

Hamden Slough

National Wildlife Refuge

Comprehensive Conservation Plan



Cover Photograph: U.S. Fish and Wildlife Service



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.

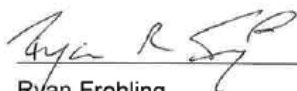
Comprehensive Conservation Plans provide long-term guidance for management decisions; set forth goals, objectives and strategies needed to accomplish refuge purposes; and, identify the Fish and Wildlife Service's best estimate of future needs. These plans detail program planning levels that are sometimes 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.

Hamden Slough

National Wildlife Refuge

Comprehensive Conservation Plan Approval

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Chapter 1: Introduction and Planning Background

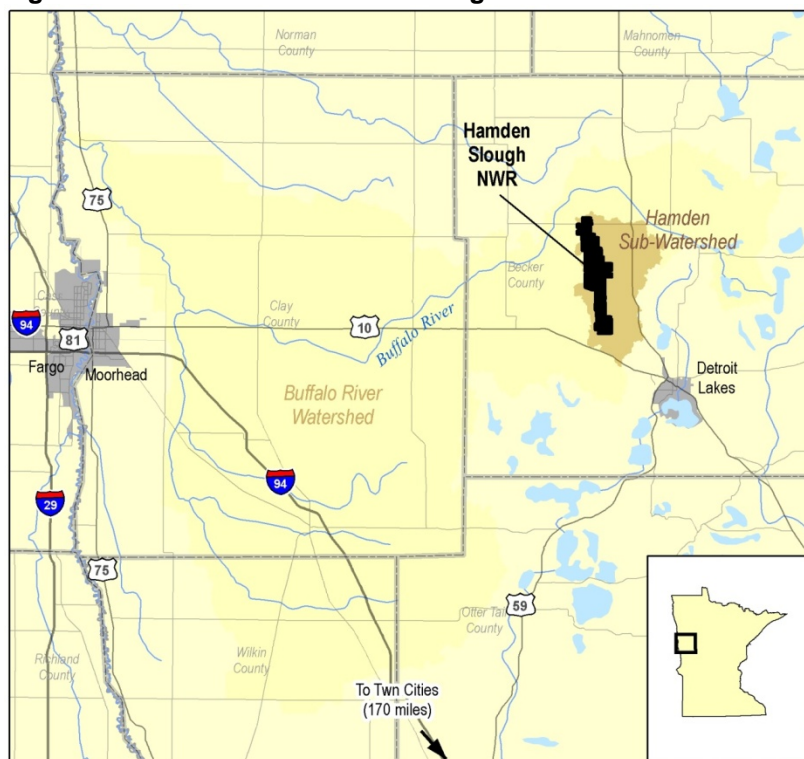
In this chapter:

- 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

Located about seven miles northwest of Detroit Lakes, MN (figure 1-1), Hamden Slough National Wildlife Refuge (NWR, Refuge) was established in 1989 by the Migratory Bird Conservation Commission. The U.S. Fish and Wildlife Service (FWS, Service) is authorized to acquire 5,944 acres of land within the Buffalo River watershed to restore a piece of the prairie-wetland ecosystem that historically existed there. About 3,200 acres of Hamden Slough NWR have been acquired and restored so far, and the location is recognized once again as an outstanding place to see migratory birds.

Figure 1-1: Location of Hamden Slough NWR



The Refuge lies on the eastern edge of the Prairie Pothole Region (PPR), within the Northern Tallgrass Prairie (NTGP) ecosystem, which once covered 18 million acres of Minnesota. Pothole wetlands dotted the landscape and were surrounded by vast expanses of prairie grasses and wildflowers. Vegetation and wildlife communities evolved and thrived with periodic disturbances from fire, flood, drought, and large ungulate grazing. European settlers in the late 19th century soon discovered the richness of the prairie soils, which led to conversion of prairie to cropland and drainage of many wetlands in western Becker County, including the area of Hamden Slough NWR. Today, there are only 170,000 acres remaining of

the Minnesota NTGP, a decline of roughly 99 percent. Many prairie and wetland-dependent wildlife species are declining range-wide.

1.2 Purpose and Need for Plan

The purpose of this Comprehensive Conservation Plan (CCP) is to guide management and administration of the Refuge 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. It addresses identified issues of significance, 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-government groups who have an interest, responsibility, or authority related to the Refuge.

In addition, the landscape has undergone 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. Updated management guidance is needed that reflects these changes to help achieve Refuge goals for wildlife, habitat, and people.

