment opportunities. These opportunities are coordinated by the Refuge biologist who incorporates classes and volunteers into biological projects on the Refuge.

Objective 3-4: Hunting and Fishing

Provide the public with safe and enjoyable hunting and fishing opportunities that minimize conflict with other compatible public uses and are consistent with sound fish and wildlife management practices.

Strategies:

- Continue current waterfowl and archery deer hunts on the Refuge.
- As additional land is acquired, reevaluate the areas that are open to hunting.
- Open the Refuge to fishing in accordance with state regulations.
- Evaluate each new acquisition to determine if it meets the criteria (>20 acre block size) for opening it to hunting. If so, complete opening package for new lands.
- Update website with current hunting regulations.

Rationale:
Hunting and fishing are two of the six wildlife-dependent recreational uses that receive priority consideration in Refuge planning and management under the Improvement Act. Hunting and fishing can instill a unique understanding and appreciation of fish and wildlife, their behavior, and their habitat needs. Well-managed hunting and fishing programs provide traditional outdoor activities for the public with negligible adverse impacts to the biological integrity of the Refuge.

Due to the small size of the Refuge, areas open to hunting will be evaluated after any new land acquisition. The goal will be to open deer hunting on the largest blocks of Refuge land to minimize potential impacts on neighboring lands through trespass. In general, we will look for minimum blocks of 20 acres in order to open it to hunting.

In an effort to eliminate confusion with the fishing regulations, the Refuge is proposing to align Refuge regulations with state regulations by opening the Refuge to fishing. Refuge regulations currently do not allow fishing, but according to state law, individuals may walk in the creek and legally fish. The Refuge was involved in the overall planning for the restoration of coaster brook trout when the state of Wisconsin established catch and release regulations for Whittlesey Creek. By aligning Refuge regulations through Title 50 Code of Federal Regulations, Wildlife and Fisheries with state regulations, we hope to minimize confusion for the visiting public.

Objective 3-5: Wildlife Observation and Photography

Continue to provide year-round opportunities for visitors to safely observe and photograph wildlife on the Refuge.

Strategies:

- Provide a new accessible foot trail from the NGLVC to the Coaster Classroom; coordinate the off-Refuge segment with NGLVC partners.
- Allow year round off-trail access on foot throughout the Refuge, including snowshoeing and cross-country skiing in the winter. The Refuge reserves the right to close specific units throughout the year for management or safety purposes.
- Evaluate the feasibility of providing an accessible foot and biking trail along the old railroad right-of-way through the Refuge.

Rationale:
Wildlife observation and photography are priority wildlife-dependent recreation activities listed in the Improvement Act. They are popular and important activities that promote understanding and

appreciation of natural resources and their management. If properly managed, these uses provide valuable opportunities for interaction between people and the natural environment with little or no detrimental effect to wildlife or habitat. Good wildlife viewing opportunities are available along town roads that pass through the Refuge. Developing and maintaining trails and overlooks can enhance access to locations that offer premium wildlife viewing opportunities.

Any trail and overlook proposals need to consider the important resources at the Refuge, especially the creeks and adjacent riparian zones. Trails should not create impacts in these areas that may result in increased erosion, sedimentation, or destruction of wetland resources. Due to potential impacts to migratory birds, an observation deck at the mouth of Whittlesey Creek was dropped from consideration. Although this is an excellent viewing area for many species of birds, we do not want to create additional disturbance at this important stopover, feeding, and wintering site. Numerous gulls, eagles, and waterfowl gather here to take advantage of the outflow of Whittlesey Creek. The beaches also provide migratory habitat for many species of shorebirds. Because of the importance of this site to migratory birds, we determined that minimal disturbance at this site would be in line with the purposes of the Refuge.

The existing railroad right-of-way (ROW) is currently used as a snowmobile trail during the winter season pursuant to existing easements held by the county. Recently there was a proposal to develop a hiking and biking trail along the ROW that would also require approval from many other landowners along the proposed trail system. The Refuge is opposed to any additional motorized uses of the railroad ROW including ATV use. Certain non-motorized uses such as hiking and biking may provide enhanced wildlife observation opportunities along the corridor. Ownership along the railroad ROW will need to be clarified before evaluating any trail proposal.

Objective 3-6: Outreach

Throughout the life of the plan, increase local community support and appreciation for the role of the Service and the Refuge in fish and wildlife conservation.

Strategies:

- Develop a message that relays the important role Whittlesey Creek NWR plays in conservation, and include it in all visitor services activities.
- Coordinate with other FWS stations and partners to expand outreach through local news media. Provide news releases, television/radio spots, interviews, newsletter articles, etc. a minimum of three times per year.
- Maintain regular contact with community leaders and organizations through tours, meetings, presentations, and events.
- Increase opportunities to interact with and listen to local residents and landowners.
- Maintain Facebook page once park ranger position is filled.

Rationale:
It is important to the success of Whittlesey Creek NWR that people, organizations, and agencies in the area know about the Service and the Refuge and support it as a valuable part of the community. Building support for land and water conservation among Refuge neighbors is essential to protect natural resources over the long-term. Outreach can foster a sense of

ownership in the greater community and contribute to achievement of Whittlesey Creek NWR purposes and the Refuge System mission. Effective outreach depends on open and continuing communication and collaboration between the Refuge and the public.

The NGLVC partnership presents a unique and cost-effective opportunity for the Service to work with other federal and state agencies to coordinate outreach efforts. In addition to Refuge specific social media tools like the website or Facebook, partner agencies also host a NGLVC website and Facebook page. Outreach needs to consider the balance between the needs of the partnership and the need to maintain the identity of the Refuge and its mission. The Refuge will also target much of our outreach effort to the landowners in the Whittlesey Creek watershed and the adjacent recharge area. Efforts to restore coaster brook trout and accomplish Refuge purposes are directly tied to landowners in these important areas.

Objective 3-7: Volunteers Programs and Community Partnerships

Throughout the life of the plan, work with local communities and organizations to generate support for the Refuge resulting in at least 500 volunteer hours annually.

Strategies:

- Recruit, orient, and train volunteers to assist with a variety of projects including visitor services programs, habitat restoration, biological programs, and maintenance tasks.
- Engage volunteers to monitor various suites of bird species such as raptors and shorebirds if the data is valuable for refuge, regional, or national monitoring efforts.
- Maintain mutually beneficial partnership opportunities with Northland College.
- Examine potential of working with existing non-profit conservation organizations to take a larger role in supporting the Refuge. There are no plans to develop a formal Friends group for the Refuge, but several groups with closely aligned missions may be interested in formalizing a partnership with the Refuge.

Rationale:
The Service recognizes the value of time and expertise contributed by individuals and groups. Volunteers help the Service achieve agency goals. An effective volunteer program: (1) provides people with opportunities to assist in the accomplishment of the Refuge System mission; (2) enhances our performance through the creativity, innovations, labor, and expertise contributed by volunteers; (3) provides opportunities for students and others to gain experience in areas of interest for future careers; and (4) encourages stewardship of wild lands, wildlife, and other natural and cultural resources through public participation in Service programs. Whether through volunteers or other important partnerships in the community, Refuge staff seeks to make Whittlesey Creek NWR an integral part of the community.

The volunteer program at the Refuge will be a combination of Refuge-specific volunteers and volunteers through the NGLVC partnership who may volunteer for multiple agencies at the Center. An important part of the Refuge's volunteer program will be coordination with the other agencies to implement an efficient program and provide clearly defined supervisory responsibilities. Numerous volunteers are recruited through other agencies and their respective programs but at the Center volunteers often work with staff from multiple agencies. Constant communication of needs and opportunities with the Center's volunteer coordinator is crucial to the success of the program.

The biologist at the Refuge also maintains a working relationship with local colleges and professors. Numerous student volunteers work directly with Refuge staff on small research or habitat restoration projects. This program also provides a mentoring opportunity to the students.

There are no plans to develop a Friends group for the Refuge. There is a Friends of the Center Alliance, (FOCAL) at the NGLVC that focuses efforts on raising funds for Center operations. There are a large number of Friends groups and other non-profit organizations in the local area but only a small number of individuals that are involved in many of them. Competition for limited local funds and grants is a constant challenge for these groups. The FOCAL group has served as a fiscal agent for Refuge projects in the past and is a valued partner to the Refuge.

Objective 3-8: Law Enforcement

Visitors feel safe and resources are protected on Service lands.

Strategies:

- Post and maintain Refuge boundaries.
- Annually inspect each FSA and Service easement, and follow up with landowner contact.
- Ensure that all easement files meet requirements identified in the Service Easement Manual.
- Continue to work with Service zone Law Enforcement Officer, WDNR officers, and local authorities to address enforcement concerns and violations.

Rationale:
The Service recognizes the value of providing a safe environment for all Refuge visitors and staff. The Refuge relies on coverage from the zone officer located in Necedah, WI, over three hours from Whittlesey Creek NWR. Therefore, it is important that the Service work closely with local officials, especially the Bayfield County Sheriff's Office to address any immediate enforcement concerns. The zone officer coordinates any follow-up investigations or support for the Refuge.

Chapter 5: Plan Implementation

In this chapter:

5-1 Introduction
5-2 Funding and Staffing
5-3 Priorities
5-4 Partnership Opportunities
5-5 Plan Review and Revision

5.1 Introduction

This chapter summarizes the actions, funding, coordination, and monitoring needed to implement the Comprehensive Conservation Plan (CCP). As noted in the inside cover of this document, this plan does not constitute a commitment for staffing increases or operational and maintenance increases. These decisions are at the discretion of Congress in overall appropriations and in budget allocation decisions made at the Washington and regional levels of the U.S. Fish and Wildlife Service (FWS, Service).

5.2 Funding and Staffing

This CCP outlines an ambitious course of action for the future management of Whittlesey Creek National Wildlife Refuge (NWR, Refuge). The ability to meet objectives for wildlife, habitat, and people will require a significant commitment of staff and funding from the Service. The Refuge will continually need appropriate operational and maintenance funding to implement this plan.

A park ranger (currently vacant) and a Service biologist are stationed at the Refuge at an office in the Northern Great Lakes Visitor Center (NGLVC, Visitor Center, Center). Management, maintenance, and administrative support are coordinated from the St. Croix Wetland Management District (WMD) office in New Richmond, WI approximately 160 miles away. Both the ranger and biologist positions will be needed for full implementation of this CCP.

5.3 Priorities

In the National Wildlife Refuge Improvement Act of 1997, Congress established a three-tiered hierarchy, or three priorities for Refuge management. As a first priority, every refuge is to be managed to fulfill its purposes and the National Wildlife Refuge System mission, namely conservation of fish, wildlife, and plants. Secondly, refuges are to facilitate wildlife-dependent or “Big 6” public uses, namely hunting, fishing, wildlife observation and photography, and interpretation and environmental education. Of lowest priority is managing other uses and activities such as general recreation.

However, setting priorities based on this list may not be realistic given the complexities of managing a national wildlife refuge. Below are some reasons why certain actions may be completed before others in this plan.

- Staffing levels and expertise at the Refuge determine the types of activities that may take place each year. The region has held the park ranger position vacant on the Refuge since 2011 for workforce planning salary savings. Unless the position is filled, the

Refuge will not be able to undertake many of the strategies identified for environmental education and interpretation. Refuge participation in special events at the visitor center will also be reduced due to lack of staff. Many of the objectives and strategies assume a best case staffing and funding scenario. Due to the annual variation in funding levels as well as long-term workforce planning, strategies and objectives will be prioritized through annual work plans that are developed based on funding levels.

- Many of the habitat and riparian restoration projects are very expensive, often exceeding the capability of the Refuge to independently fund the project. Successful completion of the project requires a coalition of partners and grant funding sources. Since grants often have specific purposes, the availability of grant resources and partners can often redefine the hierarchy of refuge priorities. We will not “chase” grant funding to complete new projects or start new initiatives, but rather, we will rely on good science and established priorities to make decisions.
- Refuge management is partially dependent on the availability of staff from the St. Croix WMD to assist with administrative and operational support. Priorities at the Refuge need to be considered in conjunction with St. Croix WMD priorities. A high priority in the Whittlesey Creek NWR plan may not be possible without support from St. Croix WMD staff. Therefore decisions will need to be made about the highest priority use of resources at both stations.
- Defined priorities in the plan may change if safety problems or other high priority activities are identified and need to be resolved, thus resulting in a shift in funding that may limit the capacity to complete plan strategies.

In the short term, given the fiscal climate and congressional budgets, our strategy is to maintain the wildlife biologist position at the Refuge, focusing on habitat restoration and, when complementary to our main biological efforts, partnerships with local universities and colleges that provide learning opportunities for students. These learning opportunities will complement some of the strategies identified in Goal 3 (“Provide a diverse audience with opportunities to experience high quality, wildlife-dependent activities and to understand and appreciate a natural functioning landscape”). Although budget levels cannot be predicted from one year to the next, our strategy is eventually to fill the park ranger position at the Refuge to implement many of our visitor services goals.

As part of the plan implementation, various step-down plans are usually identified in the CCP. Several plans including Habitat Management Plan, Public Use Plan, and Hunt Plan have already been completed for the Refuge. At this time, the only remaining step-down plan that will need to be developed is the Inventory and Monitoring Plan, which should be completed within one year after approval of the CCP.

5.4 Partnership Opportunities

Partnerships are an essential element for the successful accomplishment of goals, objectives, and strategies at Whittlesey Creek NWR. The objectives outlined in this CCP need the support and the partnerships of federal, state, and local agencies; non-governmental organizations, and individual citizens. Refuge staff will continue to seek creative partnership opportunities to achieve the vision of the Refuge.

We expect to continue to work with the following notable partners, while also developing new partnerships:

- U.S. Forest Service
- Natural Resources Conservation Service
- National Park Service
- Wisconsin Department of Natural Resources
- Bayfield County
- Town of Barksdale
- City of Ashland
- Northland College
- Trout Unlimited
- Northern Great Lakes Visitor Center

5.5 Plan Review and Revision

The CCP is intended to be a dynamic plan based on the concept of adaptive management. Since the CCP will be a constant reference and guide for Refuge staff, internal review will be continuous. In addition, it is expected that the public and partners will offer continuous feedback. The Service will monitor, evaluate, and document minor plan modifications to determine that changes are needed to achieve Refuge goals and objectives. There will be opportunity for public review and comment before making any substantive amendments or revisions.

Appendix A: Environmental Assessment

In this appendix:

A.1: Purpose and Need for Proposed Action
A.2: Description of Alternatives
A.3: Affected Environment
A.4: Environmental Consequences

A.1 Purpose and Need for Proposed Action

A.1.1 Purpose and Need

The purpose of this Environmental Assessment (EA) is to adopt and implement a Comprehensive Conservation Plan (CCP) for Whittlesey Creek National Wildlife Refuge (NWR, Refuge) as mandated in the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and that the CCP meets the purposes for which the Refuge was established, contributes to the overall mission of the National Wildlife Refuge System (NWRS, Refuge System) and adheres to U.S. Fish and Wildlife Service (FWS, Service) policies and mandates. Refuge purposes and the Refuge System mission are included in chapter 1 of the CCP. Appendix H of the CCP contains a list of key laws, orders, and regulations that provide a framework for the proposed action.

This EA addresses the need to provide guidance for future Refuge management; address significant issues; identify priorities; ensure consistent and integrated management; protect the biological integrity, diversity, and environmental health of the Refuge; evaluate the appropriateness and compatibility of public uses; and meet other requirements of the Improvement Act. The plan is needed to help achieve Refuge goals for wildlife, habitat, and people.

Adequate long-term management direction does not currently exist for the Refuge. A 1998 Interim Comprehensive Management Plan provided a general outline on how the Refuge would be operated until a more detailed plan could be completed. In addition, new threats to wildlife and habitat are emerging, new laws and policies are in place, and new scientific information is available.

A.1.2 Scoping of the Issues

In January 2013, the planning team met to develop a preliminary list of issues, concerns, and opportunities associated with management of the Refuge. A second internal scoping session was held in May 2013 with regional supervisors, biologists, planners, and other program specialists.

In April 2013, staff hosted an open house in Ashland, WI, to inform the public of the planning process and to solicit input on issues of concern. A news release was distributed to area media, informational posters were displayed in the local community, and a notice was sent to more than 600 names on the Refuge mailing list. Written comments were received from 11 stakeholders. Refuge staff also met with numerous partners to explain the importance of the CCP process and to encourage active participation.

A.1.3 Whittlesey Creek NWR Issues, Concerns, and Opportunities

Major issues identified and analyzed as part of the CCP process are summarized below. These issues were critical in framing the various alternatives considered and formed the basis for evaluating environmental effects. Additional detail on these topics can be found in chapters 2 and 3 of the CCP.

Wildlife

Coaster Brook Trout
The coaster brook trout was common prior to European settlement, but numbers soon plummeted due to overharvest and habitat degradation. The 30-year Whittlesey Creek experiment is one of the collaborative efforts begun by conservation partners in the 1990s to reestablish coaster brook trout in the Lake Superior basin. It combines four priority actions: improve habitat, establish protective harvest regulations, stock coaster brook trout, and assess and monitor. The role of the Refuge in the experiment is to restore suitable habitat in the creek and monitor the effects of habitat restoration projects.

A self-sustaining migratory coaster population has not yet been achieved, although numbers have increased, and movement into and out of Whittlesey Creek has been documented. Habitat restoration is incomplete, and the effects of competition from non-native salmonids are not well understood. Because these fish are migratory, conditions outside the local watershed could affect the likelihood of successful coaster reestablishment within Whittlesey Creek.

Migratory Birds
Restoration of forests and wetlands on the Refuge improves habitat for many migratory bird species including songbirds, raptors, waterfowl, and shorebirds. Improved water quality in Whittlesey Creek also benefits Chequamegon Bay, an important downstream staging area for migrating waterfowl.

Some improvements in habitat quality are possible (e.g., forest stand management) but may not be cost effective. Additional population benefits would be minimal because the Refuge is small, so bird-specific management actions have not been a high priority to date. Surveys and monitoring have been sporadic and not always closely tied to habitat restoration activities.

Habitat

Stream, Floodplain, and Watershed Restoration
Habitat protection and restoration are underway in the creek, on Refuge wetlands and floodplain, and within the watershed, although much work remains. Activities in recent years have centered on in-stream habitat and fish passage, especially installation of large woody debris and replacement of culverts. In addition, native conifers have been planted in some riparian zones and floodplain hayfields, and some floodplain wetlands have been restored, mainly by plugging ditches.

Facilitating surface water infiltration and controlling erosion within the upstream watershed are crucial to successful restoration of downstream fish and wildlife habitat on Refuge lands. Several easements have been acquired and conservation actions have been implemented on private lands in the watershed. Continued progress requires strong partnerships with landowners, other agencies, and conservation organizations.

The Habitat Management Plan (HMP) (FWS, 2006c) provides comprehensive guidance for habitat restoration and management on Refuge lands and conservation actions within the watershed, but does not set priorities. Management actions must focus on the highest priority projects to make the best use of limited resources and to maximize the fish and wildlife benefits of the Refuge.

Climate Change
The effects of a warming climate are expected to eliminate brook trout habitat in many Wisconsin streams by mid-century, although Whittlesey Creek is expected to remain highly suitable. Boreal and lowland forests will be subject to increased stress and may be lost altogether in northern Wisconsin. Hardwood trees are predicted to expand their range in the state.

People

Hunting and Fishing
The Refuge offers waterfowl and archery deer hunting opportunities in some locations. Should more or fewer hunting opportunities be available? Fishing is allowed within Whittlesey Creek waters in accordance with state regulations. The Refuge itself, however, has never been opened to fishing per Service regulations, so anglers must walk up the streambed to fish legally within the Refuge boundary. Should streambank fishing be allowed in the Refuge?

Wildlife Observation and Photography
Ideas to enhance wildlife observation and photography on the Refuge have included new foot trails and construction of an overlook at the mouth of the creek. Additional facilities and increased visitation on such a small Refuge must be evaluated carefully to limit wildlife and habitat disturbance.

Environmental Education and Interpretation
Environmental education has been a high priority, but capabilities are limited currently due to lack of visitor services staff. There is a need to define the vision and priorities for environmental education and interpretation on the Refuge and for Service participation in special events at the Northern Great Lakes Visitor Center (NGLVC, Visitor Center, Center). Refuge-specific interpretive exhibits and brochures are available at the NGLVC. The Coaster Classroom and one interpretive kiosk are located on Refuge land, but the Coaster Classroom is underutilized.

Northern Great Lakes Visitor Center
The NGLVC partnership provides many opportunities for mutually beneficial collaboration and enhancement of Service identity in the region, but current Service involvement in day-to-day activities is limited because the park ranger position is vacant and the refuge manager is located several hours away. The annual agreement between the Service and the U.S. Forest Service (USFS) does not address the Service's long-term commitment to the partnership nor does it provide clearly defined roles and expectations.

A.1.4 Decision Framework

This EA describes four alternatives for future Refuge management and the environmental consequences of each alternative. Each alternative has a reasonable mix of wildlife habitat

prescriptions and wildlife-dependent recreational opportunities. A summary table of action is included at the end of this section (Table A-1).

This EA is an important step in the Service's formal decision-making process. In compliance with the National Environmental Policy Act of 1969 (NEPA), the Regional Director of the Midwest Region (Region 3 of the Service) will consider the information presented in this document to select the preferred management alternative. Selection of the preferred alternative is based on its environmental consequences and ability to achieve Refuge purposes and goals.

The Regional Director will determine whether the preferred alternative is a major federal action, which would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of NEPA. If it is determined not to be a major federal action, a Finding of No Significant Impact (FONSI) will be issued. A FONSI means that the preferred alternative is selected and can be implemented in accordance with other laws and regulations. A Decision of Significant Impact would indicate the need to conduct more-detailed environmental analysis in an Environmental Impact Statement.

The planning team has recommended Alternative B ("Refuge and Watershed Restoration; Maintain Visitor Center Partnership") to the Regional Director. The Draft CCP was developed for implementation based on this recommendation.

A.2 Description of Alternatives

This section summarizes the alternatives considered by the planning team to achieve the proposed vision and goals and to address the issues. These alternatives include continuation of current management (Alternative A) and the planning team's proposed action (Alternative B).

A.2.1 Formulation of Alternatives

Alternatives are different approaches to protecting, restoring, and managing the Refuge. The planning team developed and evaluated four alternatives for Whittlesey Creek NWR based on the significant issues, concerns, and opportunities brought forth during the CCP scoping period. All are designed to achieve Refuge purposes, the vision and goals identified in the CCP, and the mission and goals of the Refuge System and the Service.

The alternatives were formulated under the assumptions that (1) a large budget increase for Refuge operations is unlikely during the life of the plan, and (2) Refuge staffing would continue to include one park ranger and one biologist position.

A.2.2 Alternative Components Not Considered for Detailed Analysis

End Participation in the Whittlesey Creek Brook Trout Experiment
The CCP planning team considered discontinuing Refuge involvement in the experimental restoration of coaster brook trout in Whittlesey Creek due to funding and staffing limitations. About 20 years remain in the 30-year experiment to re-establish a self-sustaining coaster brook trout population in Whittlesey Creek. The Refuge role in the experiment is to restore suitable habitat in the creek. Considerable staff time is required to design, organize, implement, and monitor habitat improvement projects in the creek and to work with landowners in the watershed to slow overland flow and reduce sediment input. Reducing or ending this work would allow increased focus on restoring forests and wetlands on the Refuge.

The experiment, however, is a partnership commitment between the Service and the Wisconsin Department of Natural Resources (WDNR) to reach a common goal, with shared responsibilities between the Refuge, the Service's fisheries program, and the WDNR's Division of Fish and Wildlife. The combined efforts of all three partners are critical to the success of the project. If the Refuge unilaterally ended its involvement, no other potential partner would have the resources needed to continue habitat restoration, and the experiment likely would fail.

Furthermore, creek restoration benefits not only coaster brook trout but also other Refuge resources of concern. Restoration of diverse in-stream habitat with good cover will improve conditions for all fish and wildlife species that depend on coldwater streams during their life cycle, and improving watershed health is an important component of forest and wetland restoration on Refuge lands downstream. These restored habitats and the wildlife they support will be more resilient to long-term stressors including climate change.

Fully meeting Refuge purposes and goals requires that we continue to restore Whittlesey Creek. For these reasons, this alternative was eliminated from further consideration.

Modify the Brook Trout Restoration Program
The CCP team also considered potential changes to other components of the brook trout program, such as exclusion of coho salmon from a Whittlesey Creek tributary to study coho-brook trout competition and implementation of additional protective harvest regulations in off-Refuge streams. The Refuge, however, does not have sole decision-making authority for these topics or any others not specifically related to the Whittlesey Creek habitat restoration portion of the coaster brook trout program. These broader questions lie outside the scope of this CCP. They will be addressed instead by the entire partnership as part of the ongoing evaluation of the coaster restoration program on the Wisconsin shore of Lake Superior. The Refuge will continue to participate in these programmatic discussions in partnership with the Ashland Fish and Wildlife Conservation Office (FWCO), which is the lead Service entity on the interagency team.

Trail to Lake Superior and Overlook on Shore
The CCP team considered adding a new Refuge foot trail from Highway 13 to Lake Superior and a new overlook on the lakeshore. A small parking area would be constructed next to the highway. These developments would provide easier access for visitors to view migratory birds that use the coastal wetlands and Chequamegon Bay, especially during fall migration.

A parking area on the west side of the highway, however, would require visitors to cross the busy roadway to access the trail. Locating it on the east side instead would require filling of wetlands. In addition, Chequamegon Bay and shore is an important migratory bird stopover area, and the Refuge portion includes some of the last remaining protected coastal wetlands on Lake Superior. The risk of increased disturbance to waterfowl and shorebird populations was determined to be unacceptably high. For these reasons, this alternative was eliminated from further consideration.

A.2.3 Elements Common to All Alternatives

- The team-partnership approach to experimental restoration of coaster brook trout will continue between Whittlesey Creek NWR, Ashland FWCO, and WDNR. The Refuge's role in the experiment will continue to be restoration of brook trout habitat in Whittlesey Creek.

- The habitat restoration program will be based on overall guidance developed in the HMP for the Refuge (FWS, 2006c).
- The Service will continue to acquire land and easements from willing sellers within the approved boundary.
- The Service will ensure that Refuge management complies with all federal laws and regulations that provide direction for managing units of the Refuge System.
- No adjacent landowners will be adversely impacted by any action taken by the Service without mutual agreement and adequate compensation.

A.2.4 Description of Alternatives

Alternative A: Opportunistic Restoration; Maintain Visitor Center Partnership (No Action)

Under this alternative, the current management direction of Whittlesey Creek NWR would continue. Habitat restoration activities would be opportunistic. The Service partnership with the NGLVC would continue unchanged. Visitor services opportunities would remain the same. This alternative provides the baseline against which to compare other alternatives. NEPA requires that a no-action alternative be addressed in the planning process. A detailed description of the existing programs and uses contained in this alternative is found in chapter 3 of the CCP.

These are key elements of Alternative A:

- Select habitat restoration priorities based primarily on availability of funding and other resources; targeted control of priority invasive plants during restoration.
- Complete currently planned tree planting, logjam installation, and culvert replacement projects; targeted control of priority invasives during restoration.
- Migratory birds continue to benefit from restoration of historic vegetation communities, but no bird-specific management occurs. Bird surveys and monitoring are opportunistic.
- Continue to focus watershed easement acquisition on protection of springs.
- Maintain current conservation partnerships with other agencies, landowners, and organizations.
- Maintain current Service involvement in the NGLVC; Refuge office remains on-site. Participate in partnership events when consistent with Refuge purposes.
- Continue current opportunities on the Refuge for hunting and wildlife observation. Continue to develop Refuge-specific environmental education and interpretation programs.
- Continue to educate and mentor Northland College students and Youth Conservation Corps (YCC) participants.

Alternative B: Refuge and Watershed Restoration; Maintain Visitor Center Partnership (Preferred Alternative)

Under this alternative, the Refuge would develop prioritized focus areas for future habitat restoration using best available science to achieve maximum benefits for brook trout and other priority species. Inventory and monitoring would answer management-relevant questions. Roles and expectations for Service involvement in the NGLVC would be more clearly defined. Visitor services opportunities would expand on the Refuge. Detailed objectives, strategies, and rationales associated with this alternative were developed for chapter 4 of the CCP.

These are key elements of Alternative B:

- Prioritize and integrate all future restoration actions in consultation with partners. Emphasize use of data from sediment transport model (U.S. Army Corps of Engineers, 2010), hydrology study (Lenz et al., 2003), and climate models (Wisconsin Initiative on Climate Change Impacts, 2011) to maximize long-term habitat benefits using limited resources. Examine role of off-Refuge ground-water-contributing area. Develop map of highest priority focus areas. Consider Little Whittlesey and Terwilliger Creeks.
- Complete currently planned tree planting, logjam installation, and culvert replacement projects; expand footprint of historic vegetation beyond riparian zone to increase migratory bird benefits. Targeted control of priority invasives during restoration.
- Develop monitoring plan designed to answer highest priority management questions; consider the cost/benefit of migratory bird monitoring.
- Acquire fee title land and easements from willing sellers within the approved boundary; emphasize lands within the priority focus areas.
- Develop and implement additional watershed protection tools such as buffer strips and riparian easements in partnership with the Natural Resources Conservation Service (NRCS), USFS, and private landowners.
- Build landowner support for future floodplain reconnection and re-meandered channel on the Refuge.
- Maintain current Service involvement in the NGLVC. Keep Refuge office on-site. Participate in partnership events when consistent with Refuge purposes. Develop cooperative agreement to clarify the Service's role and responsibilities.
- Continue the hunting program. Open the Refuge to fishing in accordance with state regulations.
- Continue to develop Refuge-specific education and interpretive programs; expand themes to include the watershed/trout connection. Increase use of Coaster Classroom.
- Add foot trail from NGLVC boardwalk to Coaster Classroom.
- Continue to educate and mentor Northland College students and YCC participants.

Alternative C: Watershed Restoration; Expand Visitor Center Partnership

Under this alternative, Refuge habitat priorities would focus on protection and restoration of the Whittlesey Creek watershed. Easement acquisition would increase, as would partnerships to implement conservation measures on private lands. Stream restoration would focus on the

upper reaches of the watershed. Lowland forest and coastal wetland restoration would be a lower priority. The Service would expand its participation in the NGLVC. Visitor services opportunities would increase and focus more on NGLVC priorities.

These are key elements of Alternative C:

- Focus future habitat restoration on stabilizing bluffs and slowing overland flow to reduce sedimentation and flood peaks in Whittlesey Creek
- Complete currently planned logjam and culvert projects on lower Whittlesey Creek. Design and construct logjams for erosion control on upper Whittlesey Creek.
- Allow natural regeneration of Refuge forests; no new coastal wetland restorations on the Refuge; control only problem invasives (e.g., threats to adjacent private land).
- Migratory birds benefit from restoration of historic vegetation communities, but no bird-specific management occurs. Develop volunteer-based bird surveys with NGLVC to gather basic trend data and encourage public involvement and support.
- Continue to acquire land and easements from willing sellers within the approved boundary. Focus easement acquisition on bank and bluff stabilization.
- Expand efforts to promote conservation farming and forestry practices on private lands in the watershed. Develop and implement additional watershed protection tools (e.g., buffer strips and riparian easements) in partnership with NRCS, USFS, and Partners for Fish and Wildlife.
- Expand Service involvement in the NGLVC; focus visitor services priorities on NGLVC programs and special events; provide Refuge staff at front desk. Develop cooperative agreement to clarify the Service's role and responsibilities.
- Continue the hunting program. Open the Refuge to fishing in accordance with state regulations.
- Add a limited foot trail onto Refuge property from the NGLVC boardwalk.
- Continue to educate and mentor Northland College students and YCC participants.

Alternative D: Refuge Restoration; Reduce Visitor Center Partnership

Under this alternative, Refuge habitat priorities would focus on restoring stream and floodplain habitat within the Refuge boundary. Restoration of lowland forests and coastal wetlands on the Refuge would increase. Refuge management would focus more on benefits to migratory birds. Stream restoration would focus on lower reaches within the Refuge boundary. Watershed work would continue, but would be a lower priority. The Service would reduce participation in the NGLVC; Refuge staff and programs would move off-site. Visitor services opportunities on Refuge lands would increase.

These are the key elements of Alternative D:

- Focus future habitat work on restoring natural hydrology and native vegetation on the Refuge. Climate change is a concern but not a driver of restoration priorities.

- Complete currently planned logjam and culvert projects on lower Whittlesey Creek. Design and install logjams for fish habitat on the Refuge portion of Little Whittlesey and Terwilliger Creeks.
- Create intensively managed seed production blocks for forest restoration. (This relates to managing for scattered blocks of mature native conifers that would ultimately disperse seed for forest restoration. Initially it means intensive weed and browse control, then it's mostly hands-off and low-intensity, low-input).
- Expand wetland restoration and management efforts on the Refuge.
- Increase invasive plant control efforts; work to establish the Refuge as an Invasives-Free Zone.
- Additional actions to benefit bird species of concern (northern waterthrush, veery, black duck, common tern, piping plover, sora rail, cavity nesters). Develop scientifically rigorous monitoring of migratory bird use of Refuge floodplain and coastal wetlands.
- Restore stream meanders and reconnect Whittlesey, Little Whittlesey, and Terwilliger Creeks to their floodplains.
- Continue to acquire fee title land from willing sellers. Continue limited easement acquisition and private lands conservation assistance.
- Reduce involvement in the NGLVC. Move Refuge office and programs off-site.
- Establish the Coaster Classroom as the center of visitor services information for the Refuge; establish staffed hours during peak periods.
- Develop Refuge-specific mission-relevant programming. End participation in NGLVC events.
- Add foot trail from the NGLVC to Coaster Classroom.
- Develop auto tour route with interpretive signs along Refuge roads; add small parking areas.
- Educate and mentor Northland College and YCC participants

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Table A-1: Comparison of Actions by Alternative

Issues	**Alternative A** Opportunistic Restoration; Maintain Visitor Center Partnership (No Action)	**Alternative B** Refuge and Watershed Restoration; Maintain Visitor Center Partnership (Preferred Alternative)	**Alternative C** **Watershed Restoration; Expand Visitor Center Partnership**	**Alternative D** **Refuge Restoration; Reduce Visitor Center Partnership**
WILDLIFE				
Coaster Brook Trout	Team approach to restoring coaster brook trout; Refuge role is to restore Whittlesey Creek habitat. Opportunistic habitat restoration based primarily on availability of grants and other resources.	Team approach to restoring coaster brook trout; Refuge role is to restore Whittlesey Creek habitat. Develop and prioritize focus areas for habitat restoration. Consult with partners. Emphasize use of data from sediment transport model and hydrology study.	Team approach to restoring coaster brook trout; Refuge role is to restore Whittlesey Creek habitat. Focus on stabilizing bluffs and slowing overland flow in the watershed to reduce sedimentation and flood peaks.	Team approach to restoring coaster brook trout; Refuge role is to restore Whittlesey Creek habitat. Focus on restoring stream and floodplain habitat within the Refuge boundary.
Migratory Birds	Birds benefit from restoration of historic vegetation, but no bird-specific management. Minimal, opportunistic bird monitoring.	Expand footprint of restored historic vegetation beyond riparian zone where feasible to increase bird benefits. Develop monitoring plan designed to answer highest priority management-relevant questions; consider the cost/benefit of migratory bird monitoring.	Birds benefit from restoration of historic vegetation, but no bird-specific management. Develop volunteer-based bird surveys (e.g., annual raptor migration) in partnership with NGLVC to gather basic trend data and encourage public involvement and support.	Expand footprint of restored historic vegetation beyond riparian zone where feasible to increase bird benefits. Implement bird-specific habitat management to benefit northern waterthrush, veery, black duck, common tern, piping plover, sora rail, etc. Develop scientifically rigorous monitoring of migratory bird use of Refuge floodplain and coastal wetlands.

HABITAT				
Stream Restoration	Install remaining logjams on lower Whittlesey Creek; replace remaining bad culverts.	Install remaining logjams on lower Whittlesey Creek; replace remaining bad culverts; reestablish free-flowing North Fork by removing beaver dams. Prioritize new stream restoration activities using current science in consultation with partners; consider Little Whittlesey and Terwilliger Creeks.	Install remaining logjams on lower Whittlesey Creek; replace remaining bad culverts. Design and install logjams for erosion control on upper Whittlesey Creek.	Install remaining logjams on lower Whittlesey Creek; replace remaining bad culverts. Design and install logjams for fish habitat on the Refuge portion of Little Whittlesey and Terwilliger Creeks.
Floodplain and Coastal Wetland Restoration	Plant trees and restore/manage wetlands on Refuge as resources allow. Targeted control of priority invasive plants during restoration.	Complete Refuge tree planting within 10 years; prioritize new wetland restoration activities with partners. Targeted control of priority invasive plants during restoration. Build landowner support for future floodplain reconnection and restoration of stream meanders on the Refuge.	Allow natural regeneration of forests; no new wetland restoration. Control only problem invasives (e.g., threats to adjacent private lands).	Create intensively managed seed production blocks for forest restoration. Expansion of wetland restoration and management on the Refuge is a priority. Reduce Refuge acres infested with invasive plants by 95% (monitoring and maintenance mode). Restore stream meanders on the Refuge and reconnect stream to floodplain.
Watershed Protection	Acquire easements from willing sellers. Continue limited private lands work.	Prioritize watershed projects using current science in consultation with partners. Develop new watershed protection tools (e.g., buffer strips and riparian easements) with NRCS, USFS, and Partners for Fish and Wildlife.	Focus easement acquisition on bank and bluff stabilization. Expand efforts to promote conservation farming and forestry practices on private lands in the watershed. Develop new watershed protection tools with NRCS, USFS, and Partners for Fish and Wildlife.	Acquire easements from willing sellers. Continue limited private lands work.
Climate Change	No specific management driven by climate change modeling.	Climate change modeling is one tool used to prioritize and integrate all restoration actions and could affect priorities.	Climate change is a concern but not a driver of restoration priorities.	Climate change is a concern but not a driver of restoration priorities.

PEOPLE				
NGLVC Partnership	Continue current Service involvement.	Continue current Service involvement. Clarify roles and responsibilities; develop cooperative agreement.	Become more complete partner. Focus Refuge visitor services on NGLVC priorities, participate in seasonal tours and programs, provide staff at front desk, develop cooperative agreement.	Reduce partnership involvement. Move Refuge office and programs off-site.
Welcome and Orient Visitors	Visitor contact station, Refuge exhibits, and brochures provided at NGLVC.	Visitor contact station, Refuge exhibits and brochures provided at NGLVC.	Visitor contact station, Refuge exhibits, and brochures provided at NGLVC; Refuge staff works at the front desk.	Coaster Classroom is the center of visitor services information for the Refuge, with staffed hours during peak periods.
Environmental Education and Interpretation	Maintain Refuge-specific mission-relevant programming. Participate in NGLVC events when appropriate. Educate and mentor Northland College and YCC students.	Expand Refuge-specific mission-relevant programming; participate in NGLVC events when appropriate. Increase collaboration with Ashland FWCO; expand themes to include watershed/trout connection. Educate and mentor Northland College and YCC students.	Focus Refuge visitor services activities on support of NGLVC programs and special events. Educate and mentor Northland College and YCC student.	Expand Refuge-specific mission-relevant programming. End participation in NGLVC events. Increase collaboration with Ashland FWCO; expand themes to include watershed/trout connection. Develop auto tour route with interpretive signs and small parking areas along Refuge roads. Educate and mentor Northland College and YCC students.
Wildlife Observation and Photography	All Refuge lands open to visitor access on foot. No designated foot trails or overlooks.	All Refuge lands open to visitor access on foot. Add limited trail onto Refuge property from NGLVC boardwalk.	All Refuge lands open to visitor access on foot. No designated trails or overlooks.	All Refuge lands open to visitor access on foot. Add limited trail onto Refuge from NGLVC to Coaster Classroom.
Hunting and Fishing	Waterfowl and archery deer hunting in designated locations. Fishing officially closed.	Waterfowl and archery deer hunting in designated locations. Open Refuge to fishing in accordance with state regulations.	Same as Alternative B.	Same as Alternative B.

A.3 Affected Environment

See chapter 3 of the CCP.

A.4 Environmental Consequences

A.4.1 Effects Common to All Alternatives

Environmental Justice
Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" establishes environmental justice as a federal government priority and directs all federal agencies to make environmental justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs and policies, and activities on minority and low-income populations.

None of the alternatives described in this EA will disproportionately place any adverse environmental, economic, social, or health effects on minority and low-income populations. Public use activities that would be offered under each of the alternatives would be available to any visitor regardless of race, ethnicity, or income level.

Cultural Resources
The Service is responsible for managing archaeological and historic sites found on refuges. Under each of the alternatives evaluated in this EA, Refuge management would ensure compliance with relevant federal laws and regulations, particularly Section 106 of the National Historic Preservation Act. Prior to all habitat and facility projects, appropriate efforts will be made to identify and protect cultural resources within the area of potential impact by contacting the Regional Historic Preservation Officer for project review.

Climate Change
The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long-range planning endeavors. Some potential impacts of climate change on the Superior Coastal Plain ecoregion in Wisconsin have been identified and are discussed in chapter 3 of the CCP.

For example:

- Increased average surface and groundwater temperatures could affect habitat quality for coldwater-dependent fish species.
- Changes in recharge and discharge patterns could affect erosion, sedimentation, and flood peaks.
- Changes in wildlife composition could occur as boreal forest plant species shift their ranges northward.

Managers and resource specialists on the Refuge need to be aware of the potential effects of climate change. When feasible, documenting long-term vegetation, wildlife, and hydrologic

changes should become a part of research and monitoring programs. Adjustments in management direction may be necessary over time to adapt to a changing climate.

Carbon Sequestration
Increased carbon dioxide in the atmosphere has been linked to global climate change. In relation to comprehensive conservation planning for refuges, carbon sequestration is one of the primary climate-related management strategies that can be considered despite uncertainty surrounding site-specific climate change effects. The U.S. Department of Energy (USDOE, 1999) defines carbon sequestration as ". . . the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Vegetation is an important factor in global carbon sequestration. Both wetlands and forests have been shown to be carbon sinks, capturing and storing carbon, thereby removing a portion of the atmospheric carbon dioxide. The USDOE report notes that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Restoration of lands previously cleared for agriculture will increase the total quantity of sequestered carbon on the Refuge under all alternatives. All alternatives would result in increased carbon storage due to continuing land acquisition and restoration.

A.4.2 Summary of Effects by Alternative

This section examines the environmental impacts of implementing each alternative. Impacts are discussed under three broad categories consistent with the CCP: wildlife, habitat, and people. A summary table of impacts is included at the end of this section (Table A-2).

Wildlife

All four alternatives would benefit Refuge species of concern, although the magnitude of benefit would vary by alternative for specific species. Alternative B provides the greatest overall benefits due to improved sequencing and integration of habitat restoration activities that would make the most effective use of limited resources.

Coaster Brook Trout
All four alternatives will improve stream habitat and thereby increase the likelihood of increasing the number of coasters in Whittlesey Creek. It should be noted, however, that coaster brook trout numbers are not solely dependent on Refuge efforts to restore stream habitat; many other factors outside Refuge control also will affect the likelihood of successfully restoring a migratory population in Whittlesey Creek.

Under Alternative B, the improvement in amount and quality of coldwater stream habitat suitable for coasters would be greatest due to improved prioritization and integration of habitat restoration activities. So, all other factors being equal, the greatest increase in coaster brook trout numbers would be expected under this alternative.

The smallest increase in coaster brook trout numbers would be expected under Alternative D. Some structural in-stream habitat improvements would continue, but water quality improvement would be smallest under this alternative due to decreased focus on upland runoff and sediment reduction.

Migratory Birds

All alternatives would benefit migratory birds as additional acres are acquired and native vegetation restoration continues on the Refuge. Northern waterthrush (lowland forest), veery (riparian forest), black duck, and sora (coastal wetland) are Refuge bird species of concern as defined in the HMP, although many other species also benefit from habitat restoration on the Refuge. Although notable local benefits accrue to migratory birds, particularly during migration, the Refuge is small, so none of the alternatives is expected to have a significant overall effect on migratory bird populations that use the area.

Under Alternatives A and B, a small increase in bird numbers would be expected on the Refuge as more acres are acquired and restored. Some additional benefits could accrue under Alternative B, depending on the habitat restoration priorities that arise from the modeling effort.

Under Alternative C, stable numbers of migratory birds would be expected as habitat focus shifts primarily to watershed erosion and runoff control rather than native vegetation restoration on the Refuge.

Under Alternative D, a medium increase in migratory bird use of the Refuge would be expected. This alternative would provide the greatest benefits due to the primary focus on restoring native plants on Refuge floodplains—emergent wetlands, lowland, and riparian forest; plus additional bird-specific management.

Habitat

All alternatives would have a positive net effect on quantity and quality of wetland, forest, and stream habitat although amount of improvement achieved over the next 15 years for each habitat type would vary by alternative. Alternatives B and C would provide the greatest benefits to stream habitat. Alternative D would provide the greatest benefit to forests and wetlands in the Refuge floodplain. Alternative C would provide the greatest reduction in watershed erosion and runoff.

Alternative B would provide the greatest overall increase in biological integrity, diversity, and environmental health of the Refuge, Whittlesey Creek, and the watershed because restoration activities would be more efficiently prioritized and integrated to target sites and activities of greatest potential impact.

The environmental effects of Whittlesey Creek NWR habitat restoration also were addressed as part of the EA developed for the HMP (FWS, 2006c)

Stream Restoration

Under Alternative A, stream habitat structure and water quality would improve due to continuing in-stream restoration and some reduced runoff and sedimentation in the watershed.

Under Alternative B, more improvement in stream habitat structure and water quality would be expected than under Alternative A due to improved sequencing and integration of restoration activities to achieve maximum benefit with limited resources.

Under Alternative C, habitat structure would improve due to continuing in-stream restoration of woody debris in upstream reaches of the creek. This alternative also would significantly improve water quality due to a primary focus on runoff and erosion reduction in the watershed.

Under Alternative D, stream habitat and water quality benefits would be smallest and localized primarily at the lower end of Whittlesey Creek on and near Refuge lands.

Floodplain and Coastal Wetland Restoration

Under Alternative A, acres of floodplain forest and restored wetland would increase as land acquisition and restoration continues. Wetland plant diversity would remain stable and invasive reed canarygrass would continue to dominate many areas due to limited wetland management activities. Invasive plants in Refuge forests and fields would remain stable or drop slightly when they are controlled during restoration projects. Herbicide use would be limited and primarily occur via direct application methods such as cut-stump treatment and by utilizing weed-wipers. Least-toxic compounds such as the aquatic glyphosate formulation would be utilized. Impacts to non-target plants and other organisms are expected to be minimal. Floodplain hydrology would remain stable or show some improvement as wetlands are restored and trees planted.

Under Alternative B, acres of floodplain forest and restored wetland would increase as land acquisition and restoration continues. Wetland plant diversity would remain stable or increase; invasive plants, for example reed canarygrass, would remain stable or decrease if prioritization efforts expand wetland management activities over the next 15 years. Invasive plants in Refuge forests and fields would remain stable or drop slightly when they are controlled during restoration projects. Herbicide use would be limited and primarily occur via direct application methods such as cut-stump treatment and by utilizing weed-wipers. Least-toxic compounds such as the aquatic glyphosate formulation would be utilized. Impacts to non-target plants and other organisms are expected to be minimal. Floodplain hydrology would remain stable or show some improvement as wetlands are restored and trees planted.

Alternative C would provide the fewest benefits to floodplain and coastal wetland habitats. Restoration activities would be focused primarily in the watershed rather than near the coast. This alternative would treat the fewest species and acres with herbicides and would have the least impact on non-target plants and other organisms.

Alternative D would provide the greatest improvement in quantity and quality of forest and coastal wetland habitat on Refuge lands. Restoration activities would focus primarily on Refuge lands in the floodplain near the coast. Forest acreage would increase. Restored wetland acreage and native plant diversity would increase significantly, accompanied by near elimination of invasive plants. Herbicide use would include numerous application methods, timings and compounds applied to diverse species. While least-toxic compounds would be selected and Best Management Practices followed, this alternative would result in the most herbicide applied and have the greatest potential impact on non-target plants and other organisms. Floodplain hydrology would improve through restoration of stream meanders and reconnection of the stream to its floodplain.

Watershed Erosion and Runoff

Alternative A would provide some reduction in sediment and overland flow due to opportunistic implementation of conservation practices on private lands and purchase of easements.

Alternative B includes more focused attention on areas of greatest concern within the Whittlesey watershed, so greater reduction in erosion and more natural water flow patterns would be expected under this alternative than under alternatives A or D, with greater habitat benefits downstream.

Alternative C would provide the greatest reduction in overland flow and erosion because watershed restoration would be the primary focus of habitat work.

Under Alternative D, some watershed work could still occur, but the priority would be restoration of Refuge lands downstream. This alternative would provide the smallest reduction in watershed erosion and runoff.