1.3 Refuge Establishment and Purposes

The Migratory Bird Conservation Commission established Hamden Slough NWR on September 19, 1989 to restore and protect prairie pothole habitat for waterfowl production near the town of Audubon in Becker County, MN. The area had long been recognized as an outstanding waterfowl production area, but dramatic loss of nesting cover and small prairie wetlands had raised awareness of the need for conservation of these natural resources. As early as the 1940s, the Minnesota Department of Natural Resources (DNR) had proposed the Hamden Slough area for public acquisition. The Service presented its first proposal for a refuge in 1976. Although a new refuge did not result from that effort, a continued interest led to a second study in 1985, which was ultimately successful.

Hamden Slough NWR was one of the first refuges designed using a computerized Mallard Management Model to predict duck production. Eight land use models were evaluated. The approved design included a 5,944-acre Refuge buffered by an additional 2,600 acres of land protected via a combination of easements, leases, and conservation farming agreements. (The Service already had authority under the Small Wetlands Program for easements, leases, and agreements throughout Becker County, not just adjacent to the Refuge. The buffer area boundary, therefore, caused some confusion. As a result, it is not shown on more-recent maps of Hamden Slough NWR.) The Service and the Buffalo-Red River Watershed District signed a cooperative agreement to ensure continued maintenance of the agricultural drainage system on Refuge lands.

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. 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 Hamden Slough NWR derive from three authorities:

" . . . conservation, management, and . . . restoration of the fish, wildlife, and plant resources and their habitats . . . for the benefit of present and future generations of Americans . . . " 16 U.S.C. 668dd(a)(2) (*National Wildlife Refuge System Administration Act*)

" . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (*Migratory Bird Conservation Act*)

... as Waterfowl Production Areas subject to “... all the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ...” 16 U.S.C. 718(c) (*Migratory Bird Hunting and Conservation Stamp Tax*)

A Concept Plan for the management of Hamden Slough NWR was developed in the early 1990s. The Concept Plan clearly established the initial management priorities for the Refuge and has been useful in informing the goals and objectives of this CCP. Goals established at that time were:

- Provide migratory bird production, resting, and feeding habitat with emphasis on duck production.
- Preserve, restore, and enhance a diversity of indigenous plants and animals of the northern Minnesota prairie wetland ecosystem.
- Promote a wise and lasting land use ethic in the Red River Valley by becoming an educational model for land and water stewardship.
- Provide opportunities for compatible wildlife-related recreation.

The primary management focus was to protect and enhance wetland habitat for the benefit of waterfowl, using ditch plugs, dikes, and water control structures to restore drained wetlands and facilitate water level management. Additional techniques included establishing and managing a mixture of grasses on uplands, providing nesting islands and structures, and implementing a predator control program—all designed to provide optimum nesting habitat.

About 3,200 acres of Hamden Slough NWR have been acquired to date. Before being secured, almost all of the land was used for agricultural purposes. Much of the privately owned land located within the authorized boundary, but not yet purchased, is being grazed, hayed, or left idle.

Refuge staff was located onsite until 2006, headquartered in a farmhouse at the south end of the Refuge. At that time, due to budget cuts and reorganization, responsibility for Hamden Slough NWR was transferred to the Detroit Lakes Wetland Management District.

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 craft 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

“In the morning if it was still and a little foggy, my grandfather said you could hear the prairie chickens drumming, also the trumpet swans, whooping cranes, geese, loons and many species of ducks. He said it sounded like a symphony.”

—Donald P. Larson

Hamden Slough NWR has a rich history defined by its remarkable abundance of wildlife and deep connection with the people who visited the area and called Hamden their home. The Refuge was established to provide habitat for a diversity of migratory birds and native wildlife. The vision for Hamden Slough NWR is a fulfillment of this purpose; a lasting legacy bestowed upon future generations.

Hamden Slough NWR is located on the eastern edge of the Prairie Pothole Region in the NTGP ecosystem. Wetlands and shallow lakes surrounded by tallgrass prairie are nestled within a working landscape rich in agriculture, industry, conservation and tight-knit communities. We will continue to restore, protect, and manage habitats for wildlife, resulting in shared benefits that are relevant in the daily

lives of our Refuge neighbors and local communities. This collaboration will foster an appreciation for a landscape in balance and deepen their personal connection with nature.

Refuge Goals

Wildlife/Habitat Goal

Habitats on Hamden Slough NWR will be restored, protected, and actively managed to provide a diversity of native wetland and grassland habitats. These efforts will be further leveraged by partnerships and conservation actions outside the Refuge, resulting in a resilient and balanced landscape, meeting the needs of migratory birds, threatened and endangered species, and other wildlife in an uncertain future.

People Goal

The Service will engage the public, build relationships, and encourage awareness of a landscape in balance. The Refuge will provide compatible wildlife-dependent recreation that connects people to the land and demonstrates the societal benefits of a restored prairie-wetland system.