Climate Change
Climate change is likely to result in changing native vegetation communities in the Superior Coastal Plain over the long-term. Although major changes are not expected during the life of this plan, it is important to continue to build ecosystem resilience to the effects of climate change.

All four alternatives would increase resilience to outside stressors including climate change by restoring native vegetation and ecosystem function (hydrology). Under all four alternatives, Whittlesey Creek is expected to continue providing suitable coldwater habitat for brook trout due to consistent groundwater input. Stream restoration activities (logjams, sediment reduction, etc.) would enhance stream resilience to climate change under all alternatives. In addition, Alternative B would consider the potential for mitigation of climate change effects in prioritizing habitat restoration actions.

People

Hunting and Fishing
Under all four alternatives, hunting opportunities would remain the same, with waterfowl hunting and archery deer hunting allowed on some Refuge lands.

Under Alternative A, Refuge fishing would remain closed per Service regulations. Under Alternatives B, C, and D, fishing opportunities would increase because the Refuge would be open to fishing in accordance with state regulation.

Wildlife Observation and Photography
Under Alternatives A and C, wildlife observation opportunities would remain stable, with off-trail access allowed year round, but no foot trails or overlooks.

Under Alternatives B and D, wildlife observation opportunities would increase due to a trail extension from the NGLVC boardwalk and a trail from the NGLVC boundary to the Coaster Classroom.

Environmental Education and Interpretation
Under Alternative A, environmental education and interpretation opportunities would remain stable.

Under Alternative B, environmental education opportunities would expand, and quality could improve due to increased collaboration with Ashland FWCO and expanded themes to include the watershed/trout connection.

Under Alternative C, Refuge and Service-specific education and interpretive opportunities would decrease significantly because the focus would shift to NGLVC messages.

Under Alternative D, environmental education opportunities would expand, and quality could improve due to increased collaboration with Ashland FWCO and expanded themes to include the watershed/trout connection. Self-directed interpretive opportunities would increase due to the development of an interpreted auto tour route.

Public Awareness and Support

Public awareness and support for Whittlesey Creek NWR is strong in the local community. Many factors affect public awareness and support including partnerships, outreach, youth mentoring, habitat restoration, wildlife-dependent recreation opportunities, community involvement, and increased tourism and other economic effects of Refuge activities.

Under Alternative A, public awareness and support would remain stable as current Refuge programs and Service involvement in the NGLVC partnership continue.

Under Alternative B, public awareness and support could increase slightly as wildlife-dependent recreation opportunities increase.

Under Alternative C, public awareness and support could remain stable, or could decrease if some Service identity is lost as the Refuge becomes more closely integrated into the NGLVC partnership.

Under Alternative D, public awareness and support would decrease without the high public visibility afforded by the NGLVC; it could increase again over the long-term if the Refuge successfully develops a stronger individual identity separate from the NGLVC.

Cumulative Impacts

Cumulative impacts are effects that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.

The Council on Environmental Quality, which ensures that federal agencies meet their obligations under NEPA, requires mitigation measures when the environmental analysis process detects possible significant negative impacts on habitat, wildlife, or the human environment. None of the activities proposed are expected or intended to produce significant levels of cumulative environmental impacts that would require mitigation measures.

Biological Resources

All four alternatives are intended to maintain or improve biological resources on the Refuge. All alternatives would increase the acreage of restored Refuge floodplain forest and coastal wetland. All include working with partners to increase the conservation value of adjacent lands. The combination of our proposed management actions with those of other organizations could result in beneficial cumulative impacts through restoration and protection of stream, floodplain, and wetland habitats that are declining nationwide.

Water Resources

All alternatives would reduce erosion and runoff in the local watershed by converting fields to native vegetation, purchasing conservation easements, and encouraging adoption of additional conservation measures on privately owned agricultural land. Alternatives B and D also include measures to restore more natural hydrologic function in the floodplain over the long-term by

restoring stream meanders and reconnecting the stream to its floodplain. Improved quality of water flowing out of Whittlesey Creek could have positive local benefits in Chequamegon Bay. If many similar projects were implemented throughout the Lake Superior basin, the beneficial cumulative impacts on the lake could be significant.

Table A-2: Summary of Impacts by Alternative

Issues	**Alternative A** Opportunistic Restoration; Maintain NGLVC Partnership (No Action)	**Alternative B** Refuge and Watershed Restoration; Maintain NGLVC Partnership (Preferred)	**Alternative C** Watershed Restoration; Expand NGLVC Partnership	**Alternative D** Refuge Restoration; Reduce NGLVC Partnership
WILDLIFE				
Coaster Brook Trout Population	Increased.	Increased.	Increased.	Small increase.
Migratory Bird Populations	Small increase.	Small increase.	Stable.	Medium increase.
HABITAT				
Stream	Improved structure Improved water quality.	Significantly improved structure. Significantly improved water quality.	Improved structure. Significantly improved water quality.	Small improvement in structure. Small improvement in water quality.
Floodplain Forest	Increase in acreage .	Increase in acreage.	Small increase in acreage.	Increase in acreage.
Coastal Wetlands	Increase in restored acres Stable plant diversity.	Increase in restored acres. Stable or increased plant diversity.	Little or no change in restored acres. Stable or decreased plant diversity.	Significant increase in restored acres. Significant increase in diversity.
Invasive Plants	Stable or small reduction.	Stable or small reduction.	Increased.	Significant reduction.
Floodplain Hydrology	Stable or small improvement.	Stable or small improvement.	Stable or deteriorating.	Improved.
Watershed Runoff and Erosion	Small reduction.	Reduced.	Significantly reduced.	Stable or small reduction.
Resilience to Climate Change	Increased.	Increased.	Increased.	Increased.
PEOPLE				
NGLVC Partnership	Stable Service involvement.	Stable involvement. Increased clarity of roles/responsibilities	Expanded involvement. Potential loss of Service identity in the area.	Reduced involvement. Potential for reduced Service visibility in the area.

Issues	**Alternative A** Opportunistic Restoration; Maintain NGLVC Partnership (No Action)	**Alternative B** Refuge and Watershed Restoration; Maintain NGLVC Partnership (Preferred)	**Alternative C** Watershed Restoration; Expand NGLVC Partnership	**Alternative D** Refuge Restoration; Reduce NGLVC Partnership
Welcome and Orient Visitors	Service visibility remains the same.	Same as Alternative A.	Increased Service visibility in the area.	Reduced Service visibility in the area.
Hunting	Stable opportunities. No program changes	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Fishing	Stable opportunities. Refuge open per State but not per Service fishing regulations.	Increased opportunities. Open in accordance with both State and Service regulations.	Same as Alternative B.	Same as Alternative B.
Wildlife Observation	Stable opportunities.	Increased opportunities.	Stable opportunities.	Increased opportunities.
Environmental Education and Interpretation	Stable opportunities. Stable quality.	Expanded opportunities. Increased quality.	Decrease in Refuge and Service-focused opportunities. Shift in focus to address NGLVC messages.	Expanded opportunities. Increased quality.
Public Awareness and Support	Stable.	Stable or small increase.	Stable or decreased. Some potential loss of Service identity.	Increased or decreased.

Appendix B: Species Lists

In this appendix:

Common Native Plants Found On and Near Whittlesey Creek NWR
Invasive Plants Confirmed or Likely Found on Whittlesey Creek NWR
Whittlesey Creek NWR Mammals
Whittlesey Creek NWR Birds
Whittlesey Creek NWR Amphibians
Whittlesey Creek NWR Reptiles
Whittlesey Creek NWR Fish

Common Native Plants Found On and Near Whittlesey Creek NWR

Common name	Scientific name
Conifers	
Northern white cedar	*Thuja occidentalis*
Balsam fir	*Abies balsamea*
Eastern hemlock	*Tsuga canadensis*
Jack pine	*Pinus banksiana*
Red pine	*Pinus resinosa*
White pine	*Pinus strobes*
White spruce	*Picea glauca*
Deciduous Trees and Shrubs	
Speckled alder	*Alnus rugosa*
Black ash	*Fraxinus nigra*
Green ash	*Fraxinus pennsylvania*
Mountain ash	*Sorbus americana*
Large-toothed aspen	*Populus grandidentata*
Quaking aspen	*Populus tremuloides*
Red-osier dogwood	*Cornus stolonifera*
Balsam poplar	*Populus balsamifera*
Paper birch	*Betula papyrifera*
River birch	*Betula nigra*
Yellow birch	*Betula lutea*
Box elder	*Acer negundo*
Choke cherry	*Prunus virginiana*
Pin cherry	*Prunus pennsylvanica*
American elm	*Ulmus americana*
Ironwood	*Ostrya virginiana*
Juneberry	*Amelanchier canadensis*
Red maple	*Acer rubrum*
Sugar maple	*Acer saccharum*
Meadowsweet	*Spirea alba*
Vibernum	*Vibernum sp*
Willow	*Salix sp.*
Grasses and Forbs	
Canada bluejoint	*Calamagrostis canadensis*
Slender sedge	*Carex lasiocarpa*
Common cattail	*Typha latifolia*
Marsh horsetail	*Equisetum palustre*
Northern black currant	*Ribes hudsonianum*

Invasive Plants Confirmed or Likely Found on Whittlesey Creek NWR

Common Name	Scientific Name
Reed canarygrass*	*Phalaris arundinacea*
Bull thistle*	*Cirsium vulgare*
Canada thistle*	*Cirsium arvense*
Common buckthorn*	*Rhamnus cathartica*
Crack willow*	*Salix fragilis*
Glossy buckthorn	*Rhamnus frangula*
Exotic honeysuckles*	*Lonicera spp.*
Purple loosestrife*	*Lythrum salicaria*
Bird's foot trefoil*	*Lotus corniculatus*
Red clover*	*Trifolium pratense*
White clover*	*Trifolium repens*
White sweet clover*	*Melilotus alba*
Yellow sweet clover*	*Melilotus officinalis*
Smooth bromegrass*	*Bromus inermis*
Quackgrass*	*Elytrigia repens*
Tall fescue*	*Festuca elatior*
Common reed*	*Phragmites australis*
Kentucky bluegrass*	*Poa pratensis*
Leafy spurge	*Euphorbia esula*
Brown knapweed*	*Centaurea jacea*
Spotted knapweed	*Centaurea maculosa*
Common tansy*	*Tanacetum vulgare*
Ox-eye daisy*	*Chrysanthemum eucanthemum*
Orange hawkweed*	*Hieracium aurantiacum*
Yellow hawkweed*	*Hieracium caespitosum*
Wintercreeper	*Euonymous fortunei*
Wild parsnip	*Pastinaca sativa*
Common burdock*	*Arctium minus*
Orange day lily*	*Hemerocallis fulva*
Butter-and-eggs	*Linaria vulgaris*
Periwinkle	*Vinca minor*
Chicory	*Cichorium intybus*
Lily-of-the-valley	*Convallaria majalis*
Crown vetch*	*Coronilla varia*
Queen Anne's lace	*Daucus carota*
Creeping Charlie	*Glechoma hederacea*
Common St. John's-wort	*Hypericum perforatum*
Curly cock	*Rumex crispus*
Watercress	*Nasturtium officinale*
Canada bluegrass*	*Poa compressa*
Field bindweed	*Convolvulus arvensis*
Forget-me-not, garden	*Myosotis sylvatica*
Forget-me-not, aquatic	*Myosotis scorpioides*
Common mullein*	*Verbascum thaspus*
Bishop's goutweed*	*Aegopodium podagraria*

Asterisk * indicates species confirmed on Refuge

Whittlesey Creek NWR Mammals

Common Name	*Scientific Name*	Common Name	*Scientific Name*
Virginia Opossum	*Didelphis virgiana*	Meadow Vole	*Microtus pennsylvanicus*
Northern Short-tailed Shrew	*Blarina brevicauda*	House Mouse	*Mus musculus*
Arctic Shrew	*Sorex arcticus*	North American Deermouse	*Peromyscus maniculatus*
Masked Shrew	*Sorex cinereus*	White-footed Deermouse	*Peromyscus leucpus*
Pygmy Shrew	*Sorex hoyi*	Norway Rat	*Rattus norvegicus*
Water Shrew	*Sorex palustris*	Southern Bog Lemming	*Synaptomys cooperi*
Star-nosed Mole	*Condylura cristata*	Woodland Jumping Mouse	*Napaeozapus insignis*
Big Brown Bat	*Eptesicus fuscus*	Meadow Jumping Mouse	*Zapus hudsonius*
Silver-haired Bat	*Lasionycteris noctivagans*	Common Porcupine	*Erethizon dorsatum*
Little Brown Bat	*Myotis lucifugus*	Coyote	*Canis latrans*
Northern Long-eared Bat	*Myotis septentrionalis*	Gray Wolf	*Canis lupus*
Red Bat	*Lasiurus borealis*	Red Fox	*Vulpes vulpes*
Hoary Bat	*Lasiurus cinereus*	Gray Fox	*Urocyon cinereoargenteus*
Eastern Pipistrelle	*Pipistrellus subflavus*	Black Bear	*Ursus americanus*
Snowshoe Hare	*Lepus americanus*	Common Raccoon	*Procyon lotor*
Eastern Cottontail	*Sylvilagus floridanus*	American Marten	*Martes americana*
Southern Flying Squirrel	*Glaucomys volans*	Fisher	*Martes pennanti*
Northern Flying Squirrel	*Glaucomys sabrinus*	Short-tailed Weasel	*Mustela erminea*
Woodchuck	*Marmota monax*	Long-tailed Weasel	*Mustela frenata*
Eastern Gray Squirrel	*Sciurus carolinensis*	Least Weasel	*Mustela nivalis*
Red Squirrel	*Tamiasciurus hudsonicus*	Mink	*Mustela vison*
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	American Badger	*Taxidea taxus*
Least Chipmunk	*Tamias minimus*	Striped Skunk	*Mephitis mephitis*
Eastern Chipmunk	*Tamias striatus*	Northern River Otter	*Lutra canadensis*
Plains Pocket Gopher	*Geomys bursarius*	Canada Lynx	*Lynx canadensis*
American Beaver	*Castor canadensis*	Bobcat	*Lynx rufus*
Muskrat	*Ondatra zibethicus*	White-tailed Deer	*Odocoileus virginianus*
Southern Red-backed Vole	*Clethrionomys gapperi*	Moose	*Alces alces*

Whittlesey Creek NWR Birds

(Spring: Mar–May, Summer: Jun–Aug, Fall: Sept–Nov, Winter: Dec–Feb)

Common name	Scientific name	Spring	Summer	Fall	Winter
Loons					
Common Loon	*Gavia immer*	X	X	X	
Grebes					
Pied-billed Grebe	*Podilymbus podiceps*	X		X	
Horned Grebe	*Podiceps auritus*	X		X	
Red-necked Grebe	*Podiceps grisegena*	X		X	
Eared Grebe	*Podiceps nigricollis*	X			
Pelicans					
American White Pelican	*Pelecanus erythrorhynchos*	X	X	X	
Cormorants					
Double-crested Cormorant	*Phalacrocorax aurtis*	X	X	X	
Herons and Bitterns					
American Bittern	*Botaurus lentiginosus*	X	X	X	
Least Bittern	*Ixobrychus exilis*	X	X		
Great Egret	*Ardea alba*	X			
Great Blue Heron	*Ardea herodias*	X	X	X	
Cattle Egret	*Bubulcus ibis*	X		X	
Green Heron	*Butorides virescens*	X	X	X	
Snowy Egret	*Egretta thula*	X			
Tricolored Heron	*Egretta tricolor*	X			
Yellow-crowned Night Heron	*Nyctanassa violacea*	X	X		
Black-crowned Night Heron	*Nycticorax nycticorax*	X	X		
Vultures					
Turkey Vulture	*Cathartes aura*	X	X	X	
Ducks, Geese, and Swans					
Greater White-fronted Goose	*Anser albifrons*	X		X	
Snow Goose	*Chen caerulescens*	X		X	
Ross's Goose	*Chen rossii*	X			
Canada Goose	*Branta canadensis*	X	X	X	X
Mute Swan	*Cygnus olor*	X	X	X	X
Tundra Swan	*Cygnus buccinator*	X		X	
Trumpeter Swan	*Cygnus columbianus*	X	X	X	
Wood Duck	*Aix sponsa*	X	X	X	
Gadwall	*Anas strepera*	X		X	
American Widgeon	*Anas americana*	X		X	
American Black Duck	*Anas rubripes*	X	X	X	X
Mallard	*Anas platyrhynchos*	X	X	X	X
Blue-winged Teal	*Anas discors*	X	X	X	
Green-winged Teal	*Anas crecca*	X	X	X	X
Northern Pintail	*Anas acuta*	X		X	X

Common name	Scientific name	Spring	Summer	Fall	Winter
Northern Shoveler	*Anas clypeata*	X		X	
Canvasback	*Aythya valisineria*	X		X	
Redhead	*Aythya americana*	X		X	
Ring-necked Duck	*Aythya collaris*	X	X	X	
Lesser Scaup	*Aythya affinis*	X		X	
Greater Scaup	*Aythya marila*	X		X	
King Eider	*Somateria spectabilis*			X	
Oldsquaw	*Clangula hyemalis*	X		X	X
Surf Scoter	*Melanitta perspicillata*	X		X	
Black Scoter	*Melanitta nigra*	X		X	
White-winged Scoter	*Melanitta fusca*	X		X	
Bufflehead	*Bucephala albeola*	X		X	X
Common Goldeneye	*Bucephala clangula*	X		X	X
Ruddy Duck	*Oxyura jamaicensis*	X		X	
Hooded Merganser	*Lophodytes cucullatus*	X	X	X	
Common Merganser	*Mergus merganser*	X		X	X
Red-breasted Merganser	*Mergus serrator*	X	X	X	
Hawks and Eagles					
Osprey	*Pandion haliaetus*	X	X	X	
Bald Eagle	*Haliaeetus leucocephalus*	X	X	X	X
Northern Harrier	*Circus cyaneus*	X	X	X	X
Sharp-shinned Hawk	*Accipiter striatus*	X	X	X	X
Cooper's Hawk	*Accipiter cooperii*	X	X	X	
Northern Goshawk	*Accipiter gentilis*	X	X	X	X
Red-shouldered Hawk	*Buteo lineatus*	X	X	X	
Broad-winged Hawk	*Buteo platypterus*	X	X	X	
Swainson's Hawk	*Buteo swainsoni*	X			
Red-tailed Hawk	*Buteo jamiacensis*	X	X	X	
Rough-legged Hawk	*Buteo lagopus*	X		X	X
Golden Eagle	*Aquila chrysaetos*	X			
Falcons					
American Kestrel	*Falco sparverius*	X	X	X	X
Merlin	*Falco columbarius*	X	X	X	
Peregrine Falcon	*Falco peregrinus*	X		X	
Upland Game Birds					
Ring-necked Pheasant	*Phasianus colchicus*	X	X	X	X
Ruffed Grouse	*Bonasa umbellus*	X	X	X	X
Sharp-tailed Grouse	*Tympanuchus phasianellus*	X	X	X	
Rails and Coots					
Yellow Rail	*Coturnicops noveboracensis*	X	X	X	
Virginia Rail	*Rallus limicola*	X	X	X	
Sora Rail	*Porzana carolina*	X	X	X	
American Coot	*Fulica americana*	X		X	
Cranes					

Common name	Scientific name	Spring	Summer	Fall	Winter
Sandhill Crane	*Grus canadensis*	X	X	X	
Shorebirds					
Black-bellied Plover	*Pluvialis squatarola*	X	X	X	
American Golden-Plover	*Pluvialis dominica*	X	X	X	
Semipalmated Plover	*Charadrius semipalmatus*	X	X	X	
Piping Plover	*Charadrius melodus*	X		X	
Killdeer	*Charadrius vociferus*	X	X	X	X
American Avocet	*Recurvirostra americana*	X	X		
Greater Yellowlegs	*Tringa melanoleuca*	X	X	X	
Lesser Yellowlegs	*Tringa flavipes*	X	X	X	
Solitary Sandpiper	*Tringa solitaria*	X	X	X	
Willet	*Catoptrophorus semipalmatus*	X	X		
Spotted Sandpiper	*Actitus macularia*	X	X	X	
Upland Sandpiper	*Bartramia longicauda*	X	X		
Whimbrel	*Numenius phaeopus*	X	X	X	
Hudsonian Godwit	*Limosa haemastica*	X			
Marbled Godwit	*Limosa fedoa*	X			
Ruddy Turnstone	*Arenaria interpres*	X	X	X	
Red Knot	*Calidris canutus*	X	X	X	
Sanderling	*Calidris alba*	X	X	X	
Semipalmated Sandpiper	*Calidris pusilla*	X	X	X	
Least Sandpiper	*Calidris minutilla*	X	X	X	
White-rumped Sandpiper	*Calidris fuscicollis*	X	X	X	
Baird's Sandpiper	*Calidris bairdii*	X	X	X	
Pectoral Sandpiper	*Calidris melanotos*	X	X	X	
Dunlin	*Calidris alpina*	X	X	X	
Stilt Sandpiper	*Calidris himantopus*	X	X		
Buff-breasted Sandpiper	*Tryngites subruficollis*		X	X	
Short-billed Dowitcher	*Limnodromus griseus*	X	X	X	
Long-billed Dowitcher	*Limnodromus scolopaceus*	X		X	
Wilson’s Snipe	*Gallinago gallinago*	X	X	X	X
American Woodcock	*Scolopax minor*	X	X	X	
Wilson's Phalarope	*Phalaropus tricolor*	X		X	
Gulls and Terns					
Franklin's Gull	*Larus pipixcan*	X	X	X	
Little Gull	*Larus minutus*	X	X		
Bonaparte's Gull	*Larus philadelphia*	X	X	X	X
Ring-billed Gull	*Larus delwarensis*	X	X	X	X
Herring Gull	*Larus argentatus*	X	X	X	X
Thayer's Gull	*Larus thayeri*			X	
Lesser Black-backed Gull	*Larus fuscus*	X	X		
Greater Black-backed Gull	*Larus marinus*	X			
Glaucous Gull	*Larus hyperboreus*	X			X
Caspian Tern	*Sterna caspia*	X	X	X	

Common name	Scientific name	Spring	Summer	Fall	Winter
Common Tern	*Sterna hirundo*	X	X	X	
Arctic Tern	*Sterna paradisaea*	X	X		
Forster's Tern	*Sterna forsteri*	X	X	X	
Black Tern	*Chlidonias niger*	X	X		
Doves					
Rock Dove	*Columba livia*	X	X	X	X
Mourning Dove	*Zenaida macroura*	X	X	X	X
Cuckoos and Roadrunners					
Black-billed Cuckoo	*Coccyzus erythropalmus*	X	X		
Owls					
Great Horned Owl	*Bubo virginianus*	X	X	X	X
Snowy Owl	*Nyctea scandiaca*				X
Northern Hawk Owl	*Surnia ulula*				X
Barred Owl	*Strix varia*	X	X	X	X
Great Gray Owl	*Strix nebulosa*	X	X	X	X
Long-eared Owl	*Asio otus*	X		X	
Short-eared Owl	*Asio flammeus*	X	X	X	
Boreal Owl	*Aegolius funereus*				X
Northern Saw-whet Owl	*Aegolius acadicus*	X	X	X	X
Nighthawks and Nightjars					
Common Nighthawk	*Chordeiles minor*	X	X	X	
Whip-poor-will	*Capirmulgus vociferus*	X	X	X	
Swifts					
Chimney Swift	*Chaetura pelagica*	X	X	X	
Hummingbirds					
Ruby-throated Hummingbird	*Archilochus colubris*	X	X	X	
Kingfishers					
Belted Kingfisher	*Ceryle alcyon*	X	X	X	X
Woodpeckers					
Red-headed Woodpecker	*Melanerpes erythrocephalus*	X	X	X	X
Red-bellied Woodpecker	*Melanerpes carolinus*	X	X	X	X
Yellow-bellied Sapsucker	*Sphyrapicus varius*	X	X	X	
Downy Woodpecker	*Picoides pubescens*	X	X	X	X
Hairy Woodpecker	*Picoides villosus*	X	X	X	X
American Three-toed Woodpecker	*Picoides tridactylus*				X
Black-backed Woodpecker	*Picoides arcticus*	X	X	X	X
Northern Flicker	*Colaptes auratus*	X	X	X	
Pileated Woodpecker	*Dryocopus pileatus*	X	X	X	X
Flycatchers					
Olive-sided Flycatcher	*Contopus cooperi*	X	X	*	
Eastern Wood Pewee	*Contopus virens*	X	X	*	
Yellow-bellied Flycatcher	*Empidonax flaviventrus*	X	X	*	
Alder Flycatcher	*Empidonax alnorum*	X	X	*	
Least Flycatcher	*Empidonax minimus*	X	X	*	