1.5 Legal and Policy Framework

Hamden Slough NWR is managed and administered as part of the Refuge System within a framework of organizational setting, laws, and policy. Key aspects of the framework are outlined below. A list of other laws and executive orders that have guided preparation of the CCP and that guide future implementation are provided in Appendix E: Legal and Policy Guidance.

U.S. Fish and Wildlife Service

The Refuge is administered by the U.S. Fish and Wildlife Service, Department of the Interior (DOI). The Service is the primary federal agency responsible for conserving and enhancing the nation's fish and wildlife populations and their habitats. Although the Service shares this responsibility with other federal, state, tribal, local, and private entities, the Service 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."

The National Wildlife Refuge System

The National Wildlife Refuge System had its beginning in 1903 when President Theodore Roosevelt used an Executive Order to set aside tiny Pelican Island in Florida as a refuge and breeding ground for birds. From that small beginning, the Refuge System has become the world's largest collection of lands specifically set aside for wildlife conservation, including more than 550 refuges covering more than 150 million acres, plus 38 wetland management districts. 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).
- 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 (Service Manual, 603 FW 2). 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 Service is directed by the Improvement Act 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 (Service Manual, 601 FW 3) 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 (Service Manual, 605 FW 1)

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 wildlife-dependent 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.

Wilderness Review

Refuge planning policy mandates that wilderness reviews be conducted through the comprehensive conservation planning process. The criteria are size, naturalness, opportunities for solitude or primitive recreation, and supplemental values. No lands within Hamden Slough NWR met the criteria for wilderness established by Congress and described in Service policy (FWS, 2008). Hamden Slough 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 agriculture, drainage, and road building.

1.6 Other Conservation Initiatives

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

Buffalo-Red River Watershed District

Revised Watershed Management Plan

The Buffalo-Red River Watershed District (BRRWD) is a local unit of government responsible for water and resource management within a 1,379-square mile watershed that includes portions of Clay, Becker, Wilkin, and Otter Tail Counties; the Red River is the western boundary. The mission of the BRRWD is to “alleviate flooding and to manage the water resources of the District in a manner that best protects this valuable resource.” Operation of the 1,379-square mile BRRWD is guided by a Watershed Management Plan (WMP). Per Minnesota statute, the BRRWD is required to update and revise its WMP every ten years. The most recent revision was completed in June 2010.

During the 1990s there were frequent disagreements between watershed districts and resource management agencies in northwestern Minnesota over the most effective and environmentally preferable methods to reduce flood damage. After the U.S. Army Corps of Engineers and Minnesota DNR completed a joint environmental impact statement on cumulative effects of flood control projects in the Red River Basin in 1996, the controversy reached its peak. Consequently, in May 1997, the Minnesota Legislature authorized a mediation process to resolve the disputes regarding environmental effects of flood control and to break the gridlock blocking many new flood damage reduction projects.

In December 1998, a mediation agreement to reduce flood damages and improve natural resources in the Minnesota portion of the Red River Basin was reached by representatives of the watershed districts, state and federal agencies, environmental organizations, and private landowner representatives. Key elements of the agreement are clearly identified goals both for flood reduction and natural resources, comprehensive watershed planning, early consultation and collaboration among stakeholders, and a cooperative approach to permitting projects.

Development of the 2010 revised WMP provided an effective means of incorporating the goals of the mediation agreement into the BRRWD. The BRRWD was divided into seven planning regions based on hydrologic boundaries. Hamden Slough NWR lies in the Mainstem Region where issues identified include floodplain management, flood damage reduction, agricultural drainage systems, water quality, wetlands, natural resources and recreation, groundwater, erosion and sediment control, education, long-range work planning and financing, and data collection and management. Becker County Ditch No. 15 and Hamden Slough NWR are located within the boundaries of a Wetland/Grassland Restoration Priority Area. One of the potential solutions listed for flood damage reduction is restoration of Pierce and Hamden Lakes on the Refuge.

Cooperative Agreement

A cooperative agreement between the Service and the BRRWD was signed in July 1989 to identify rights and responsibilities relating to Becker County Judicial Ditch 15 System (Ditch 15 system). Upon execution of the agreement, BRRWD withdrew any objection to the establishment of Hamden Slough NWR. A complete survey profile of the Ditch 15 system was completed by the Service in 1991 as required by the agreement. The Service is responsible for repair and maintenance of the Ditch 15 system on Refuge lands (subject to availability of appropriated funds) to ensure that pre-establishment ditch profile, grade, width, or depth are not changed unless such change is mutually agreed upon. The Service further agreed to periodically review its plan for management of wetland habitat in order to optimize the impact on the secondary objective of flood water retention. The cooperative agreement is in effect for an initial 40-year period.