Common name	Scientific name	Spring	Summer	Fall	Winter
Eastern Phoebe	*Sayornis phoebe*	X	X	X	
Great-crested Flycatcher	*Myiarchus crinitus*	X	X	X	
Eastern Kingbird	*Tyrannus tyrannus*	X	X	*	
Western Kingbird	*Tyrannus verticalis*	X	X		
Shrikes					
Northern Shrike	*Lanius excubitor*	X		X	X
Loggerhead Shrike	*Lanius ludovicianus*	X			
Vireos					
Yellow-throated Vireo	*Vireo flavifrons*	X	X		
Blue-headed Vireo	*Vireo solitarius*	X	X	X	
Warbling Vireo	*Vireo gilvus*	X	X	X	
Philadelphia Vireo	*Vireo philadelphicus*	X		X	
Red-eyed Vireo	*Vireo olivaceus*	X	X	X	
Jays, Magpies, and Crows					
Blue Jay	*Cyanocitta cristata*	X	X	X	X
American Crow	*Corvus branchyrhynchos*	X	X	X	X
Common Raven	*Corvus corax*	X	X	X	X
Larks					
Horned Lark	*Eremophila alpestris*	X		X	
Swallows					
Purple Martin	*Progne subis*	X	X		
Tree Swallow	*Tachycineta bicolor*	X	X	X	
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	X	X		
Cliff Swallow	*Petrochelidon pyrrhonota*	X	X		
Bank Swallow	*Riparia riparia*	X	X		
Barn Swallow	*Hirundo rustica*	X	X	X	
Chickadees and Titmice					
Black-capped Chickadee	*Poecile atricapilla*	X	X	X	X
Boreal Chickadee	*Poecile hudonicus*	X		X	X
Nuthatches					
Red-breasted Nuthatch	*Sitta canadensis*	X	X	X	X
White-breasted Nuthatch	*Sitta carolinensis*	X	X	X	X
Creepers					
Brown Creeper	*Certhia americana*	X	X	X	X
House Wren	*Trogodytes aedon*	X	X	X	
Winter Wren	*Trogodytes troglodytes*	X	X	X	
Sedge Wren	*Cistothorus platensis*	X	X		
Marsh Wren	*Cistothorus palustris*	X	X	X	
Kinglets, Bluebirds, Thrushes					
Golden-crowned Kinglet	*Regulus satrapa*	X	X	X	X
Ruby-crowned Kinglet	*Regulus calendula*	X	X	X	
Eastern Bluebird	*Sialia sialis*	X	X	X	
Veery	*Catharus fuscescens*	X	X	X	
Gray-cheeked Thrush	*Catharus minimus*	X		X	

Common name	Scientific name	Spring	Summer	Fall	Winter
Swainson's Thrush	*Catharus ustulatus*	X	X	X	
Hermit Thrush	*Catharus guttatus*	X	X	X	
Wood Thrush	*Hylocichla mustelina*	X	X	X	
Varied Thrush	*Ixoreus naevius*	X		X	
American Robin	*Turdus migratorius*	X	X	X	X
Mimics					
Gray Catbird	*Dumetella carolinensis*	X	X	X	
Northern Mockingbird	*Mimus polyglottos*	X	X		
Brown Thrasher	*Toxostoma rufum*	X	X	X	
Starlings					
European Starling	*Sturnus vulgaris*	X	X	X	X
Pipits					
American Pipit	*Anthus rubescens*	X		X	
Waxwings					
Bohemian Waxwing	*Bombycilla garrulus*	X		X	X
Cedar Waxwing	*Bombycilla cedrorum*	X	X	X	X
Warblers					
Golden-winged Warbler	*Vermivora chrysoptera*	X	X	X	
Tennessee Warbler	*Vermivora peregrina*	X	X	X	
Orange-crowned Warbler	*Vermivora celata*	X		X	
Nashville Warbler	*Vermivora ruficapilla*	X	X	X	
Yellow Warbler	*Dendroica petechia*	X	X	X	
Northern Parula	*Parula americana*	X	X	X	
Chestnut-sided Warbler	*Dendroica pensylvanica*	X	X	X	
Magnolia Warbler	*Dendroica magnolia*	X	X	X	
Cape May Warbler	*Dendroica tigrina*	X	X	X	
Black-throated Blue Warbler	*Dendroica caerulescens*	X	X	X	
Yellow-rumped Warbler	*Dendroica coronata*	X	X	X	
Black-throated Green Warbler	*Dendroica virens*	X	X	X	
Blackburnian Warbler	*Dendroica fusca*	X	X	X	
Pine Warbler	*Dendroica pinus*	X	X	X	
Palm Warbler	*Dendroica palmarum*	X	X	X	
Bay-breasted Warbler	*Dendroica castanea*	X	X	X	
Blackpoll Warbler	*Dendroica striata*	X		X	
Black-and-white Warbler	*Mniotilta varia*	X	X	X	
American Redstart	*Setophaga ruticilla*	X	X	X	
Ovenbird	*Seiurus aurocapillus*	X	X	X	
Northern Waterthrush	*Seiurus noveboracensis*	X	X	X	
Connecticut Warbler	*Oporornis agilis*	X	X		
Mourning Warbler	*Oporornis philadelphia*	X	X	X	
Common Yellow-throat	*Geothylpis trichas*	X	X	X	
Wilson's Warbler	*Wilsonia pusilla*	X	X		
Canada Warbler	*Wilsonia canadensis*	X	X	X	
Tanagers					
Scarlet Tanager	*Piranga olivacea*	X	X	X	

Common name	Scientific name	Spring	Summer	Fall	Winter
Western Tanager	*Piranga ludoviciana*	X			
Sparrows, Buntings, Grosbeaks					
Eastern Towhee	*Pipilo erythrophthalmus*	X	X		
American Tree Sparrow	*Spizella arborea*	X	X	X	
Chipping Sparrow	*Spizella passerina*	X	X	X	
Clay-colored Sparrow	*Spizella pallida*	X	X	X	
Field Sparrow	*Spizella pusilla*	X	X	X	
Vesper Sparrow	*Pooecetes gramineus*	X	X	X	
Lark Sparrow	*Chondestes grammacus*	X			
Lark Bunting	*Calamospiza melanocorys*	X			
Savannah Sparrow	*Passerculus sandwichensis*	X	X	X	
Grasshopper Sparrow	*Ammodramus savannarum*	X	X		
Le Conte's Sparrow	*Ammodramus leconteii*	X	X	X	
Fox Sparrow	*Passerella iliaca*	X		X	
Song Sparrow	*Melospiza melodia*	X	X	X	
Lincoln's Sparrow	*Melospiza lincolnii*	X	X	X	
Swamp Sparrow	*Melospiza georgiana*	X	X	X	
White-throated Sparrow	*Zonotrichia albicollis*	X	X	X	
Harris's Sparrow	*Zonotrichia querula*	X		X	
White-crowned Sparrow	*Zonotrichia leucophrys*	X		X	
Dark-eyed Junco	*Junco hyemalis*	X	X	X	X
Lapland Longspur	*Calcarius lapponicus*	X		X	
Snow Bunting	*Plectrophenax nivalis*	X		X	X
Northern Cardinal	*Cardinalis cardinalis*	X	X	X	X
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	X	X	X	
Indigo Bunting	*Passerina cyanea*	X	X	X	
Dickcissel	*Spiza americana*	X	X		
Blackbirds and Orioles					
Bobolink	*Dolichonyx oryzivorus*	X	X	X	
Red-winged Blackbird	*Agelaius phoeniceus*	X	X	X	
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	X	X	X	
Eastern Meadowlark	*Sturnella magna*	X	X	X	
Western Meadowlark	*Sturnella neglecta*	X	X	X	
Rusty Blackbird	*Euphagus carolinus*	X		X	
Brewer's Blackbird	*Euphagus cyanocephalus*	X	X	X	
Common Grackle	*Quiscalus quiscula*	X	X	X	X
Brown-headed Cowbird	*Molothrus ater*	X	X	X	
Orchard Oriole	*Icterus spurius*	X			
Baltimore Oriole	*Icterus galbula*	X	X		
Finches					
Pine Grosbeak	*Pinicola enucleator*	X		X	X
Purple Finch	*Carpodacus purpureus*	X	X	X	X
House Finch	*Carpodacus americana*	X	X	X	X
Red Crossbill	*Loxia curvirostra*	X	X	X	X

Common name	Scientific name	Spring	Summer	Fall	Winter
White-winged Crossbill	*Loxia leucoptera*	X	X	X	X
Common Redpoll	*Carduelis flammea*	X		X	X
Hoary Redpoll	*Carduelis hornemanni*				X
Pine Siskin	*Carduelis pinus*	X	X	X	X
American Goldfinch	*Carduelis tristis*	X	X	X	X
Evening Grosbeak	*Coccothraustes vespertinus*	X	X	X	X
Old World Sparrows					
House Sparrow	*Passer domesticus*	X	X	X	X

Asterisk * – Early migrants (i.e., flycatchers) largely migrate south in late summer.

Whittlesey Creek NWR Amphibians

Common Name	*Scientific Name*
Central Newt	*Notophthalmus viridescens*
Common Mudpuppy	*Necturus maculosus*
Blue-spotted Salamander	*Ambystoma laterale*
Spotted Salamander	*Ambystoma maculatum*
Four-toed Salamander	*Hemidactylium scutatum*
Eastern Red-backed Salamander	*Plethodon cinereus*
Eastern American Toad	*Bufo americanus*
Northern Spring Peeper	*Pseudacris crucifer*
Western chorus frog	*Pseudacris triseriata*
Gray Treefrog	*Hyla versicolor*
American Bullfrog	*Rana catesbeiana*
Green Frog	*Rana clamitans*
Northern Leopard Frog	*Rana pipiens*
Mink Frog	*Rana septentrionalis*
Wood Frog	*Rana sylvatica*

Whittlesey Creek NWR Reptiles

Common Name	*Scientific Name*
Common Snapping Turtle	*Chelydra serpentina*
Painted Turtle	*Chrysemys picta*
Wood Turtle	*Clemmys insculpta*
Northern Prairie Skink	*Eumeces septentrionalis*
Ring-necked Snake	*Diadophis punctatus*
Western Fox Snake	*Elaphe vulpina*
Eastern Hog-nosed Snake	*Heteron platirhinos*
Northern Water Snake	*Nerodia sepidon*
Smooth Green Snake	*Opheodrys vernalis*
Northern Red-bellied Snake	*Storeria occipitomaculata*

Common Name	*Scientific Name*
Common Garter Snake	*Thamnophis sirtalis*

Whittlesey Creek NWR Fish

Common name	*Scientific name*
Brown Trout*	*Salmo trutta*
Brook Trout	*Salvelinus fontinalis*
Rainbow Trout*	*Oncorhynchus mykiss*
Coho Salmon*	*Oncorhynchus kisutch*
Chinook Salmon*	*Oncorhynchus tshawytscha*
Splake (hybrid)	Lake trout x brook trout
Slimy Sculpin	*Cottus cognatus*
Ninespine Stickleback	*Pungitius pungitius*
Brook Stickleback	*Culaea inconstans*
Common Shiner	*Luxilus cornutus*
Spottail Shiner	*Notropis hudsonius*
Blackchin Shiner	*Notropis heterodon*
Johnny Darter	*Etheostoma nigrum*
Fathead Minnow	*Pimephales promelas*
Blacknose Dace	*Rhinichthys atratulus*
White Sucker	*Catostomus commersoni*
Rainbow Smelt*	*Osmerus mordax*
Creek Chub	*Semotilus atromaculatus*
Central Mudminnow	*Umbra limi*

Asterisk * indicates introduced species

Appendix C: Whittlesey Creek NWR Habitat Management Plan, Chapter IV

Note that page numbers references used within this appendix (C) refer to the original document's page numbering and not the page numbering of this comprehensive conservation plan.

IV. Habitat Goals, Objectives and Strategies

Habitat and population goals were adopted for the Whittlesey Creek NWR when the Interim Comprehensive Conservation Plan was written. Revisions to the original goals were made for this plan, only to clarify, add watershed approaches or merge similar habitats into one goal. The intent and direction of the original goals were not altered.

The goals and objectives discussed in this document were developed with an understanding that upstream events, both past and present, directly impact the streams and floodplain within the refuge. Our goals, objectives and strategies must be based on flows and sediments entering the refuge from upstream. As engaged landowners continue to restore habitats that reduce flows and sediments, our objectives can be better defined.

The Service will gain a much better understanding of the dynamics of sediment entering the stream once a sediment transport study has been done. This study will identify sediment sources, quantify the amount, and model the movement of sediment entering and moving through the system. Until this study is done, stream restoration objectives within the Whittlesey Creek NWR will not be set, because anything we might try to do could be negated with excess sediment buildup or simply lost to high flood flows.

Goals, objectives and strategies are divided into two categories based on land ownership: Whittlesey Creek NWR and private lands. Private lands here refer to lands that are upstream of the refuge boundary and located within the surface water drainage area of Whittlesey Creek (Figure 2). The Service has no jurisdiction or authority over private land actions, but it can provide financial and technical assistance to landowners who are interested in restoring fish and wildlife habitat.

Several resources were used to redraft goals and draft objectives:

- Refuge staff convened a group of scientists that have expertise in hydrology, geomorphology, fisheries biology or wildlife biology to identify stream reaches and describe potential habitat and geomorphic characteristics for each reach. They were extremely helpful in formulating stream goals and objectives. A list of participants is provided in Appendix C.

- We convened another group of scientists that have expertise in plant ecology and soils to help us identify historic and potential native plants for the floodplain. A list of participants from this group is provided in Appendix C.

- We relied on data collected for the Whittlesey Creek hydrology study, as well as results of the analysis from this work (Lenz et al. 2003). Faith Fitzpatrick of USGS and coauthor of the Whittlesey Creek hydrology study (Lenz et al. 2003) and Marty Melchoir of inter-fluve, inc. provided valuable insight and helped us quantify objectives for the stream.

- Other reports and studies were used as references, such as the "Bayfield Peninsula Stream Assessment" (inter-fluve, inc. and Graber 2003) and "Guidelines for Evaluating Fish Habitat in Wisconsin Streams" (Simonson et al. 1993).

Steam objectives are set to provide habitat for coaster brook trout. If these objectives are not reachable by slowing overland flow and reducing sediment inputs, then the Service assumes the stream will still provide habitat for other fish and wildlife species, such as wood turtle, black duck and coho salmon.

A. Habitat Goals

Habitat Goal 1 – Stream: Restore watershed[1] and stream hydrologic functions that improve fish and wildlife habitat within the stream and the refuge, with an emphasis on native species.

Brook Trout Population Goal: Establish a self-sustaining brook trout population in the Whittlesey Creek watershed that exhibits a migrating life history.

Objectives and Strategies are laid out in the document titled, "An experiment to establish a self-sustaining brook trout population in Whittlesey Creek that exhibits a migrating life history (coaster) by stocking, enacting protective regulations and implementing habitat improvements." Specific objectives are:

1) By 2030, establish a self-sustaining migratory brook trout population. A population is considered self-sustaining when it supports itself for at least two life spans after stocked fish no longer contribute to recruitment.

2) Stocking Objective: Establish 25 spawning pairs of brook trout exhibiting the migratory life history.

Assessment needs, stocking schedules and monitoring requirements are specified in the Whittlesey Creek Brook Trout plan mentioned above.

Habitat improvements will improve the chances of success for Coaster Brook Trout and other species of concern, such as wood turtle and northern water shrew. The following habitat objectives are laid out to improve brook trout survival.

<u>Objectives for Entire Whittlesey Creek:</u>

Objectives for Whittlesey Creek are to slow the flow of water over the upland and within the stream. These objectives are measured with geomorphic terms. In the next 30 years, Whittlesey Creek will have:

1) A 20 percent reduction in flood peaks in Whittlesey Creek, as measured by 2 to 10 year flood events.

2) In-channel roughness of 0.06 (using Manning's roughness coefficient). [2]

3) Roughness coefficient of overland flow increased to 0.5 (using overland flow coefficient calculated in SWAT model (Lenz et al. 2003)).[3]

[1] Watershed in goals, objectives and strategies refers to the surface-water contributing portion of the watershed only.
[2] Manning's roughness coefficient represents the resistence to flood flows in a stream channel. A streambed with a lot of debris, boulders, rubble or vegetation will have a higher roughness coefficient. A rough stream will slow flood flows and the erosive power of a stream. The Manning's coefficient of 0.6 corresponds to a stream with a large amount of large woody debris. North Fork Reach 2 is the most important stretch for increasing channel roughness in the Whittlesey watershed.

Objectives for Whittlesey Creek Within Refuge:

Within the next 30 years, Whittlesey Creek will have:

4) Whittlesey Creek Reach 1: A moving, dynamic channel and delta with the channel freely meandering in the floodplain. Conditions allow spawning adult fish to pass to spawning sites. Adjacent wetlands and floodplains are dominated by native tree, shrub and emergent vegetation.

5) Whittlesey Creek Reach 2: A naturalized stream channel, with variable depth and cover. Habitat rated as good to excellent when using Simonson et al. (1993) quantitative habitat assessment for Wisconsin streams.[4] Native riparian vegetation with a diversity of tree age classes and good shrub cover. The floodplain reconnected to the stream.

Objectives for Whittlesey Creek Within Private Lands:

The Service will work with partners and private landowners to restore the Creek toward:

6) Whittlesey Creek Reaches 3 – 5: Complex in-stream habitat with good cover (large woody debris, undercut banks, boulders, and macrophytes), pools, gravel and overhead riparian cover (rating of good to excellent when using Simonson et al. (1993) quantitative habitat assessment for Wisconsin streams). Riparian forest maturing naturally, to include conifers co-dominant with hardwoods. The floodplain reconnected to the stream.

7) Whittlesey Creek Reaches 6 and 7: Sediments entering the stream from this reach significantly reduced.[5] Complex in-stream habitat with good cover (large woody debris, undercut banks, boulders), especially good pool structure and overhead riparian cover (rating of good when using Simonson et al. (1993) quantitative habitat assessment for Wisconsin streams). Riparian forest maturing naturally, with conifers co-dominant with hardwoods. Stream water temperatures below 70 °F.

8) North Fork Reach 1: Same as Whittlesey Creek reaches 3 - 5.

9) North Fork Reach 2: Adequate fish passage between North Fork Reaches 2 and 3, without creating incision problems below Cozy Corner Rd. Complex in-stream habitat with good cover (large woody debris, undercut banks, boulders, and macrophytes), pools, gravel and overhead riparian cover (rating of good to excellent when using Simonson et al. (1993) quantitative habitat assessment for Wisconsin streams). Riparian forest maturing naturally, with conifers co-dominant with hardwoods.

10) North Fork Reach 3: Large upstream wetland protected and maintained.

Objectives for Terwilliger and Little Whittlesey Creeks Within the Refuge:

Within the next five years, the Service will have determined the potential to restore Little Whittlesey and Terwilliger Creeks as tributaries to Whittlesey Creek within reach 2, as they may have done historically.

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[3] Overland flow is also referred to as sheetflow. It is surface runoff from rain that is not absorbed (infiltrated into the ground) but insead fills small depressions and runs downslope into streams. In the SWAT model, the overland flow is related to vegetation type and soil type.

[4] Refuge staff will consider each habitat variable on a case-by-case basis and use those that fit well with Whittlesey Creek specifically and Bayfield peninsula streams generally.

[5] We will need to complete a sediment transport study to give us amounts of sediments that are entering and flowing through the system. Then we can set quantifiable objectives for this reach.

Strategies for Whittlesey Creek Within Refuge:
Clear, quantifiable strategies cannot be identified for the stream within the refuge until a sediment transport study is completed (objective 1, page 45). This study will not only identify quantity, flow and deposition of sediments, but will also provide recommendations for how to meet our objectives for reaches 1 and 2. In the meantime, broad strategies are placeholders for future, specific strategies. Many private lands strategies will also apply to appropriate habitats within the refuge.

Stream Strategy 1: Reach 1 – Investigate the possibility of removing spoil banks that were deposited when the stream was channelized, along with other man-induced barriers, to allow the stream to meander within the floodplain.

Stream Strategy 2: Reaches 1 and 2 - Restore natural stream channel as recommendations are provided in the sediment transport study (objective 1, page 45).

Stream Strategy 3: Reach 2 – Improve stream habitat in conjunction with or in addition to natural stream channel restoration work. Determine specific work to be conducted as part of stream restoration design.

Strategies for Whittlesey Creek on Private Lands[6]:
Private Lands Strategy 1: Slow overland flow
This strategy will help fulfill objective 3 (page 40) regarding slowing overland flow by increasing surface "roughness." Upland roughness can be increased by adding obstructions that will slow water as it flows over the watershed's clay soils. Wetlands, wooded land, surface micro-topography, and shrubs are examples of such obstructions that reduce flow (Lenz et al. 2003; Fitzpatrick et al. 1999) and can also be good wildlife habitat. The Service will work with willing landowners and other partners to add these features in appropriate places. The Service, in cooperation with partners, will rerun the SWAT model (from Lenz el al. 2003) and the watershed health/open lands model[7] (Kroska 2005) adding restored habitat features to determine if we can sufficiently increase overland roughness to slow the flow. We will also analyze our actions on a subwatershed basis to help set priorities. Until these models are rerun, we will give priority to uplands around North Fork 2 and Whittlesey Creek 6 and 7 reaches. This is also the highest priority strategy to implement.

Private Lands Strategy 1a: Restore wetlands and create detention ponds.

Private Lands Strategy 1b: Plant trees and shrubs on abandoned fields and open lands (new clearcuts), encouraging conifers such as red pine, white pine and white spruce, as much as possible.

Private Lands Strategy 1c: Restore hydrology of old fields (by filling old ditch networks) that were leveled and drained, but are no longer used for agriculture.

Private Lands Strategy 1d: Experiment with other new techniques as they are developed (infiltration ponds, detention wetlands, etc.)

[6] All strategies on private lands will be conducted with willing landowners who voluntarily agree to work with the Service and other partners to participate in habitat projects. Also, these projects will be limited to the surface-drainage portion of the watershed.
[7] This model was developed in 2004 and 2005 as part of the project titled: Comparative Analysis of Subwatersheds in the WI Portion of the Lake Superior Watershed. The project is a joint effort of the Wisconsin Coastal Management Program (Wisconsin Department of Administration), the Great Lakes Protection Fund (Wisconsin DNR) and the Ashland/Bayfield/Douglas/Iron Counties Land Conservation Department.

Private Lands Strategy 2: Reduce gully erosion
This strategy will help us meet the sediment reduction goal (page 45). Measurable objectives were not developed for this goal, but practices to reduce sediment inputs can still be implemented. The Bayfield Peninsula Stream Assessment report noted that gully erosion of tributaries, especially those near open land, is a source of sediments into Bayfield streams (inter-fluve and Graber 2003). Inter-fluve inc. also provided recommendations for actions that can reduce erosion and restore hydrology to these tributaries. One of their recommendations is incorporated into this plan: that the Wisconsin DNR's best management practice of 35 foot no-harvest buffers around intermittent streams (Wisconsin DNR 1995) be increased to 50 feet for Whittlesey Creek because of steeper slopes and heavy clay soils. They also recommended a selective harvest buffer (no clearcuts) within 300 feet of intermittent streams in the Whittlesey watershed.

Several landowners in the Whittlesey watershed have replaced stream and tributary crossings that were eroding and/or causing increased erosion downstream of the crossing. Additional opportunities to stem erosion from gullies, either at crossings or elsewhere likely exist. The Service will work with interested landowners and partners to provide technical and financial assistance to fix such sites. Priority will be given to problems that affect Whittlesey Creek reaches 6 and 7, and North Fork reaches 2 and 3.

Private Lands Strategy 2a: Identify roads that cross stream tributaries or are near the stream bank. Note crossings and roads that are exacerbating gully erosion, and restore hydrology and habitat to reduce erosion where possible.

Private Lands Strategy 2b: Identify other gully erosion problem areas, such as those created by field drainages, and use appropriate technology to fix them.

Private Lands Strategy 2c: Encourage no-cut zones of at least 50 feet around steep gullies and tributaries and recommend selective harvest within 300 feet of them.

Private Lands Strategy 2d: Where there are no trees near steep gullies, tributaries, and high terraces, plant buffer zones of trees and shrubs that are at least 100 feet wide (interfluve inc. and Graber 2003).

Private Lands Strategy 3: Reduce bank and slump erosion
This strategy will also help meet the sediment reduction goal (page 45). There are a few locations that have large slumps creating substantial bank erosion. The Service is not suggesting that we armor banks that are eroding – that is often counterproductive to stream dynamics and if not done correctly, will reduce in-stream habitat. There are some locations, however, where proper technology can reduce erosion from slumps. U.S. Geological Survey has successfully installed flow-deflecting vanes[8] in the North Fork of Fish Creek to stop erosion from 100 foot tall banks (Fitzpatrick et.al, 2004). The Service and Partners have incorporated large woody debris to stabilize a slump that was eroding in reach 5 of Whittlesey Creek. The partners do not know yet whether that action will be successful. All actions to reduce slump erosion must be carefully designed and placed appropriately.

Private Lands Strategy 3a: Identify locations of bank slumps that add large sediment loads and use appropriate technology to fix them.

[8] Vanes are vertical plates that protrude from a stream-bed about one-third of the bankfull depth, are oriented at an angle to the local stream velocity, and are distributed in a group along the stream near the eroding bank. They deflect the flow and cause sedimentation at the toe of a cut bank, preventing further undercutting and helpint to stabilize the bank.

Private Lands Strategy 4: Install large woody debris and riffle grade structures in appropriate areas to reduce flood power.
This strategy will help meet objective 2 regarding channel roughness (page 40) under habitat goal 1. Flood power is a function of water's specific weight, flow and channel slope. When the roughness of the channel increases, flood power is reduced. Inter-fluve inc. and Graber (2003) note that prior to settlement, channel roughness was likely very high due to complex log jams in the channel and floodplain. The addition of properly sized and placed log jams is an appropriate means to add channel roughness to Bayfield peninsula streams. Whittlesey Creek has substantial access difficulties, with steep slopes and few roads to the creek. This confounds large woody debris projects in Whittlesey Creek. One project has been done where Whittlesey Creek flows through Galligan Farms in Reach 5. There are likely other locations that are possible large woody debris project sites if landowners are interested. The best location for these projects is above the regional groundwater discharge area (upper end of reach 5, reaches 6 and 7), where excess sand can accumulate and not affect spawning sites.

Private Lands Strategy 5: Protect groundwater discharge areas by purchasing conservation easements from willing sellers.
The largest groundwater discharge area (about 18 cfs) is located around the confluence of Whittlesey Creek and the North Branch (Lenz et al. 2003). These groundwater upwellings are also important spawning and nursery areas for trout and salmon in Whittlesey. In-stream habitat is better here than anywhere else within the drainage, but there remain limiting factors, such as shallow pools and sparse overhanging vegetation (inter-fluve, inc. and Graber 2003). Much of the riparian vegetation is nearing maturity (70 to 80 years old), and could be a good source of large woody debris.

The most effective means to protect this groundwater discharge area is to leave it alone. An appropriate easement would restrict any activity such as trails, roads, buildings, and logging within and near the discharge area. Easements are purchased only from willing landowners.

Private Lands Strategy 6: Purchase development rights from willing landowners on lands with development potential that are located in sensitive portions of the watershed.
The SWAT analysis showed that daily mean flow on peak flood days would increase up to 12 percent if the basin were developed to 25 percent urban (Lenz et al. 2003). Whereas this substantial change from rural residential and agriculture to urban is not likely to happen within the next 20 years, concerns remain about roads that increased housing development could bring. Roads channelize flows and often increase erosion and sedimentation. Housing development often fragments habitats, which can reduce wildlife populations that require large blocks of habitat. Human habitation will bring in domestic cats and dogs that prey on wildlife. The Service will therefore purchase development rights from willing landowners, especially in the upper portion of the watershed.

Private Lands Strategy 7: Find or develop a program that provides incentives and technical assistance for sustainably managing forests along riparian corridors and upland buffers.
Retention of existing forest cover in the basin will help keep peak flows at current levels.[9] Most landowners obtain income from their forests, and if they are following a management plan, are also required to harvest timber to improve stands and diversity. The Service will encourage the use of existing state programs to maintain sustainable forestry, but not all forest lands are or can be included in state program. The Service proposes to work with partners to provide additional incentives to either forgo timber harvest in some areas, such as steep slopes, or to provide an additional means to manage forests. It will be important to include tributaries of Whittlesey Creek in this program. It will also be

[9] Increasing forest cover is provided in strategy 1b.

important to emphasize growth of conifers, such as white pine, red pine, white spruce and white cedars, as much as possible. Mature trees will eventually fall into the stream bank to provide large woody debris.

Habitat Goal 2 - Sediments: Reduce sediment loads into Whittlesey Creek to historic (pre-European settlement) range of variability.

Sediment Objective:

Within the next five years, conduct a sediment transport study to determine the amount and supply of sediment load in the stream, and to determine the proper sizing and geomorphology of Whittlesey Creek through the refuge.

Habitat Goal 3 – Floodplain and Wetland Hydrology: Restore to the extent possible floodplain function in the coastal wetlands and floodplains of the refuge.

Hydrology Objective:

Restore habitat by reconnecting the floodplain to the stream and allowing overbank flooding onto all stream floodplains within the refuge at least once a year.

Hydrology Strategy 1: Within the next five years, review road and bridge infrastructure within the refuge to identify how transportation needs and habitat restoration needs can overlap.

Hydrology Strategy 2: Within the old golf course, remove fill, especially in areas that have high groundwater to restore flooded conditions. Consider re-contouring the bottoms of some of the deep ponds to provide one-half to three feet of water.

Habitat Goal 4 – Floodplain Habitat: Restore native species composition of trees and shrubs in the floodplain that will provide heterogeneous vertical and horizontal structure for migratory bird habitat.

Floodplain within the refuge includes lowland forest, lowland shrub, riparian forest and coastal wetland. These habitats can provide for several species of concern: northern waterthrush, veery, northern black current, marsh horsetail, and black duck. The habitat objectives for lowland forest and shrub are based on habitat needs of veery.

Objectives for Lowland Forest and Shrub:

Over the next 50 years, aim for a mosaic of native trees and shrubs, both deciduous and coniferous, that provide a relatively open tree canopy (25 to 60 percent canopy cover) and a dense shrub canopy cover (25 to 50 percent). Habitat patches should be at least 250 acres contiguous with adjacent Wisconsin DNR and Northern Great Lakes Visitor Center lands.

Objective for Riparian Forest:

Remove exotic trees and shrubs and restore native tree and shrub canopy cover at a rate that provides a 75 percent canopy cover on the stream through the refuge; allow these trees to mature and drop into the stream to produce large woody debris.

Objective for Coastal Wetland:

Eliminate invasive plant species and allow the native plants to follow a natural successional pathway.

Coastal Wetland Strategy: Eliminate invasive species according to invasive free zone objectives and strategies, and provide native species restoration when necessary and possible.

Strategies for Floodplain within the Refuge:

Floodplain Strategy 1. Replace reed canarygrass with native species.
Floodplain objectives are to restore hydrology (page 45) and native species (see objectives under floodplain habitat goal, page 45). Over 50 percent of the floodplain is infested with varying densities of reed canarygrass, which seriously inhibits native species growth. This invasive species is most prevalent where land had been logged, drained, farmed and then abandoned. Reed canarygrass was likely planted for cattle forage in some of these fields. Reed canarygrass has dominated these fields for many years, so the seed bank will be very dense.

The Service's goal is to eliminate all invasive plant species on refuge and Northern Great Lakes Visitor Center lands. A more detailed description of the invasive project is provided later (page 47). The invasive species inventory, and control and monitoring plan will be appended to this document once it is completed (late 2006). That plan will provide details on location and timing of strategies recommended in this section.

Recent studies of reed canarygrass have provided excellent guidelines for its control and for restoring native species in its place (Reinhardt and Galatowitsch 2004; Tu 2004). It is expected that reed canarygrass control will take several years. The Service's preliminary strategy is to:

- Annually treat reed canarygrass as seed heads emerge, typically in August, with Rodeo or a similar glyphosate herbicide using selective (weed wiper) application techniques. At this growth stage the species is most susceptible to systemic herbicides.
- Continue annual herbicide application to control both established plants and new plants arising from the seed bank. Monitoring, described below, will guide the decision to discontinue herbicide treatment and proceed with habitat restoration.
- Remove the duff layer, either by mowing or burning during the year prior to habitat restoration.
- Till to prepare for planting.
- Replant to adapted woody and herbaceous native species. Lists of such species will be developed for use in various floodplain locations.

Floodplain Strategy 2. Plant native conifers along stream corridor.
Plant red pine, white spruce and other adapted conifers interspersed with hardwood shrubs and trees. Plant cedar and hemlock in patches that can be protected from deer browsing with techniques such as exclosures or repellent sprays.
Note: This strategy should not be implemented until decisions have been made on stream and floodplain hydrological restoration.

Floodplain Strategy 3. Allow natural succession to take place.
Some areas within the floodplain are dominated by native species. Native trees and shrubs are reestablishing themselves in former agricultural fields that haven't been in production for many years. Where native species make up greater than 50% of the tree and shrub canopy, plants will be left alone

to follow natural successional pathways. Where trees and shrubs make up less than 50% of the canopy, but where it appears their cover is increasing, consider allowing natural succession to take place. Where appropriate, speed succession by inter-planting swamp conifers such as cedars and protect them from deer browsing with exclosures or repellent sprays.

Strategies for All Refuge Lands and Habitats - Invasive Free Zone Development:
The U.S. Fish and Wildlife Service, U.S. Forest Service and partners of the Northern Great Lakes Visitor Center (Center) are establishing the Whittlesey Creek NWR and the lands of Center as a model Invasive Free Zone, covering 720 acres. The model will include inventory and control of terrestrial and emergent aquatic plants that are non-native invasives, along with an education program about invasive species. The project will integrate inventory and control programs of two federal agencies on their adjacent lands and cooperate with private landowners to participate in inventory and control efforts. The Center will be used as a platform to demonstrate invasive species control and prevention, as well as native habitat restoration.

The Invasive Free Zone includes: inventory of invasive species known or suspected to be present, initial control of targeted species that are present, development of a plan to prevent further spread on Invasive Free Zone lands, development of education and interpretive programs to be given at the Center, and presentation of the project's successes and failures to Lake Superior basin agencies and interested parties. Future work will include: continued control and prevention of newly-found invasive species on federal and private lands, additional delivery of education and interpretive programs at the Center and refinement of our model based on successes and failures. Our experience and results will be used to produce a "case study" which will be circulated widely to serve as a template for other interested parties.

Invasive Free Zone Strategy 1: Comprehensive inventory of terrestrial and emergent aquatic plant invasive species.
Standardized methods will be used to ensure systematic GPS mapping and documentation of invasive species. All collected data will be managed via the refuge's geographic information system.

Invasive Free Zone Strategy 2: Control of known invasive species
Target exotic buckthorn, exotic bush honeysuckle, purple loosestrife and reed canarygrass for initial control. Generally, the following techniques will be used:

- Buckthorn and Honeysuckle – Cut stems and apply herbicide to the stumps. Marking paint will also be applied to monitor treatment efficacy.
- Purple loosestrife – Large infestations are found at the mouth of Whittlesey. Smaller infestations are found along road rights-of-way. Control larger infestations with *Galerucella sp.* beetles. Small infestation will be treated with Rodeo or similar herbicide using selective (weed wiper) application techniques.
- Reed canarygrass – Strategies are provided in the Floodplain strategy section (page 46).

Invasive Free Zone Strategy 3: Design a monitoring program for all species.
Monitoring will be targeted by species. Spatially referenced locations will be established for long-term monitoring of invasive control and habitat restoration results. Monitoring techniques will include transects, quadrats, photo-points and possibly aerial photo interpretation. Monitoring will guide follow up control, restoration and maintenance efforts.

Invasive Free Zone Strategy 4: Develop a plan for prevention of spread and future control.
A thorough literature search, consultations and experience will guide the U.S. Fish and Wildlife Service and the U.S. Forest Service in formulating prescriptions to eradicate terrestrial and emergent

aquatic invasive plant species within the Invasive Free Zone. The plan will include recommended techniques, a control schedule, expected costs and a monitoring program as described above. Restoration of appropriate native flora will be included. The plan will also identify and incorporate additional partners for the project.

Invasive Free Zone Strategy 5: Demonstrate lessons learned and provide education about invasive species.
The partnership between federal agencies and private landowners within the refuge, as well as educational opportunities provided at the Center, make this an ideal setting to demonstrate this model of cooperation and to educate visitors about the need to stop invasive species. An education program will be developed cooperatively with the U.S. Forest Service and partners of the Center.

Invasive Free Zone Strategy 6: Promotion
A plan to market the project beyond our boundaries will be developed that will include outreach to other agencies and organizations who can lead future prevention and control efforts.

Appendix D: Legal and Policy Guidance

Administrative Procedures Act of 1946
Outlines administrative procedures to be followed by federal agencies with respect to identification of information to be made public; publication of material in the *Federal Register*; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.

American Indian Religious Freedom Act of 1978
Directs federal agencies to evaluate their policies and procedures, in consultation with native traditional religious leaders, in order to determine changes required to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act of 1990, as amended by the ADA Amendments Act of 2008
Requires that public services be accessible to individuals with disabilities and prohibits discrimination in employment of qualified individuals with disabilities.

Antiquities Act of 1906
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. Requires that a permit be obtained for examination of ruins, excavation of archaeological sites, and the gathering of objects of antiquity on federal lands. Provides penalties for violations.

Archaeological Resources Protection Act of 1979
Largely supplants the resource protection provisions of the Antiquities Act for archaeological items. Establishes detailed requirements for issuance of permits. Protects material of archaeological interest from unauthorized removal or destruction. Establishes civil and criminal penalties for violations, including trafficking in such resources in violation of any provision of federal law. Requires federal managers to develop plans and schedules to locate archaeological resources and to establish public awareness programs regarding the value of archaeological resources to the Nation.

Archeological and Historic Preservation Act of 1960, as amended
Directs the preservation of historic and archaeological data in federal construction projects.

Architectural Barriers Act of 1969
Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Bald and Golden Eagle Protection Act of 1940, as amended
Prohibits the possession, sale, or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes or for the religious purposes of Indians.

Bankhead-Jones Farm Tenant Act of 1937
Directs the Secretary of Agriculture to develop a program of land conservation and utilization in order to correct maladjustments in land use and thus assist in such things as control of soil erosion, reforestation, preservation of natural resources, and protection of fish and wildlife. Some early refuges and hatcheries were established under authority of this act.

Clean Air Act of 1970
Regulates air emissions from area, stationary, and mobile sources. Requires federal land managers to protect the “air quality and related values” of land under their control. These values include fish, wildlife, and their habitats.

Emergency Wetlands Resources Act of 1986
Authorizes the purchase of wetlands using Land and Water Conservation Fund dollars. Requires the Secretary of the Interior to establish a National Wetlands Priority Conservation Plan and requires the states to include wetlands in their comprehensive outdoor recreation plans. Directs the Secretary, through the U.S. Fish and Wildlife Service, to continue the National Wetlands Inventory; to complete mapping of the contiguous United States; and to produce at ten-year intervals reports to update and improve in the September 1982 "Status and Trends of Wetlands and Deepwater Habitat in the Coterminous United States, 1950s to 1970s."

Endangered Species Act of 1973, as amended
Directs federal agencies to ensure that actions they carry out, authorize, or fund do not jeopardize endangered species or their critical habitat. Provides land acquisition authority.

Environmental Education Act of 1990
Establishes the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the U.S. Fish and Wildlife Service.

Executive Order 11593: Protection and Enhancement of the Cultural Environment (1971)
States that if the U.S. Fish and Wildlife Service proposes any development activities that may affect the archaeological or historic sites, the Service will consult with federal and state Historic Preservation Officers to comply with section 106 of the National Historic Preservation Act of 1966, as amended.

Executive Order 11644: Use of Off-road Vehicles on the Public Lands (1972)
Establishes policies and procedures to ensure that the use of off-road vehicles on public lands will be controlled and directed to protect the resources of those lands, to promote the safety of all users of those lands, and minimize conflicts among the various uses of those lands. EO 11989 (1977) amends section 2 of EO 11644 and directs agencies to close areas negatively impacted by off-road vehicles.

Executive Order 11988: Floodplain Management (1977)
Prevents 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, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains.

Executive Order 11990: Protection of Wetlands (1977)
Directs federal agencies to: (1) minimize destruction, loss, or degradation of wetlands; and (2) preserve and enhance the natural and beneficial values of wetlands when a practical alternative exists.

Executive Order 12372: Intergovernmental Review of Federal Programs (1982)

Directs the Service to send copies of the Environmental Assessment to state planning offices for review.

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994)
Establishes environmental justice as a federal government priority and directs all federal agencies to make environmental justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs and policies, and activities on minority and low-income populations.

Executive Order 12906: Coordinating Geographical Data Acquisition and Access: The National Spatial Data Infrastructure (1994), as amended by Executive Order 13286: Amendment of Executive Orders, and Other Actions, in Connection With the Transfer of Certain Functions to the Secretary of Homeland Security (2003)
Recommends that the executive branch develop, in cooperation with state, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data, including the National Vegetation Classification System (NVCS).

Executive Order 12962: Recreational Fisheries (1995)
Directs federal agencies to improve recreational fishing opportunities in cooperation with states and tribes.

Executive Order 12996: Management and General Public Use of the National Wildlife Refuge System (1996)
Defines the mission, purpose, and priorities public uses of the National Wildlife Refuge System. Presents four principles to guide System management.

Executive Order 13007: Indian Sacred Sites (1996)
Directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Executive Order 13061: Federal Support of Community Efforts Along American Heritage Rivers (1997)
Establishes the American Heritage Rivers initiative for environmental protection, economic revitalization, and historic and cultural preservation. Directs federal agencies to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage.

Executive Order 13084: Consultation and Coordination with Indian Tribal Governments (2000)
Provides a mechanism for establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.

Executive Order 13112: Invasive Species (1999)
Directs federal agencies to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and habitat conditions, conduct research, and promote public education on invasive species and the means to address them.

Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds (2001)
Instructs federal agencies to conserve migratory birds by several means, including incorporation of recommendations found in national and continental bird conservation plans into agency management documents.

Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation (2007)
Directs appropriate federal agencies, including the Department of the Interior and the Department of Agriculture, to expand and enhance hunting opportunities and the management of game species and their habitat.

Farmland Protection Policy Act of 1981, as amended
Minimizes the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

Federal Advisory Committee Act of 1972, as amended
Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, non-duplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.

Federal-Aid Highways Act of 1968
Establishes requirements for approval of federal highways through wildlife refuges and other designated areas to preserve the natural beauty of such areas.

Federal Aid in Sport Fish Restoration Act (Dingell-Johnson Act) of 1950
Authorizes the Secretary of the Interior to provide financial assistance for state fish restoration and management plans and projects through excise taxes paid by manufacturers of rods, reels, and other fishing tackle.

Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act) of 1937
Taxes the purchase of ammunition and firearms and earmarks the proceeds to be distributed to the states for wildlife restoration.

Federal Cave Resources Protection Act of 1988
Establishes requirements for management and protection of caves and their resources on federal lands, including allowing the land managing agencies to withhold the location of caves from the public and requiring permits for any removal or collecting activities.

Federal Lands Recreation Enhancement Act (REA) of 2004
Allows the government to charge a fee for recreational use of public lands managed by the U.S. Fish and Wildlife Service and other agencies. Fees paid by visitors to certain federal recreation sites are retained by the collecting site and used to improve the quality of the visitor experiences at those sites.

Federal Noxious Weed Act of 1975, as amended
Requires the use of integrated management systems to control or contain undesirable plant species, and an interdisciplinary approach with the cooperation of other federal and state agencies.

Federal Records Act of 1950
Directs the preservation of evidence of the government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Federal Water Pollution Control Act of 1948, as frequently amended particularly by the Clean Water Act of 1977
Requires restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters. Regulates discharge of pollutants, including dredge and fill materials, into waters of the United States. Requires consultation with the U.S. Army Corps of Engineers (404 permits) for major wetland modifications.

Federal Water Project Recreation Act of 1965, as amended
Declares the intent of Congress that recreation and fish and wildlife enhancement be given full consideration as purposes of federal water development projects. Authorizes the use of federal water project funds for land acquisition in order to establish refuges for migratory waterfowl.

Fish and Wildlife Act of 1956, as frequently amended
Establishes a comprehensive national fish and wildlife resources policy with emphasis on the commercial fishing industry, but also public opportunities for recreational use of fish and wildlife resources. Broadens the authority for acquisition and development of refuges. The 1998 amendments modify the powers of the Secretary of the Interior regarding volunteer service, community partnerships, and education programs.

Fish and Wildlife Conservation Act of 1980, as amended
Requires the Service to monitor non-game bird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act of 1973.

Fish and Wildlife Coordination Act of 1934, as amended
Requires consultation with the U.S. Fish and Wildlife Service and the state fish and wildlife agencies whenever the "waters of a stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under federal permit or license. Authorizes use of surplus federal property for wildlife conservation purposes and authorizes the Secretary of the Interior to provide public fishing areas and accept donations of lands and funds.

Fish and Wildlife Improvement Act of 1978
Improves the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act of 1966, and the Fish and Wildlife Act of 1956. Authorizes the Secretary of the Interior to accept gifts and bequests of real and personal property on behalf of the United States. Authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

Food Security Act of 1985 (Farm Bill), as amended
Promotes wetland conservation. Establishes "Swampbuster" provisions whereby farmers who convert wetlands for the purpose of planting are ineligible for most farm program subsidies. Establishes the Wetlands Reserve Program to restore and protect wetlands through easements.

Freedom of Information Act of 1966
Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions; official, published and unpublished policy

statements; final orders deciding case adjudication; and other documents. Special exemptions have been reserved for nine categories of privileged material. The act requires the party seeking the information to pay reasonable search and duplication costs.

Geothermal Steam Act of 1970, as amended
Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15(c) of the act prohibits issuing geothermal leases on virtually all U.S. Fish and Wildlife Service-administered lands.

Historic Sites, Buildings and Antiquities Act of 1935
Popularly known as the Historic Sites Act, as amended in 1965. Establishes a national policy to preserve historic sites and objects of national significance, including those located on refuges. Provides procedures for designation, acquisition, administration, and protection of such sites, including National Historic and Natural Landmarks.

Lacey Act of 1900, as amended
Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species. Prohibits interstate and international transport and commerce of fish, wildlife, or plants taken in violation of domestic or foreign laws. Regulates the introduction of foreign species to the United States.

Land and Water Conservation Fund Act of 1965
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, as amended
Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) of 1934
Requires every waterfowl hunter 16 years of age or older to carry a Duck Stamp and earmarks proceeds to buy or lease waterfowl habitat. A 1958 amendment authorizes the acquisition of small wetland and pothole areas to be designated as “Waterfowl Production Areas,” which may be acquired without the limitations and requirements of the Migratory Bird Conservation Act.

Migratory Bird Treaty Act of 1918
Designates the protection of migratory birds as a federal responsibility. Enables the setting of seasons, closed areas and other regulations related to migratory bird hunting. Makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export, or import any migratory bird, part, nest, egg, or product except as allowed by special regulations. Implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds.

Mineral Leasing Act for Acquired Lands of 1947, as amended
Authorizes and governs mineral leasing on acquired public lands.

Minerals Leasing Act of 1920, as amended

Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas, and other hydrocarbons, sulphur, phosphate, potassium, and sodium. Section 185 of this act contains provisions relating to granting rights-of-way over federal lands for pipelines.

Mining Act of 1872, as amended
Authorizes and governs prospecting and mining for the so-called “hardrock” minerals (such as gold and silver) on public lands.

National and Community Service Act of 1990
Authorizes several programs to combat illiteracy and poverty, provide job and education skills, and fulfill environmental needs. Establishes the American Conservation and Youth Service Corps to engage young adults in projects that benefit the public and occur on federal or tribal lands.

National Environmental Policy Act of 1969 (NEPA), as amended
Requires federal agencies to examine the environmental impacts of their actions, incorporate environmental information, and utilize public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements and must prepare appropriate NEPA documents to facilitate better environmental decision-making.

National Historic Preservation Act of 1966, as amended
Establishes as policy that the federal government is to provide leadership in the preservation of the nation’s prehistoric and historic resources. Section 106 requires federal agencies to consider potential impacts of their undertakings on historic properties; Section 110 requires agencies to manage historic properties and document them prior to destruction or damage; Section 101 requires agencies to consider Indian tribal values in historic preservation programs and requires each agency to establish a program to inventory all historic properties on its land.

National Trails System Act of 1968
Assigns responsibility to the Secretary of Interior to protect the historic and recreational values of congressionally designated National Historic Trail sites.

National Wildlife Refuge System Administration Act of 1966 (amended by the National Wildlife Refuge System Improvement Act of 1997)
Defines the National Wildlife Refuge System and addresses the growing need for recreational opportunities by providing a decision framework for allowing appropriate and compatible uses of the Refuge System.

National Wildlife Refuge System Improvement Act of 1997
Amends the National Wildlife Refuge System Administration Act of 1966 and serves as the "organic act" for the NWRS. Defines the mission as focused singularly on wildlife conservation, designates priority wildlife-dependent public uses, and calls for comprehensive conservation planning. Requires the Secretary to maintain the biological integrity, diversity, and environmental health of the Refuge System.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998
Amends the Fish and Wildlife Act of 1956 to promote volunteer programs and community partnerships for the benefit of national wildlife refuges, and for other purposes.

National Wildlife Refuge Volunteer Improvement Act of 2010

Maintains funding authorization for volunteer and community partnership programs. Directs the Service to develop and implement a national strategy for coordination of volunteers within the National Wildlife Refuge System. Requires the Service to provide at least one volunteer coordinator for each Service region to implement the strategy.

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990
Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession. Imposes serious delays on a project when human remains or other cultural items are encountered in the absence of a plan.

Neotropical Migratory Bird Conservation Act of 2000
Establishes a matching grants program to fund projects that promote the conservation of neotropical migratory birds in the United States, Latin America, and the Caribbean.

North American Wetlands Conservation Act of 1989
Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan between the United States, Canada, and Mexico. Available funds may be expended for up to 50 percent of the United States' share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).

Partnerships for Wildlife Act of 1992
Establishes a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the state fish and game agencies in carrying out their responsibilities for conservation of non-game species.

Refuge Recreation Act of 1962, as amended
Requires that any recreational use on areas of the NWRS be "compatible" with the primary purpose(s) for which the area was acquired or established. Requires that sufficient funding be available for the development, operation, and maintenance of recreational uses that are not directly related to the area's primary purpose(s).

Refuge Revenue Sharing Act of 1935
Provides for payments to counties for loss of tax revenue due to the establishment of Service areas. Uses funds derived from the sale of products from refuges.

Rehabilitation Act of 1973, as amended
Prohibits discrimination based on disability under any program or activity receiving federal financial assistance.

Rivers and Harbors Appropriations Act of 1899, as amended
Requires the authorization by the U.S. Army Corps of Engineers (USACE) prior to any work in, on, over, or under navigable waters of the United States. The Fish and Wildlife Coordination Act authorizes the Service to review and comment on the fish and wildlife effects of proposed or permitted activities by the USACE.

Sikes Act of 1960, as amended
Provides for the cooperation by the Departments of the Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the U.S.

Surface Mining Control and Reclamation Act of 1977
Regulates surface mining and reclamation of coal-mined lands. Designates certain areas as unsuitable for coal mining operations.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948
Provides that, upon a determination by 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.

Transportation Equity Act for the 21st Century of 1998
Establishes the Refuge Roads Program, requires transportation planning, and provides funding for approved public use roads/trails and associated parking lots, comfort stations, and bicycle/pedestrian facilities.

Treasury and General Government Appropriations Act of 2000
Requires federal agencies to publish guidelines to ensure and maximize the quality, objectivity, utility, and integrity of information that they disseminate to the public (44 U.S.C. 3502).

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970
Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. Requires that any purchase offer be no less than the fair market value of the property.

Water Resources Planning Act of 1965
Establishes the Water Resources Council to review river basin plans with respect to agricultural, urban, energy, industrial, recreational, and fish and wildlife needs. Establishes a grant program to assist states in participating in the development of related comprehensive water and land use plans.

Wild and Scenic Rivers Act of 1968
Establishes a National Wild and Scenic Rivers System and prescribes the methods and standards through which additional rivers may be identified and added to the system. Requires that federal planning for use and development of water and related land resources consider potential wild and scenic rivers.

Wilderness Act of 1964
Establishes the National Wilderness Preservation System. Requires review of roadless areas in national wildlife refuges, national parks and national forests for wilderness suitability. Prescribes the management of new wilderness areas.

Youth Conservation Corps Act of 1970
Establishes a permanent Youth Conservation Corps program within the Departments of the Interior and Agriculture.

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Appendix F: Appropriate Use Determinations

In this appendix:

Installation of Artificial Nest Structures
Haying
Short Term Upland Disturbance or Other Public Interest Projects
Third Party Research

Summary of Appropriate Use Policy on National Wildlife Refuges (603 FW 1)

The Service's appropriate use policy (FWS, 2006b) describes the initial decision process a refuge manager follows when first considering whether to allow a proposed use on a refuge. The refuge manager must first find a use to be appropriate before undertaking a compatibility review of the use and outline the stipulation of the use (see appendix G). By screening out proposed uses not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews.

Appropriate use findings are not required for uses that have been administratively determined appropriate under the policy.

A. **Six wildlife-dependent recreational uses.** As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.

B. **Take of fish and wildlife under state regulations.** States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations to be appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

An internal memorandum with attachments (FWS, 2008c) provides (1) additional guidance to the regions and refuge managers in implementing this policy and (2) additional background information further describing the policy's function and applicability.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Whittlesey Creek National Wildlife Refuge

Use: Installation of Artificial Nest Structures

This form is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ____ No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ____ **Appropriate** X

Refuge Manager: /Tom Kerr/ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Whittlesey Creek National Wildlife Refuge

Use: Haying

This form is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ____ No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ____ **Appropriate** X

Refuge Manager: /Tom Kerr/ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date: _____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Whittlesey Creek National Wildlife Refuge

Use: Short Term Upland Disturbance or Other Public Interest Projects – see CD

This form is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ____ No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ____ **Appropriate** X

Refuge Manager: /Tom Kerr/ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Whittlesey Creek National Wildlife Refuge

Use: Third Party Research

This form is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ____ No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ____ **Appropriate** X

Refuge Manager: /Tom Kerr/ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Appendix G: Compatibility Determinations

In this appendix:

Wildlife Observation and Photography
Environmental Education and Interpretation
Archery Deer Hunting
Sport Fishing
Installation of Bluebird Boxes, Other Nest Boxes, or Nesting Structures by Public or Groups
Short-Term Upland Disturbance or Other Public Interest Projects with No Right-of-Way Expansion and Full Restoration
Scientific Studies and Research Projects by Third Parties

Summary of Compatibility Policy on National Wildlife Refuges (603 FW 2)

Compatibility determinations are documents written, signed and dated by the refuge manager and the regional chief of refuges that signify whether proposed or existing uses of national wildlife refuges are compatible with their establishing purposes and the mission of the National Wildlife Refuge System. All recreational activities and economic or other uses of a refuge by the public or other non-Service entity require compatibility determinations. Economic uses must also contribute to achieving refuge purposes and the mission of the Refuge System. Before undertaking a compatibility review, the refuge manager must first determine that the use is appropriate (see appendix F).

Compatibility determinations are not required for such refuge management activities as prescribed burning, managing water levels, controlling invasive species, routine scientific monitoring, studies, surveys, and censuses, conducting historic preservation or law enforcement activities, or maintaining refuge facilities.

Compatibility determinations for priority public uses – hunting, fishing, wildlife observation and photography, and environmental education and interpretation – are reevaluated at least every 15 years, and all other uses are reevaluated at least every 10 years (sooner if conditions change or significant new information about the use or its effects becomes available).

Draft COMPATIBILITY DETERMINATION

Use: Wildlife Observation and Photography

Refuge Name: Whittlesey Creek National Wildlife Refuge

Establishing Authority and Acquisition Authority:
Whittlesey Creek National Wildlife Refuge (NWR, Refuge), located in Bayfield County, Wisconsin, as established on September 30, 1999.

Refuge Purposes:
The primary purpose of Whittlesey Creek National Wildlife Refuge is "…for the development, advancement, management , conservation, and protection of fish and wildlife resources…16 U.S.C. 742f(a)(4)"…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (Refuge System) is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [668dd-668ee])

Description of Use:
The U.S. Fish and Wildlife Service (Service) encourages wildlife observation and photography as a means for the public to enjoy the Refuge resource. Access to the refuge would be limited to foot traffic only (including hiking, snowshoeing, and cross-country skiing). Access by bicycles, horses, and motorized vehicles would be limited to county and township roads. Boats are not allowed on the refuge.

Wildlife observation and photography are priority public uses on Refuge System lands as identified in the National Wildlife Refuge System Improvement Act of 1997. Entry on all or portions of individual areas may be suspended by posting upon occasions of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

Availability of Resources:

What resources are needed to properly and safely administer the use?
The needed staff for developing and administering the wildlife observation/photography program is available.

Are existing refuge resources adequate to properly and safely administer the use?
Because of the anticipated low impact of these uses, minimal staff time will be required. Most resources will be dedicated to the upkeep of associated facilities for these uses.

Anticipated Impacts of Use:
Both short- and long-term impacts include temporary disturbance to wildlife while visitors access the Refuge. However, by limiting the disturbance on the refuge to foot travel only, these disturbances will be minimized.

How does the use affect the refuge purposes, the Refuge System mission, and the refuge goals and objectives?
By providing wildlife observation and photography, the public will have an opportunity to observe/photograph wildlife on the Refuge. This appreciation of the Refuge and associated resources supports the Refuge goals and objectives.

Public Review and Comment:
This compatibility determination is available for public review as part of the Whittlesey Creek National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. Comments received and agency responses are included in the final version of the Whittlesey Creek NWR Comprehensive Conservation Plan.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Access to the Refuge will be by foot traffic only (including hiking, snowshoeing, and cross-country skiing).
2. Motorized vehicles, bicycles, and horses are restricted to adjacent county and township roads. Boats are not allowed within the Refuge.

Justification:
This use has been determined compatible provided the above stipulations are implemented. This use is a priority public use on national wildlife refuges. By providing wildlife observation and photography, the public will have an opportunity to observe/photograph wildlife on the Refuge. This could lead to a further appreciation of the Refuge and associated resources.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15- year Re-Evaluation Date: 2029

Draft COMPATIBILITY DETERMINATION

Use: Environmental Education and Interpretation

Refuge Name: Whittlesey Creek National Wildlife Refuge

Establishing Authority and Acquisition Authority:
Whittlesey Creek National Wildlife Refuge (NWR, Refuge), located in Bayfield County, Wisconsin, as established on September 30, 1999.

Refuge Purposes:
The primary purpose of Whittlesey Creek National Wildlife Refuge is "…for the development, advancement, management , conservation, and protection of fish and wildlife resources…16 U.S.C. 742f(a)(4)"…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (Refuge System) is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [668dd-668ee])

Description of Use:
Allow wildlife interpretation and environmental education programs to be conducted on Whittlesey Creek NWR. Formal programs include activities prepared, scheduled, and organized for school-aged children and organized groups by Service staff. In most cases, curriculums and program schedules are prepared in advance. These curriculums address a number of wildlife conservation issues including coaster brook trout restoration, riparian habitat restoration, wetland and grassland conservation, migratory bird management, and the conservation of endangered species. The visitation and use of the Refuge by local educators and their classes on their own for the purposes of furthering their understanding of natural resource management issues would also classified as an informal program.

In addition, this would include use of the shared facilities at the Northern Great Lakes Visitor Center (NGLVC) including exhibits, classrooms, multimedia room and auditorium, and the adjacent NGLVC trail system. This also includes the use of the Refuge's Coaster Classroom facility.

Availability of Resources:

What resources are needed to properly and safely administer the use?
The current staffing levels are sufficient to support environmental education and interpretation programs on Whittlesey Creek NWR. No increase in cost is expected above the Refuge's current Operations and Maintenance budget. The Refuge's partnership with the U.S. Forest Service at the NGLVC is a cost-effective method to share educational facilities used for the Refuge's educational and interpretive programs. Joint programming with the five partners (U.S. Forest Service, National Park Service, Wisconsin Historical Society, University of Wisconsin Extension and Friends of the Center Alliance) at the NGLVC also increases the efficiency of the program. Special educational events such as the

Birding and Nature Festival are large events with a distributed workload so the Refuge is able to participate at current staff levels.

Are existing refuge resources adequate to properly and safely administer the use?
Yes, existing Refuge resources are adequate to properly and safely administer the use.

Anticipated Impacts of Use:
The overall impacts to the Refuge and associated wildlife populations from this use will be minimal. There will be some disturbance to wildlife, but at levels that will not likely interfere with the wildlife and habitat goals of the Refuge. School buses and personal vehicles will utilize parking areas already constructed for use by other Refuge users. The limited number of nature trails planned for development will be done in a way to minimize disturbance to vegetation and wildlife use of these areas.

How does the use affect the refuge purposes, the Refuge System mission, and the refuge goals and objectives?
The use is supportive of a priority public use on national wildlife refuges.

Public Review and Comment:
This compatibility determination is available for public review as part of the Whittlesey Creek National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. Comments received and agency responses are included in the final version of the Whittlesey Creek NWR Comprehensive Conservation Plan.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Access on the Refuge will be by foot traffic only (including hiking, snowshoeing, and cross-country skiing).
2. Motorized vehicles, bicycles, and horses are restricted to adjacent county and township roads. Boats are not allowed within the Refuge.
3. The Refuge Manager may allow staff or expert-led special events such as birding festivals, etc. on a case-by-case basis.

Justification:
This use has been determined compatible provided the above stipulations are implemented. This use is a priority public use on national wildlife refuges. By allowing environmental education and interpretation, the public will have an opportunity to learn about the Refuge, its habitats and wildlife. This could lead to a further appreciation of the conserving the Refuge and associated resources.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15- year Re-Evaluation Date: 2029

FINAL COMPATIBILITY DETERMINATION

Use: Archery Deer Hunting

Refuge Name
Whittlesey Creek National Wildlife Refuge

Establishing Authority and Acquisition Authority
Fish and Wildlife Act of 1956, as amended by Public Law 93-271

Refuge Purposes
The Whittlesey Creek National Wildlife Refuge was established under the authority of the Fish and Wildlife Act of 1956 "…for the development, advancement, management , conservation, and protection of fish and wildlife resources…16 U.S.C. 742f(a)(4)"…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16U.S.C. 742f(b)(1)

National Wildlife Refuge System Mission
The mission of the National Wildlife Refuge System (Refuge System) is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of 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) The use is archery deer hunting. Hunting is a priority public use.

b) Where the use will be conducted: On tracts of refuge lands that are at least 20 contiguous acres. A buffer around the Refuge's Coaster Classroom site and near the Northern Great Lakes Visitor Center will be closed to hunting. The Refuge lands are currently 215 acres. As additional refuge lands are acquired, archery deer hunting will be allowed if they meet the 20 contiguous acre standard. Habitat utilized for archery deer hunting include coastal wetlands, uplands, forested wetlands, forested shrublands and riparian areas.

c) When the use will be conducted: During Wisconsin's regular archery deer hunting season. Wisconsin's 2005 deer hunting regulations opened archery hunting from September 17, 2005 through January 3, 2006, excluding the 10-day deer gun season.

d) How the use will be conducted: Refuge staff will notify the Wisconsin Department of Natural Resources yearly to inform them of lands available for archery deer hunting. Refuge staff will also notify the public via its web site and other mediums that archery deer hunting is allowed. The Service will request, but not require, that archery deer hunters obtain an information packet that includes a map showing lands that are open and a flyer describing Refuge-specific regulations. The packet will also request that harvest information be sent to the Refuge. Archery deer hunters typically find deer sign and either create a blind or use a portable blind/stand. Archery hunting is almost always conducted as a still hunt where the deer will walk upon the hunter who is hidden and quiet. This type of hunting will be allowed, but live vegetation cannot be removed, destroyed or altered by the hunter for any purpose. No baiting is allowed. Hunters will park at regular Refuge access points and walk to their hunting site. No additional facilities will be provided for archery deer hunting.

Why the use is being proposed: Hunting is a priority public use for National Wildlife Refuges. The Interim Comprehensive Conservation Plan (1998) that established the Whittlesey Creek National Wildlife Refuge stated: *"On most units of the Whittlesey Creek NWR, hunting and fishing will be permitted in accordance with state seasons. Units will be opened to these uses when they are of a sufficient size, when suitable public access can be provided, when there are no detrimental impacts to any threatened or endangered species, and where these activities can be conducted safely.*

The project manager may establish time and space zones to regulate these uses to insure they remain compatible with the wildlife and habitat preservation purposes of the NWR, and to reduce potential conflicts between users.

Certain small portions of the units may be closed to hunting, fishing or other public uses, when the manager determines that there are specific habitat or wildlife protection needs are best met by establishing sanctuary areas. "

The Whittlesey Creek National Wildlife Refuge Public Use Plan (1991) stated: *"Guidelines for hunting on refuge lands will be limited to waterfowl hunting for this plan version. The Service intends to provide hunting opportunities for upland birds, deer and other species on Refuge lands once additional properties are acquired and the Service understands public needs and evaluates safety issues.* "

We are beginning to meet these stated commitments by allowing deer archery hunting.

Availability of Resources
Current staff will inform the public about archery deer hunting annually through press releases. Information packets that include maps and regulations will be available at the Northern Great Lakes Visitor Center (Refuge headquarters). No additional facilities are needed.

The Refuge does not have any law enforcement personnel at the station; a zone law enforcement officer is stationed at Necedah National Wildlife Refuge in central Wisconsin. The Refuge currently utilizes this officer to meet Refuge law enforcement needs and will continue with this arrangement. Whittlesey Creek Refuge staff will be expected to watch for abuse by hunters who use live vegetation for blind construction, who impact vegetation with tree stands, and who don't remove their stands each day. Portable stands will be confiscated and turned over to state wardens or Service's law enforcement personnel. All tree stands and blinds that remain overnight will be removed. Staff will continue to work with our zone law enforcement officer and state wardens to ensure hunter compliance.

We will monitor hunter use by the number of packets that are provided to archery hunters. We will monitor harvest when hunters volunteer to provide harvest information.

Park Ranger's time to develop and distribute information, monitor use (3% of existing FTE) = $1,800
Zone Law Enforcement Officer's time and transportation to assist with enforcement (estimated at 2% of existing FTE) = $1,500.

Anticipated Impacts of Use:
The environment of the Refuge and potential impacts from public use are described in detail in the document: "Environmental Assessment for the Public Use Plan, Whittlesey Creek National Wildlife Refuge Bayfield County, Wisconsin" dated April 6, 2001. The document is on file at the

Whittlesey Creek NWR headquarters office in Ashland, Wisconsin. A summary of potential impacts specific to archery deer hunting follow.

Fish and Wildlife Populations
The Service's ability to reach its fish and wildlife population goals would not be negatively affected.

Archery deer hunting will have a minimal effect on the deer population in both the Refuge and within the DNR's deer management unit 3. We anticipate that at most, 10 deer will be harvested from Refuge lands. Concurrently, the deer population should not be negatively harmed by harvest of a few deer within the Refuge. However, we expect a minimal drop in impacts from deer browsing on trees and shrubs.

Fish and Wildlife Habitat
The proposed use would not affect the Service's ability to reach habitat goals established for the Refuge.

User Conflicts
Conflicts could occur between non-consumptive users and archery hunters, especially in September and early October when visitation remains high at the Northern Great Lakes Visitor Center and in the Coaster Classroom (Refuge environmental education site). The Service will manage public use to avoid conflicts as much as possible by prohibiting archery hunting within a buffer near the Visitor Center's boardwalk and around the Refuge's Coaster Classroom site.

Archery hunters are very inconspicuous and will shoot a deer only when it is within about 30 yards or less. Their mode of operation will in itself minimize impacts. However, other users could disrupt the experience for a hunter when they are not aware that the hunter is in her/her blind/stand. We are not proposing to control these situations; hunters will have to accept the potential for interference from other users.

Private landowners within and adjacent to the Refuge might experience additional trespass on their lands if a hunter wounds and tracks a deer onto their lands. It is considered trespass if a hunter does not have permission from the landowner to track a deer onto the landowner's land. The landowner would be responsible to report trespass violations on their property.

Threatened and Endangered Species
Archery deer hunting should not affect nesting piping plovers or bald eagles. Gray wolf travel through and possible hunt within the Refuge. Canada lynx are not known to use the Refuge. The Service will track all sightings of threatened and endangered species to monitor use and ensure that conflicts do not occur.

Public Review and Comment
A public notice was published two times each in two local papers (see attached copy of the notice). It was printed on December 8 and 15, 2005 in the Bayfield County Journal. It was printed on December 7 and 10, 2005 in the Ashland Daily Press.

The archery hunting plan, compatibility determination and supplemental environmental assessment were available for review on the Whittlesey Creek Refuge's web site or by contacting the Refuge office. No public comments were received.

Refuge staff also sent a letter to all private landowners within the Refuge boundary to inform them of the proposed plan and compatibility determination. No comments were received from them.

Determination
_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility
Hunting
General guidelines for hunting on refuge lands require that in general, the Service will follow all Federal regulations and most State of Wisconsin regulations. The following general guidelines are followed for hunting on Whittlesey Creek National Wildlife Refuge:

- Hunters will be required to follow all Federal and State laws and regulations. This includes no shooting within 100 yards of a residence without permission of the resident.
- The Service does not allow baiting on any refuge system lands, so baiting will not be allowed on the Refuge.
- A no-hunting buffer on Service-owned lands adjacent to the Center will be established for visitor safety needs.
- Ground blinds or any elevated stands may be used only if they do not damage live vegetation, including trees.
- Ground blinds may be constructed entirely of dead vegetation from on the property.
- Nontoxic shot is required for all shotgun use on the refuge.
- Check with Refuge staff annually for open hunting areas for archery deer hunting and waterfowl hunting.

Refuge-specific Hunting Regulations

- Archery deer hunting will be allowed to take place on Refuge lands owned by the Service that constitute tracts greater than 20 acres.
- No hunting will be allowed within a designated, signed area around the Coaster Classroom and Northern Great Lakes Visitor Center boardwalk.
- The construction or use of permanent blinds or platforms is not permitted.
- All stands and blinds must be removed from the refuge at the end of each day's hunt.
- Motorized vehicles are allowed only on public roads and parking areas.

National Wildlife Refuge System regulations that apply to all refuges also apply to Whittlesey Creek National Wildlife Refuge. System regulations are found in the *Code of Federal Regulations* under section "What are the requirements for hunting on areas of the National Wildlife System?" Where Federal law differs from State law, Federal law supercedes State law. For example, baiting is prohibited on all National Wildlife Refuges so it is prohibited on Whittlesey Creek National Wildlife Refuge. A hunter's duty is to know the rules and regulations of where they are hunting.

Archery hunters will be encouraged to check-in at Refuge headquarters, but no Refuge-specific permit will be required or issued. Tagging of harvested deer must follow state regulations, but the Service will request that hunters notify us of harvested deer.

Justification:
The National Wildlife Refuge System Improvement Act mandates that compatible, wildlife-dependent recreational uses involving hunting, fishing, wildlife observation, photography, environmental education and interpretation are priority public uses. This compatibility determination will allow archery deer hunting to take place at the Whittlesey Creek National Wildlife Refuge, in fulfillment of that mandate. These uses will help fulfill one of the goals of the Refuge's Interim Comprehensive Conservation Plan to: "Manage for compatible wildlife-dependent recreational uses, including environmental education, hunting, fishing, wildlife-viewing, and demonstrating restoration and management techniques."

Hunting of resident wildlife on the Refuge is not considered a means to manage regional population goals established by the WI DNR. Rather, hunting resident wildlife are considered for their compatibility with Refuge goals. This use is compatible with Refuge goals.

Archery deer hunting will have minimal impact on the resources of the Refuge. Public use of this Refuge will help build support for the Refuge and the Service's mission.

Signature: Refuge Manager: Pamela Dryer Date: 12-30-05

Concurrence: Regional Chief: Nita M. Fuller Date: 1-9-2006

Mandatory 10- or 15- year Re-Evaluation Date: 2021

Draft COMPATIBILITY DETERMINATION

Use: Sport Fishing

Refuge Name: Whittlesey Creek National Wildlife Refuge

Establishing Authority and Acquisition Authority:
Whittlesey Creek National Wildlife Refuge (NWR, Refuge), located in Bayfield County, Wisconsin, as established on September 30, 1999.

Refuge Purposes:
The primary purpose of Whittlesey Creek National Wildlife Refuge is "…for the development, advancement, management , conservation, and protection of fish and wildlife resources…16 U.S.C. 742f(a)(4)"…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (Refuge System) is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [668dd-668ee])

Description of Use:
Sport fishing as an activity conducted by the general public under regulation authority of the National Wildlife Refuge System Improvement Act. The use would be allowed on Whittlesey Creek and Little Whittlesey Creek on the Refuge.

Availability of Resources:
What resources are needed to properly and safely administer the use? The cost of administering this program includes a startup cost for incorporating fishing regulations into Refuge signage and brochures. Additional costs are associated with enforcement of the regulations on Refuge property. Under state regulation the creeks are already open to fishing. If an individual can access a stream from a public location such as a road right-of-way and remain in the streambed then the stream is open for public access. At the current time, enforcement of fishing regulations is by Wisconsin Department of Natural Resources (DNR) wardens. Additional enforcement by Refuge officers would be minimal since enforcement coverage is provided by the zone law enforcement officer in Tomah, Wisconsin. Existing fishing pressure under state regulations is minimal and would probably not increase very much by this change, which aligns state and federal regulations.

Are existing refuge resources adequate to properly and safely administer the use?
Staff resources are deemed adequate to manage this use at anticipated levels. The Comprehensive Conservation Plan identifies the filling of the existing park ranger position, which will be responsible for updating signage and brochures. The enforcement of regulations will primarily fall within the jurisdiction of the state wardens who patrol the county. Additional special enforcement if deemed necessary would be coordinated by the zone law enforcement officer.

Anticipated Impacts of Use:
Possible impacts of use include introduction of invasive species, fishing line entanglement, and impacts from lead tackle. Fishing on the Refuge would likely occur with walk-in anglers who wear chest waders or hip boots to fish in the stream or bank fish. Most movement of aquatic invasive species between water bodies occurs on boats, live wells and trailers. The method of fishing in Whittlesey Creek would tend to eliminate the use of these transport vectors thereby significantly reducing the risk of invasive species.

Use of lead tackle is an impact but to what degree, is largely unknown. Education and mandatory use of non-toxic tackle may be phased in but any such work would have to be in partnership with the state of Wisconsin. Other concerns, such as litter and fishing line entanglement are addressed through education.

Whittlesey Creek is an experimental site for the restoration of Coaster Brook Trout. The 2003 Whittlesey Creek coaster brook trout restoration plan developed by the Service and the Wisconsin DNR instituted protective harvest regulations on the creek. At this time, we do not anticipate any impact on the restoration plan because Whittlesey is designated as a catch and release brook trout stream through state regulations. The Service is conducting an extensive population monitoring study as the restoration experiment proceeds. If we determine that fishing mortality is impacting the success of the restoration project we would re-evaluate the role of fishing on the Refuge.

How does the use affect the refuge purposes, the Refuge System mission, and the refuge goals and objectives?
Recreational fishing is a priority public use identified in the National Wildlife Refuge Improvement Act of 1997. The fishing program is administered to provide recreational opportunities to visitors while avoiding negative impacts to wildlife and their habitat. The activity will promote local tourism and economic trade and enhance Service initiatives in the surrounding local community.

The fishing program follows all applicable laws, regulations and policies, including Title 50 Code of Federal Regulations, National Wildlife Refuge System goals and objectives, and the Refuge goals and objectives. This activity is also compliant with the purpose of the Refuge and the National Wildlife Refuge System mission. Conducting this program does not alter the Refuge's ability to meet habitat goals, provide for public safety and support the primary objectives of the Refuge.

Public Review and Comment:
This compatibility determination is available for public review as part of the Whittlesey Creek National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. Comments received and agency responses are included in the final version of the Whittlesey Creek NWR Comprehensive Conservation Plan.

Determination:
_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. State fishing requirements apply on the Refuge.

2. Whittlesey Creek is a catch and release stream for brook trout only.
3. Vehicles are permitted only on designated roads and parking lots.

Justification:
The use has been determined compatible provided the above stipulations are implemented. This use is being permitted as it is a priority public use and will not diminish the primary purposes of the Refuge. This use will meet the mission of the National Wildlife Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife and plant resources on these lands.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15- year Re-Evaluation Date: 2029

Draft COMPATIBILITY DETERMINATION

Use: Installation of Bluebird Boxes, Other Nest Boxes, or Nesting Structures by Public or Groups

Refuge Name: Whittlesey Creek National Wildlife Refuge

Establishing Authority and Acquisition Authority:
Whittlesey Creek National Wildlife Refuge (NWR, Refuge), located in Bayfield County, Wisconsin, as established on September 30, 1999.

Refuge Purposes:
The primary purpose of Whittlesey Creek National Wildlife Refuge is "…for the development, advancement, management , conservation, and protection of fish and wildlife resources…16 U.S.C. 742f(a)(4)"…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (Refuge System) is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [668dd-668ee])

Description of Use:
Allow the installation of nest structures such as bluebird nest boxes and wood duck boxes by individuals or groups on the Refuge. Site-by-site authorization will be made by the Refuge Manager via a letter of authorization. Requests for installing nesting structures are occasionally made by individuals and sporting groups. The majority of requests are for bluebird and wood duck boxes to be placed along roads or in Refuge wetlands. Some requests could be for artificial mallard nesting sites or other artificial nest sites for migratory birds. The structures are usually placed in late winter or early spring. Structures are affixed either using floating rafts (less common) or poles or posts. Structures are occasionally mounted to existing trees although this is less desirable due to increased nest predation.

In all cases, the intention of the requestors is to enhance wildlife populations through providing safe nesting sites.

Availability of Resources:

What resources are needed to properly and safely administer the use?
The installation of artificial nesting structures on the Refuge by private individuals or groups requires minimal resources. Monitoring and maintenance of structures is required by the private individual or group as well as associated costs of installation.

Are existing refuge resources adequate to properly and safely administer the use?
The needed staff time for development and administration of this program is available. The additional time needed to coordinate issuance and oversight of the needed special use permit is relatively minor and within Refuge resources.

Anticipated Impacts of Use:
The installation of artificial nesting structures has a minimal impact on the purposes for which the Refuge was established. Waterfowl nesting structures will increase the production of waterfowl by providing sites for nests where predators are less likely to destroy the nests. Waterfowl nests in nesting structures are far likelier to be successful than nests in uplands. Other structures such as bluebird houses will provide nesting sites for other migratory birds. Artificial nesting boxes are widely credited with helping increase the population of eastern bluebirds in North America. There is some small, temporary wildlife disturbance caused during placement and maintenance of the structures. This disturbance is minor.

How does the use affect the refuge purposes, the Refuge System mission, and the refuge goals and objectives?
There are some aesthetic costs associated with placing artificial structures in natural settings. These costs are minimized by requiring placement of non-waterfowl structures along the edges of Refuge units in areas already appearing unnatural due to fences, signs, and adjacent roads. Wood duck boxes and other waterfowl nesting devices are typically placed in or near wetlands, although private parties typically prefer to place the structures adjacent to roads. No access by motorized vehicles or other special access will be provided for installing nest structures. The use will provide an increase in value for migratory birds.

Public Review and Comment:
This compatibility determination is available for public review as part of the Whittlesey Creek National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. Comments received and agency responses are included in the final version of the Whittlesey Creek NWR Comprehensive Conservation Plan.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Approval from Refuge Manager via a letter of authorization is required prior to installation.
2. Annual maintenance is required.
3. Structures must be removed upon Refuge Managers' request. Some possible reasons include: lack of maintenance, poor placement, and variation from approved installation plan.
4. Ownership of any nest structure placed on the Refuge by private individuals or groups will be forfeited to the Service upon installation.

Justification:
Artificial nesting structures do not materially interfere with or detract from the purposes for which the Refuge was acquired. These structures likely contribute to the purposes of the Refuge by providing secure nesting sites for waterfowl and other migratory birds. Nest success for ducks using artificial nest structures is higher than for ducks nesting in grasslands or woodlands. Nesting boxes for cavity nesting birds like bluebirds and wood ducks can increase populations when natural cavities are scarce. At worst, nesting structures are neutral in their effect; it is likely

that there is a positive effect. The aesthetic costs of artificial nest structures are modest and can be minimized through appropriate siting.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15- year Re-Evaluation Date: 2024

Draft COMPATIBILITY DETERMINATION

Use: Short-Term Upland Disturbance or Other Public Interest Projects with No Right-of-Way Expansion and Full Restoration

Refuge Name: Whittlesey Creek National Wildlife Refuge

Establishing Authority and Acquisition Authority:
Whittlesey Creek National Wildlife Refuge (NWR, Refuge), located in Bayfield County, Wisconsin, as established on September 30, 1999.

Refuge Purposes:
The primary purpose of Whittlesey Creek National Wildlife Refuge is "…for the development, advancement, management, conservation, and protection of fish and wildlife resources…16 U.S.C. 742f(a)(4)"…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (Refuge System) is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [668dd-668ee])

Description of Use:
Allow short-term disturbance to uplands for highway or other public interest projects with no right-of-way expansion and full restoration. Occasionally, requests are made by state and local government agencies and utility companies to do repairs and improvements to existing roadways and utility facilities associated with existing right-of-ways on Refuge lands. Many of these requests require temporary work outside existing right-of-way boundaries, generally resulting in temporary disturbance to the associated vegetation. Frequently, the temporary work requested is required to reshape a slope immediately adjacent to a road right-of-way to improve transportation safety. Other times, the requested action can be merely for permission to turn around heavy equipment on land immediately adjacent to the right-of-way. Most often, the temporary work outside of the right-of-way is conducted during the summer and fall, when construction conditions are optimal. The work typically involves temporary disturbance to previously farmed uplands or disturbed areas that are then reseeded to native vegetation by the requesting organization. This determination will allow approved work and temporary habitat disturbance outside the right-of-way boundary when long-term impacts are either beneficial or not significantly harmful.

Availability of Resources:

What resources are needed to properly and safely administer the use?
Minimal expense is required of the Service for these projects. Authorization of the projects will require the requesting organization to cover habitat restoration costs. There is a modest administrative cost to issuing and monitoring this work.

Are existing refuge resources adequate to properly and safely administer the use?

Existing Refuge resources are sufficient to properly and safely administer this use. The additional time to issue letters of authorization or Special Use Permits is relatively minor and within exiting Refuge resources. The flexibility to solve right-of-way issues through this process is also more time efficient than requiring applications for expanding existing right-of-ways.

Anticipated Impacts of Use:
The impacts to the associated uplands with this use will be minimal and temporary. When the request includes unavoidable destruction of vegetation, approval will be limited to sites previously disturbed or dominated by invasive vegetation. No wetlands, springs, or stream habitat may be destroyed. Any areas with disturbed vegetation will be seeded by the requesting organization to a diverse mix of native species that will lead to better long-term habitat than the vegetation originally disturbed.

How does the use affect the refuge purposes, the Refuge System mission, and the refuge goals and objectives?
Most of this work occurs in summer and fall, after the nesting season for waterfowl and other migratory birds. The duration of any single project is usually one to eight weeks. Occasionally, work may occur during the nesting season, but the size of the disturbance zone will be minimal. The quality of the habitat in the disturbed zone may be diminished for up to three years following the project, but the disturbed zone will provide some migratory bird value by the year following the project. The long-term productivity of the disturbed zone will frequently increase due to the replacement of exotic, less-desirable cover with native vegetation.

Most of the impacts will be along existing roads in areas already subject to significant habitat and aesthetic deterioration due to existing transportation right-of-ways. Rarely, a utility right-of-way can split an otherwise contiguous block of quality habitat. In these settings, the disturbance will still be temporary, but the impact to waterfowl and other migratory birds is likely greater. The existing right-of-way already authorizes disturbance within the right-of-way, so the larger impact of creating a disturbance within quality habitat will likely occur anyway. The decision to authorize temporary disturbance outside the right-of-way will slightly increase the magnitude of the disturbance. Projects conducted adjacent to and in streams are regulated by the Wisconsin Department of Natural Resources. Waterway permits restrict activities from September 15 through May 15 on trout streams in order to minimize impacts on fish movement, spawning, and egg incubation. The permit and regulatory requirements adequately protect coldwater resources.

Public Review and Comment:
This compatibility determination is available for public review as part of the Whittlesey Creek National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. Comments received and agency responses are included in the final version of the Whittlesey Creek NWR Comprehensive Conservation Plan.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. All work done outside of existing right-of-ways must be approved by the Refuge Manager in the form of a letter of authorization.
2. Conditions stipulated in a letter of authorization such as seeding mixes, weed control, etc. must be followed to remain a compatible use.
3. No work that leads to permanent loss of wetlands, springs, or stream habitat will be allowed without a site-specific compatibility determination.

Justification:
This use will not materially interfere with or detract from the purposes for which the Refuge was established with the above stipulations in place. Many tracts on the Refuge are constrained by one or more right-of-ways that were in place before acquisition by the federal government. Temporary disturbances to land adjacent to these right-of-ways will have only small, temporary harmful effects on wildlife. Work within the right-of-ways is beyond the authority of the Fish and Wildlife Service to regulate other than influencing the timing and scope to minimize wildlife harm. Allowing temporary work outside the right-of-way does little or no long-term harm to wildlife resources and allows the holder of the right-of-way to provide essential human services to our rural communities.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15- year Re-Evaluation Date: 2029

Draft COMPATIBILITY DETERMINATION

Use: Scientific Studies and Research Projects by Third Parties

Refuge Name: Whittlesey Creek National Wildlife Refuge

Establishing Authority and Acquisition Authority:
Whittlesey Creek National Wildlife Refuge (NWR, Refuge), located in Bayfield County, Wisconsin, as established on September 30, 1999.

Refuge Purposes:
The primary purpose of Whittlesey Creek National Wildlife Refuge is "…for the development, advancement, management , conservation, and protection of fish and wildlife resources…16 U.S.C. 742f(a)(4)"…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (Refuge System) is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [668dd-668ee])

Description of Use:
The Refuge allows research investigations on a variety of biological, physical, archeological, and social components to address Refuge management information needs or other issues not related to Refuge management. Studies are or may be conducted by federal, state, and private entities, including the U.S. Geological Survey, Minnesota Department of Natural Resources, state and private universities, non-governmental organizations, and independent researchers and contractors through the issuance of a Special Use Permit. Each research project will be approved by the Refuge Manager on a case-by-case basis.

Research investigations will follow a specific protocol. Sites and timing of the investigations will depend on each individual project. Locations, means of access, and frequency of visits will be stipulated by the Special Use Permit.

Availability of Resources:

What resources are needed to properly and safely administer the use?
Facilities and staff are currently available to issue and oversee Special Use Permits required for research projects. Many of these research projects will address Refuge questions and require a small amount of time for the Refuge staff to review the proposal and issue a permit. Refuge staff will require a written report that will be in a format useful for future Refuge use.

Are existing refuge resources adequate to properly and safely administer the use?
Staff resources are deemed adequate to manage this use at anticipated levels. Staff will prioritize requests so that staff time is dedicated to reviewing projects that have a Refuge benefit, limiting staff time spent on third party research projects. Follow-up monitoring of the

project will take some staff time but at the expected levels of research project requests for the Refuge, Refuge staff time is adequate to administer the program.

Anticipated Impacts of Use:
Short-term impacts include disturbance to wildlife and habitat. Efforts to capture animals can cause disturbance, injury, or death. Sampling activities can also disturb habitat by trampling of vegetation.

No long-term impacts are expected as the scientific studies and research projects by third parties are typically short duration investigations.

How does the use affect the refuge purposes, the Refuge System mission, and the refuge goals and objectives?
These studies provide valuable information regarding Refuge resources and management that will help make decisions in the future. All impacts can be controlled by the issuance of Special Use Permits.

Public Review and Comment:
This compatibility determination is available for public review as part of the Whittlesey Creek National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. Comments received and agency responses are included in the final version of the Whittlesey Creek NWR Comprehensive Conservation Plan.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Prior to conducting investigations, researchers will obtain Special Use Permits.
2. Researchers must possess all applicable state and federal permits as required for their research.
3. Researchers must provide the Refuge with copies of all data and a final report.
4. Collection of specimens must be specifically authorized by the Refuge.

Justification:
Research is conducted to provide useful information on which to base Refuge management decisions in the future. In order to make scientifically-based decisions, research must be conducted to monitor and document management activities.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15- year Re-Evaluation Date: 2029

Appendix H: Whittlesey Creek Brook Trout Experiment

AN EXPERIMENT TO ESTABLISH A SELF-SUSTAINING BROOK TROUT POPULATION IN WHITTLESEY CREEK THAT EXHIBITS A MIGRATING LIFE HISTORY (COASTER) BY STOCKING, ENACTING PROTECTIVE REGULATIONS AND IMPLEMENTING HABITAT IMPROVEMENTS

U.S. Fish and Wildlife Service Ashland
Fishery Resources Office and Whittlesey
Creek National Wildlife Refuge
&
Wisconsin Department of Natural Resources
June 5, 2003

BACKGROUND

Whittlesey Creek is a 5.2-mile tributary to Lake Superior in Bayfield County located at the head of Chequamegon Bay west of Ashland, Wisconsin. There are two named tributaries to Whittlesey Creek, the North Fork of Whittlesey Creek and Little Whittlesey Creek. Whittlesey has a surface drainage watershed of approximately 4900 acres (Johannes et al 1970). The watershed has two main soil regions consisting of mainly sand or clay.

The sand portion of the basin (upstream of the headwaters) is dominated by forest cover, most of which lies within the Chequamegon National Forest. This region consists of a very deep layer of sands (at least a couple of hundred feet deep) where any precipitation that falling here quickly penetrates the ground and enters the deep aquifer of Whittlesey Creek. Faith Fitzpatrick of the United States Geological Survey has estimated that the recharge cycle (estimated time for precipitation that falls in this sand region to reach the stream) is in the neighborhood of 90 years (Faith Fitzpatrick, personal communication, 8505 Research Way, Middleton, Wisconsin 53562). This creates a situation where Whittlesey Creek receives a very stable base flow from this groundwater source (approximately 16 cfs.). The great majority of this water enters the stream reach located from about a quarter mile upstream of the junction of the Mainstem and the North Fork to about a half-mile downstream of the forks.

The second major soil region, consisting of mainly steeply sloping impervious clay soils, encompasses the drained portion of the watershed. The great majority of this region is in private ownership either in field, pasture or forest. The clay soils of this region are very impervious and shed water very quickly to the stream. Precipitation runs off this clay region so quickly that the USGS described surface runoff rates as ‘urban-like’ (Bernard Lenz, personal communication, Northwest Field Office, Rice Lake, Wisconsin 54868). A typical snow-melt or rainfall event can increase volume of flow by 15 to 20 times in a few hours while more severe events in recent years have amplified flows by up to 40 times base flow (USGS, 1999). These peak flood events cause severe bank erosion, destabilizing spawning substrates, and accelerating sedimentation.

Whittlesey Creek provides valuable spawning and rearing habitat for resident and migratory trout and salmon. Whittlesey Creek is listed as having Class I trout water on 4 miles of the main stem from Lake Superior to the junction of North Fork and 1.8 miles on the North Fork from the junction with Whittlesey Creek to Cozy Corner Road (WIDNR 2002). Upstream of Cozy Corner Road there is 1 mile of Class II trout water (WIDNR 2002). Brook trout abundance and distribution was determined during surveys

conducted by Wisconsin DNR in 1977 and by Wisconsin DNR and the Service in 2001 and 2002. Comparative data from these surveys indicates that abundance declined 70% from 1977 to 2001. Population estimates from 6 common survey stations were 184 in 1977 and 56 in 2001. In the 2 stations (Stations 4 and 5) for which population estimates were made in 1977, 2001 and 2002 brook trout population estimates were 79, 27, and 11, respectively. The apparent decline in abundance may be a result of in-stream habitat changes caused by floods over the 24-year time period between surveys.

Whittlesey was historically an important brook trout stream whose populations probably declined by the turn of the century. We assume (although there is no documented evidence yet) that at least some of the settlement period (late 1800's) brook trout may have migrated to Chequamegon Bay and exhibited lake growth (coaster). The first official record of brook trout stocking took place in 1916 and stocking continued sporadically until the early 1990's (Table 1).

We presently lack important information regarding the question, 'what creates the coaster phenotype or life history'. We note a few of the numerous explanations of which we are aware, and acknowledge that there are undoubtedly more. All can be supported given our current level of understanding.

Table 1. History of stocking in Whittlesey Creek (compiled by Wisconsin DNR).

Year	Date	Location	Species (strain)	Size	Number
1916	May 29	Whittlesey	Brook Trout	Advanced Fry	10800
1916	May 29	North Fork	Brook Trout	Advanced Fry	3600
1916	June 23	Whittlesey	Rainbow Trout	Advanced Fry	6400
1916	June 23	North Fork	Rainbow Trout	Advanced Fry	6400
1917	May 30	Whittlesey	Brook Trout	Advanced Fry	3600
1917	May 30	North Fork	Brook Trout	Advanced Fry	3600
1921	April 1	Whittlesey	Brook Trout	Fry	3600
1928	No date	Whittlesey	Brook Trout	Fingerling #3	28000 (Up to)
1929	July 18	Whittlesey	Brook Trout	Fingerling	5600
1933	Sept. 9	Whittlesey	Rainbow Trout	Yearling	3000
1933	June 26	Whittlesey	Brook Trout	Fingerling #3	1600
1935	June 10	Whittlesey	Brook Trout	Fingerling	21250
1935	August 7	Whittlesey	Brook Trout	Fingerling	15000
1936	Sept. 24	Whittlesey	Brook Trout	Fingerling	18000
1938	No date	Whittlesey	Brook Trout	Fingerling	13675
1939	No date	Whittlesey	Brook Trout	Fingerling	20815
1940	No date	Whittlesey	Brook Trout	Fingerling	25060
1941	No date	Whittlesey	Brook Trout	Adults	14
1941	No date	Whittlesey	Brook Trout	Fingerling	15000
1941	No date	Whittlesey	Brook Trout	Yearling	845
1942	No date	Whittlesey	Brook Trout	Fingerling	7650
1942	No date	Whittlesey	Brook Trout	Yearling	300
1943	No date	Whittlesey	Brook Trout	Yearling	682
1944	No date	Whittlesey	Brook Trout	Yearling	1000
1946	No date	Whittlesey	Brook Trout	Fingerling	6500
1947	No date	Whittlesey	Brook Trout	Fingerling	6800

1948	No date	Whittlesey	Brook Trout	Fingerling	7600
1949	No date	Whittlesey	Brook Trout	Fingerling	4800
1950	No date	Whittlesey	Brook Trout	Fingerling	4500
1971	May 17	Whittlesey	Brown Trout	6.8 per pound	20000
1972	May 18	Whittlesey	Brown Trout	6.2 per pound	12500
1972	May 17	Whittlesey	Brown Trout	6.3 per pound	7500
1973	May 16	Whittlesey	Brown Trout	6.7 per pound	20000
1994	No date	Whittlesey	Brown Trout (L. Nipigon)	Yearling (Ad clip)	500
1994	No date	Whittlesey	Brook Trout (L. Nipigon)	Yearling	1000
1995	No date	Whittlesey	Brook Trout (L. Nipigon)	Yearling (Ad clip)	1000

GOALS AND OBJECTIVES

To gain insight into the question of what triggers the lake life history in brook trout, a number of experiments are being developed or are on-going in Wisconsin and other areas around Lake Superior. This experiment is one aspect of the Brook Trout Plan for Wisconsin's Lake Superior Basin. It will attempt to test the whether stocking progeny of Isle Royale strains of brook trout can re-establish a self-sustaining migratory population in Whittlesey Creek.

Hypothesis:

Whittlesey Creek can support a healthy self-sustaining migrating brook trout population by stocking brook trout with a known lake life history, by protective regulations, and by habitat improvements.

Project Goal:

Establish a self-sustaining brook trout population in the Whittlesey Creek watershed that exhibits a migrating life history.

Project Objectives:

Short term: By 2003, describe the current status and abundance of the Whittlesey Creek fish community and identify strategies to establish a self-sustaining migratory brook trout population.

Long term: By 2030, establish a self-sustaining migratory brook trout population. A population is considered self-sustaining when it supports itself for at least two life spans after stocked fish no longer contribute to recruitment.

Strategies:

- Repeat in 2001, the comprehensive fish survey conducted by WIDNR in 1977.
- Establish index stations in the stream and along the lake shoreline and survey these on a regular schedule beginning in 2001.
- Stock Whittlesey Creek for seven years using strains of brook trout from the Lake Superior basin with a known lake life history.

- Identify watershed stressors and instream stressors through hydrologic geomorphologic studies and fishery assessment, identify habitat improvement options, and conduct projects that ultimately improve instream habitat.
- During and post stocking conduct the comprehensive fish survey to monitor changes in the fish community of Whittlesey Creek throughout the experiment.
- Document genetic characteristics of the existing brook trout stock and of the strains proposed to be stocked.
- Establish regulations that protect brook trout from harvest while in the stream.
- Establish regulations that provide greater protection of brook trout while in Lake Superior.

STOCKING PLAN

Stocking Goal
To establish 25 spawning pairs of brook trout exhibiting the migratory life history.

Biological Considerations
Fish Community Effects
In Wisconsin waters of Lake Superior brook trout are the only native salmonine that utilize the riverine environment. Historically, both lake trout and lake dwelling brook trout were present in the lake, with brook trout utilizing the nearshore environment and lake trout occupying deeper waters of the lake.

In addition to brook trout, the current fish community of Whittlesey Creek consists of numerous introduced salmonines including migratory coho salmon, rainbow (steelhead) and brown trout, and resident rainbow and brown trout. These introduced salmonines are considered 'naturalized' as their populations are sustained by natural reproduction. In addition, splake are stocked in Chequamegon Bay and are occasionally found in Whittlesey Creek.

As described in the Background section, brook trout numbers in Whittlesey Creek are low and declined by at least 70% over the time period from 1977 to 2001. From recently collected data, it appears that the brook trout population in Whittlesey Creek is small and remaining stable or declining.

Based on WIDNR survey data from 1977, 2001, and 2002, the abundance of coho salmon in Whittlesey Creek has also dropped. Data from 2001 and 2002 suggest that abundance was down by 70-80% from 1977. In common stations, population estimates for all ages were 26,131 in 1977 and 4,877 in 2001. While abundance is much reduced from 1977, coho salmon in Whittlesey Creek have been found to exhibit high survival over-winter, comparable or better than over-winter survival in streams of the Pacific Northwest (Ford 1997). Based on Ford's (1997) study the decline in abundance is not attributable to poor over-winter survival. We do not expect the stocking of coaster strain brook trout to affect survival of coho salmon in Whittlesey Creek.

Limited data on Lake Superior tributaries suggests that juvenile coho salmon may depress brook and brown trout populations (Stauffer 1977). Peck (1992) speculated that coho salmon might have a negative effect on the restoration of coaster brook trout in Lake Superior by competition in the stream environment. This is unknown, as coho introductions in Lake Superior occurred after coaster brook trout populations in the lake had already declined.

Inherent in the experiment hypothesis is the belief that migratory brook trout can, if the proper strain is present and if protection is adequate, co-exist with non-native naturalized and stocked salmonines in Whittlesey Creek. Groundwater upwellings or springs are abundant in Whittlesey Creek, especially in the

area near and upstream from the confluence of the main stem and North Fork. Brook trout, apparently more than any other salmonine, prefer upwellings for spawning habitat (Powers 1980, Curry and Noakes 1995). At the time of spawning, redd site selection is likely to result in some segregation of brook trout and non-indigenous salmonines in Whittlesey Creek.

Brook trout and other salmonines have proven to be rather adaptable at using apparently sub optimum spawning sites (Powers 1980, Curry and Noakes 1995). If upwelling groundwater is present brook trout have spawned on sand, silty-sand, and waterlogged sticks (Powers 1980, Curry and Noakes 1995). Kondolf and Wolman (1993) report that in a particular river system, chum salmon select sites with upwelling currents to prevent freezing of the eggs. They note that these sites are selected despite the need to excavate 30 cm of silt to locate gravel in which to deposit eggs.

Fish Community Objectives

Rehabilitation of lake dwelling coaster brook trout is a priority of the Great Lakes Fishery Commission Lake Superior Committee (Horns et al. 2002). To advance efforts to rehabilitate lake dwelling brook trout in Lake Superior, a multi-agency adhoc committee of the Lake Superior Technical Committee was formed. This committee developed the document, A Brook Trout Rehabilitation Plan for Lake Superior (Newman et al. 1999). The rehabilitation goal for brook trout in Lake Superior to maintain widely distributed, self-sustaining populations in as many of the original, native habitats as is practical (Newman et al. 1999).

The rehabilitation plan provides guidance for population objectives and identifies numerous issues and strategies for consideration. Population objectives that will be adopted for this project include: the population will be self-sustaining and capable of co-existing with populations of naturalized salmonines in the existing fish community, the population will exhibit genetic profiles consistent with those of populations currently existing in the Lake Superior basin, essential habitat will be protected and where necessary, rehabilitated, and that the fully restored population will be comprised of 6 or more age groups, including at least two spawning year classes of females.

Biology and Life History

The fecundity of brook trout in Tobin Harbor has been determined for 2 fish. A 16-inch female contained 1,800 eggs (Quinlan 2000), while a 2.5- pound, 18-inch female had 3,373 eggs (Henry Quinlan, personal communication, USFWS Ashland Fishery Resources Office, Ashland, Wisconsin, 54806). Becker (1983) reported that a 14-inch female contained 1,500 eggs. The number of eggs produced by Lake Nipigon strain brook trout at the Ontario Ministry of Natural Resources Dorian Hatchery is typically 1,500 eggs/kg of fish (John Sagar, personal communication, Hatchery Manager, Ontario Ministry of Natural Resources Dorian Fish Culture Station).

There is a dearth of information available on the characteristics of coaster redds. Ten brook trout redds located during surveys conducted by the Service in the Salmon Trout River, had an average diameter of 0.8 m (range 0.6 to 1.1m) (Lee Newman, personal communication, USFWS Ashland Fishery Resources Office, Ashland, Wisconsin, 54806). At Tobin Harbor, a large male and female and several smaller male coasters were observed on one redd in 1997. Substrate material in the redd was a mixture of sand and pea gravel, and water depth was 0.5 m (Henry Quinlan, personal communication, USFWS Ashland Fishery Resources Office, Ashland, Wisconsin, 54806). There is no information on whether or not eggs were deposited, nor whether fry emerged from redds in the Salmon Trout River or in Tobin Harbor. Becker 1983, described typical redd size as having a diameter of 0.3-0.6 m for stream brook trout.

Strain Selection and Genetics

Currently 3 strains of brook trout from the Lake Superior basin that exhibit the lake life history are being maintained in hatcheries as brood stock for rehabilitation stocking efforts. Two Isle Royale strains (Tobin

Harbor and Siskiwit Bay area) are reared by the Service at the Iron River (Iron River NFH) and Genoa National Fish Hatcheries. The Lake Nipigon strain is from a lacustrine population that is within the Lake Superior basin, but due to natural barriers is inaccessible to Lake Superior. The Lake Nipigon strain is reared at the Ontario Ministry of Natural Resources Dorian Fish Culture Station and through a transfer of eggs from Dorian at the Red Cliff Tribal Hatchery.

The Siskiwit Bay area strain originated from brook trout captured in the estuary of the Big and Little Siskiwit rivers, primarily the Big Siskiwit River. This strain has been derived from gametes collected over two years (1995 and 1999). A total of 8 males and 11 females contributed to this brood stock.

The Tobin Harbor strain is derived from gametes collected in three separate years (1996, 1998, and 2001) from a shoreline spawning population. Founding parents for the brood stock consist of 51 males and 48 females.

Tissue samples from Isle Royale stocks have been analyzed genetically using Mitochondrial DNA (MtDNA) (Burnham-Curtis 1996 and 2001). MtDNA analysis indicates that the predominant haplotype found in Lake Superior brook trout populations predominates in the Isle Royale source stocks and populations from Wisconsin (Little Onion and Little Sioux rivers and Oak Island streams numbered 6 and 7) (Burnham-Curtis 2001). The MtDNA analysis suggests that the evolutionary history of these populations have a common pattern of colonization, likely from the Atlantic refugium (Burnham-Curtis 2001). While BT1 is the predominant haplotype in Lake Superior populations, the Big Siskiwit River population also contained haplotypes BT2 and BT4 and therefore can be differentiated from the Tobin Harbor strain in which only BT1 was present. The sample size was rather small, particularly for the Siskiwit Bay area population, which renders the results informative but not statistically significant.

Additionally, recent unpublished microsatellite DNA analysis shows that the Tobin Harbor and Siskitwit Bay (Big and Little Siskiwit rivers) populations exhibit different markers and can be differentiated genetically (Loren Miller, personal communication, Department of Fisheries and Wildlife, University of Minnesota, St. Paul, Minnesota, 55108, and Wendy Lee Stott, U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, Michigan, 48105). Dr. Loren Miller's study will compare wild and hatchery stocks using microsatellite analysis to determine the level of genetic conservation in the hatcheries, to describe parentage relationships, and to provide recommendations for continued maintenance of diverse genetics in the hatchery system. Because genetic and life history differences are evident, and tagging work has shown no movement between populations at Isle Royale, the Service maintains the Tobin Harbor and Siskiwit brood stocks separately.

While no records of strain exist, it is believed that many different strains of brook trout have been stocked in Whittlesey Creek (Table 1). Additionally, brook trout have been stocked in Fish Creek located ½ mile from Whittlesey Creek, in other tributaries within 10 miles of Whittlesey Creek, and in Chequamegon Bay.

Genetic analysis of the resident brook trout in Whittlesey Creek is in progress. Samples collected in 2001 and 2002 are being analyzed by UW-Stevens Point in cooperation with Wisconsin DNR. The genetic characterization of resident brook trout will be conducted using the same genetic markers used to describe the Isle Royale strains and Lake Nipigon strain fish from the Red Cliff Tribal Hatchery.

The brook trout population in Whittlesey Creek is not a "heritage" population (remnant population with no documentation and/or likelihood of having mixed with stocked or transferred fish). As shown in Table 1, stocking of brook trout in Whittlesey Creek has occurred frequently over the last 100 years. Unfortunately, there is no record of the various strains that have been used, however, it is generally

understood that until the 1990's, the source fish were not from the Lake Superior basin. Stocking brook trout that originated from the Lake Superior basin in Whittlesey Creek is consistent with the Brook Trout Rehabilitation Plan for Lake Superior (Newman et al. 1999).

Fish Health

The U.S. Fish and Wildlife Service Fish Health Laboratory in La Crosse, Wisconsin, conducts fish health testing at the Iron River National Fish Hatchery semi-annually. At present the classification for the Iron River NFH is Rs. This classification indicates that *Renibacterium salmonarium* bacteria (causative agent for Bacterial Kidney Disease), were present in samples tested. The Service will follow guidelines of the Great Lakes Fish Health Policy which state that efforts should be made not to stock fish with overt signs of the disease (Hnath et al. 1993). None of the brook trout or lake trout at Iron River NFH shows overt signs of BKD or any other fish health diseases. Prior to stocking a complete Fish-Disease Inspection Report will be provided to WIDNR. However, due to the small size (<1 inch) of advanced fry planned for stocking, bacterial disease testing cannot readily be conducted on these fish.

Stocking Details

In determining the number of coasters to be stocked at various life stages we considered coaster biology (egg production) and information on the size of remnant and re-established coaster populations at Isle Royale, in the Salmon Trout River, Michigan, and at Grand Portage, Minnesota.

There is no definitive information available from which to determine which of the two Isle Royale strains would be most suited to Whittlesey Creek and provide the greatest chance of meeting the goal of this project. Therefore, we plan to stock various life stages of both strains and evaluate their performance in situ, through assessment surveys and genetic analysis.

Annually throughout the stocking period (2003-2009) we plan to stock multiple life stages of both the Tobin Harbor and Siskiwit strains of brook trout. The number of eggs to be stocked is based on estimated production by the target population and the availability of eggs from Iron River NFH. The number of eggs stocked will be evaluated throughout the project. Observations from surveys conducted in fall and winter on use of spawning sites by fall run salmonines will be used to provide information on the amount of available spawning habitat. This may provide additional information to better determine the number of eggs to stock.

The number of fingerlings, yearlings and adults to stock will be determined by the target population size, estimates of survival (including straying), and hatchery availability. Fingerlings, yearlings and adults will be scatter stocked throughout the stream. Areas of suitable spawning and nursery habitat will be a priority.

The stocking of Tobin Harbor spring fingerlings was determined to be more successful than fall fingerlings in an ongoing experimental stocking project in several streams at Pictured Rocks National Lakeshore (Lora Loope, personal communication, Pictured Rocks National Lakeshore, Munising, Michigan, 49862). However, the source hatchery for the fish differed, with the spring fish being reared at Genoa NFH and the fall fingerlings being reared at Iron River NFH. As a result of water temperature differences at these two hatcheries, the spring fish from Genoa NFH were equal in size (3.0-3.5 inches) to the fall fingerlings at Iron River NFH.

At the time that stocking is discontinued, we expect that 3-4 year classes of stocked fish will be mature and capable of reproducing naturally. To allow adequate evaluation of this experiment, WDNR has enacted regulations that protect brook trout in Whittlesey Creek and in the lake environment.

Methods

All life stages to be stocked, except eggs, will receive a mark for later identification. We anticipate being able to utilize genetic analysis to differentiate fish stocked as eggs (no external mark) versus naturally reproduced fish as a result of ongoing genetic analysis being conducted at the University of Minnesota and U.S. Geological Survey in Ann Arbor, Michigan.

All fish reared at Iron River NFH are marked with oxytetracycline. The oxytetracycline mark will be used to differentiate stocked advanced fry from wild fish since they are too small for an external tag or fin clip (the capability to assess / read oxytetracycline marked fish needs to be secured for this project). All yearlings will be marked with an adipose fin clip and receive a coded-wire tag in the snout. Adults will be marked with Floy tags and will retain fin clips used to manage brood stock in the hatchery. Additional stocking of adult coasters in 2005 and 2007 will be conducted if excess brood stock is available. The intent of the adult transfer is to stimulate natural reproduction by all means possible.

Lacking information, we made several assumptions on survival of stocked eggs/fish to aid planning efforts. The first is that roughly 5% of the stocked eggs will survive to the advanced fry stage (i.e. 2,500 advanced fry will survive from 50,000 eggs). Advanced fry will survive to yearlings at a rate of 10%, and yearlings to age 2 at 10% per year. Beyond age 2 we estimate that survival will be 50%, similar to the rate of survival (0.56) at Tobin Harbor, Isle Royale, Michigan (Quinlan 1999).

A telemetry study conducted on Tobin Harbor brook trout found that fish remain within the harbor year round (Newman 2000). Therefore, survival rate may be quite different for fish that migrate to and from Lake Superior. We expect the return rate of fish out-migrating to be low but have no figure to use as an estimate. The number of eggs and fish to be stocked and the number projected to survive to subsequent years are shown in Table 2.

The number of fish, particularly females, of age 3 and greater may be critical to successful reproduction. At Tobin Harbor, 80% of female coasters were found to be mature by age 3, while less than 20% of age 2 or younger females were mature (Quinlan 1999). Using the predicted survival rates as a guide, the total number of fish projected to survive to age 3 or greater is shown at the bottom of Table 2. We acknowledge that these totals result in more than the 25 pair goal for this experiment. However, due to uncertainties in our survival estimates, straying and return rates, and lack of understanding of fish survival during migration, the projected number of fish was used simply as a guide to help determine a reasonable number of eggs and fish to stock. We also note that after 2004, the number of mature fish could be greater than the projected number of fish $\geq$ age 3 shown in Table 2, as males may mature at younger ages.

At each eyed egg stocking site a minimum of 50 eggs will be placed in egg trays to estimate percent hatch. Eggs will be stocked in manually created redds in areas of suitable habitat and where brook trout are observed spawning. Care will be taken to avoid disruption of any redds created naturally by salmonines.

Advanced fry will be scatter stocked near areas of suitable spawning substrate or where brook trout are observed spawning. Yearlings and adults will be scatter stocked throughout the stream. Some yearlings and adults will be stocked in areas of suitable spawning habitat. Enclosures such as pens or temporary block nets will be used to retain stocked yearlings and adults in the stream for 3-7 days post stocking. The intent of the enclosures is to provide some degree of imprinting and reduce the likelihood of immediate departure from the stream.

Table 2. Stocking by year and number of fish present over time at assumed survival rates described in text (stocking events are shown in bold and the estimated number of fish equal to or greater than age 3 are shown in italics).

Lifestage	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2003										
Adults	***75***	*33*	*16*	*8*						
2004										
Eggs		**50,000**	250	25	*13*	*6*	*3*			
Yrlngs*		**2,000**	200	*100*	*50*	*25*	*12*			
2005										
Ad Fry**			**20,000**	2,000	200	*100*	*50*	*25*	*12*	
Adults			***50***	*25*	*12*	*6*				
2006										
Eggs				**50,000**	250	25	*13*	*6*	*3*	
Yrlngs*				**2,000**	200	*100*	*50*	*25*	*12*	
2007										
Ad Fry**					**20,000**	2,000	200	*100*	*50*	*25*
Adults					***50***	*25*	*12*	*6*		
2008										
Eggs						**50,000**	250	25	*13*	*6*
Yrlngs*						**2,000**	200	*100*	*50*	*25*
2009										
Ad Fry**							**20,000**	2,000	200	*100*
Adults							***50***	*25*	*12*	*6*
≥ Age 3	75	33	66	133	125	262	190	287	152	162

* Yearlings will be approximately 4 inches for a spring release.
** Advanced Fry - Fish will be approximately 1.25 inches for a spring release.

Measurable Objectives

- ***First Generation Target (2014):*** Do enough stocked fish migrate and survive to maturity?
  - *Migration Target*: If stocked fish survive in sufficient numbers to achieve 25 migratory spawning pair target by 2014 - Target achieved and experiment succeeds to this stage and continues.
  - *Reproduction Target*: That migratory brook trout successfully recruit enough to support next generation targets. - Target achieved and experiment succeeds to this stage and continues.
  - If fewer than 25 migrating spawning pairs survive to spawning age or if natural recruitment does not achieve self-supporting goal – Target not achieved, but assessment continues.

- ***Second Generation Target 2019:*** Does spawning stock generate sufficient juvenile production to migrate and support next generations' recruitment?
  - If spawning produces sufficient fall fingerlings that normal survival would allow population to survive and reach 25 spawning pair in the next generation, about 2019 – Target achieved and experiment succeeds to this stage and continues.
  - If fall fingerling population is insufficient to achieve next generation spawner target of 25 pair – Target not achieved, but assessment continues.

- ***Third Generation Target 2024 to 2030:*** Does experiment achieve target rehabilitation goal?
    - If spawning population is sustained at or near 25 pair for at least two generations beyond the end of stocking, about 2030 - Target achieved and experiment is a success.
    - If self-sustaining spawning population stabilizes at less than 25 pair, but assessments indicated carrying capacity reached at lower level than target – Target not achieved but rehabilitation successful at lower level.
    - If spawning population is not sustained at or near 25 pair for at least two generations beyond the end of stocking - Target not achieved.

ASSESSMENT AND HABITAT RESTORATION ACTIVITIES

Post Stocking Evaluation Period (2010 – 2030)

Assessment of stocked fish and monitoring of changes to the fish community will occur for the duration of the stocking period or until stocked fish are no longer encountered. All standardized index stations described below will be conducted for the duration of the project. These assessments will provide information to evaluate stocking success, the abundance of brook trout and other salmonines, population status, habitat use, and other life history traits of the developing migratory 'coaster' brook trout population.

Stream Electrofishing

Comprehensive Fishery Survey - In 2001, WDNR and Service staff conducted a comprehensive fishery survey repeating a similar survey done by WDNR in 1977. Tissue samples were collected in both 2001 and 2002 for genetic analysis of the existing stock (lab workup has not been done yet). We propose to repeat the comprehensive survey between 2005 and 2009, and again 3-5 years post stocking to provide a comparison of the fish community pre, during, and post stocking.

Index Stations - Three stream reaches were selected as index stations to be sampled annually (mid-September) throughout the experiment. These index stations were chosen to encompass the majority of the existing spawning habitat located in the watersheds transitional zone. Results of surveying these index stations will allow documentation of changes in brook trout recruitment success. A USFWS-DNR crew sampled the three index stations in 2002. These surveys will be conducted during the 2nd week of September.

Fall Index Station - A stream reach in the depositional zone (between STH 13 and Ondassagon Road) has been sampled by WDNR annually each fall, since 1971. This station will continue to be sampled annually throughout the experiment.

Lake Shore Electrofishing

In 2001, an index electrofishing station was established and sampled along a portion of the Chequamegon Bay shoreline (a 5 km section from the mouth of Whittlesey Creek north along the shoreline to Bono Creek). This station was selected to determine presence, abundance and habitat use by lake-dwelling migratory brook trout. This station was re-sampled during 2002 and will be sampled two to three times annually (spring and fall) throughout the experiment.

Monitoring In and Out Migration

A method to monitor in and out migration has not yet been identified. Discussion has focused on upstream and downstream nets such as the modified fyke nets used on the Salmon Trout River by Michigan Technological University, or weirs and video equipment. WDNR experience with numerous in-stream devices (weirs and or nets and traps on the Bois Brule, Iron, Sioux, and Pikes) to monitor and quantify in and out migration on local streams has proven to be impractical. Devices typically become non-functional during flood events, the autumn leaf period and during winter conditions. Structures that have been tried typically block fish runs, cause fish damage or latent mortality, or due to blowout, lose the capability of enumerating movement numbers (major peaks in both upstream and downstream fish movement typically occur during the turbid water period on the declining water volume side of the flood event). Use of underwater cameras to enumerate movement will continue to be explored, however, turbidity is a concern for effective viewing with underwater cameras. In order to enumerate ascending runs on the Bois Brule River, salmonids are crowded within two to three inches of the fish-way window during turbid water conditions. Radio telemetry will be investigated for use on larger fish, generally those greater than one pound. A stationary data logging station set up near the mouth and active tracking by foot and boat would be utilized to monitor movement of fish outfitted with radio transmitters. These and other options will be further explored in the future.

Monitor Migratory Adult Spawning Activity

Visual counts and/or electrofishing gear will be used to monitor migratory spawning aggregations to verify spawning sites. Walking the stream a number of times during the spawning period can be used to observe large fish, indicative of the migrating life history. Electrofishing gear may be used to capture and tag individuals.

Monitor Fry Emergence

Upon identification of spawning locations attempts will be made to assess fry emergence success. This will be done during the late winter/early spring fry emergence period prior to the first significant runoff event, by walking the stream.

Table 3. Assessment activities related to brook trout in Whittlesey Creek.

Purpose of Survey	Season	Waterbody	Gear
Determine presence, abundance, and habitat use	Spring/Fall	Lakeshore	EF boat
Assess YOY and juvenile year class strength	Early Fall	Stream	Barge/Backpack EF
Assess spawning adults and describe habitat used for redds	Fall	Stream	Visual and/or backpack EF
Assess fry emergence	Winter	Stream	Visual

Monitor Water Volume and Temperature

Flow and temperature data will be collected for the duration assessment period. The USGS gauging station will be maintained to provide data on daily mean and peak flow for the duration of the study. WDNR has been monitoring fall to spring water temperatures since 1994-95 at the bridge at Wickstrum

Road and this effort will continue. At least two temperature loggers will be set in the stream in areas where eggs are stocked to describe winter water conditions. Two temperature loggers will also be set in Chequamegon Bay annually from spring through early winter. One will be set within the lakeshore electrofishing index station and the other near Houghton Point to describe the thermal regime in those areas of the bay.

Monitor Stream Channel Morphology Changes

In 1999, the Service conducted an assessment of instream and riparian habitat in Whittlesey Creek. Surveys were conducted on 20 stream reaches in Whittlesey Creek, Little Whittlesey Creek, and North Fork Whittlesey Creek. The surveys identified channel type using the Rosgen Classification system (including dimension, pattern and profile) and quantity and quality of habitat (woody debris, undercut banks, sediment, riparian condition) that contribute to spawning, nursery and refuge for salmonines. This baseline information (a snapshot in time of the condition of these three streams) will assist evaluation of future watershed and instream habitat restoration activities.

The Service will select five to ten of the sites that were sampled in 1999 to serve as reference reaches. Channel morphology and substrate data will be taken annually at each site after the spring snow-melt period and after other major (100 year) flood events to monitor changes to salmonid habitat throughout the experiment. Additionally, photos will be taken at each station to visually record changes in channel structure and instream habitat.

In 2002, the U.S. Geological Survey completed field work on a hydrologic study to determine how changes in land cover affect surface water and base flow in Whittlesey Creek. Upon completion of the written report, the results and recommendations will used to evaluate future watershed, riparian, and instream habitat restoration efforts.

Watershed Improvements

Concurrent with fish assessments and management actions, the Service will conduct watershed and stream corridor restoration treatments with landowners, partner agencies and non- governmental organizations (e.g. Trout Unlimited). The actions will include but not be limited to conservation easements, land acquisition from willing sellers, educational outreach, planning, physical alterations, and streamside litter clean up. We anticipate the USGS hydrologic study on Whittlesey Creek will help identify priority actions. Initial attention will focus on the North Fork of Whittlesey Creek and contributing watershed. Instream habitat improvements have yet to be determined. Information gained from hydrologic and geomorphologic studies will be used to evaluate the suitability and location of instream habitat projects.

Angling Regulations

Angling regulations were changed in 2003 to provide greater protection for brook trout during this experiment. Stream harvest was eliminated with a ‘no kill’ regulation throughout the fishing season and lake harvest is limited by establishing a twenty-inch minimum size limit. These regulations are intended to continue for the length of the experiment.

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