Red River Basin Commission – Natural Resources Framework Plan

The Red River Basin Commission (RRBC) works across the political boundaries of Manitoba, Minnesota, North Dakota, and South Dakota in the United States and Canada to create a shared vision for action with regard to land and water issues. The mission of the RRBC is to develop a Red River Basin integrated natural resources framework plan, to achieve commitment to implement the framework plan, and to work toward a unified voice for the Red River Basin.

In 2005, the RRBC released the draft Natural Resources Framework Plan (NRFP). The purpose is to provide decision makers, managers, and the public in the Red River Basin with a clear vision for the future and a process to achieve this vision of comprehensive, integrated watershed stewardship and management. It is a guide to be used by any or all entities in their decision-making processes. The NRFP contains 13 goals. The first four focus on encouraging communication, research, and coordination across political jurisdictional boundaries. The remaining nine focus on improvements in water quality, water supply, flood damage reduction, drainage, conservation; and fish, wildlife, and outdoor recreation.

Minnesota Comprehensive Wildlife Conservation Strategy (CWCS)

Congress created the State Wildlife Grants Program in 2001 to address the unmet needs of wildlife species in greatest conservation need and mandated that all state fish and wildlife agencies develop a comprehensive wildlife conservation plan by October 1, 2005 as a condition of receiving 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.” There are 292 species in Minnesota that meet this definition. The Minnesota CWCS identifies habitat loss and degradation as the primary problem facing SGCN in Minnesota and recommends conserving key habitats used by SGCN in order to conserve the majority of Minnesota’s wildlife.

The heart of the Minnesota plan is the 25 ecological subsection profiles. Each profile identifies SGCN presence and patterns of occurrence, key habitats, and priority conservation actions. Hamden Slough NWR lies in the Red River Prairie subsection, which includes 83 SGCN. Featured wildlife species include greater prairie-chicken, marbled godwit, loggerhead shrike, Poweshiek skipperling, northern pocket gopher, and northern grasshopper mouse. Red River Prairie native habitats found on the Refuge are prairie and non-forested wetland. Priority habitat conservation actions include: manage invasive species, manage habitats adjacent to native prairie and wetlands to enhance SGCN values, use prescribed fire and other practices to maintain prairie, enforce the Wetlands Conservation Act, and provide technical assistance to interested individuals and organizations.

Migratory Bird Conservation Initiatives

The *North American Waterfowl Management Plan (NAWMP)* began in 1986 as a partnership effort to restore waterfowl populations to historic levels through habitat conservation. 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.” NAWMP is international in scope but is implemented through regional partnerships called “joint ventures.” Hamden Slough NWR lies within the Prairie Pothole Joint Venture (PPJV), which includes 100,000 square miles in Montana, North Dakota, South Dakota, Minnesota, and Iowa.

The 2001 *U.S. Shorebird Conservation Plan* provides a framework to determine species, sites, and habitats that most urgently need conservation action. The national assessment was stepped down into 11 regional conservation plans. Hamden Slough NWR lies within the Northern Plains/Prairie Potholes Region, which is especially critical to long-distance migrants that need suitable stopover sites along their migratory routes, such as American golden-plover, Hudsonian godwit, white-rumped sandpiper, pectoral sandpiper, and stilt sandpiper.

The 2002 *North American Waterbird Conservation Plan* is a framework for the conservation and management of 210 species of wading birds, marsh birds, gulls, terns, pelicans, and seabirds and their habitats. The continental area is organized into several planning regions. Species of high concern in the Northern Prairie and Parkland Region, where Hamden Slough NWR is located, include western grebe, Franklin’s gull, black tern, horned grebe, American bittern, yellow rail, and king rail.

Partners in Flight (PIF) was launched in 1990 and began to develop regional bird conservation plans in response to growing concerns about population declines of many landbird species. Hamden Slough NWR lies within the Northern Tallgrass Prairie physiographic region, which occupies parts of Iowa, Minnesota, North Dakota, and Manitoba, Canada. Priority bird species in the 1998 Northern Tallgrass Prairie Plan include greater prairie-chicken, Nelson’s (sharp-tailed) sparrow, sedge wren, bobolink, and yellow rail. In 2004, PIF published a North American landbird conservation plan that established population objectives and recommended actions for Species of Continental Importance.

The *North American Bird Conservation Initiative* (NABCI) is a continental effort to integrate all migratory bird conservation programs under one umbrella. The goal is to facilitate bird conservation through regionally-based, biologically-driven, landscape-oriented partnerships. NABCI has defined Bird Conservation Regions (BCR) as its planning units. Hamden Slough NWR lies within BCR 11, the Prairie Potholes. In 2000, the U.S. NABCI Committee agreed to promote 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.

Birds of Conservation Concern 2008 (FWS, 2008a) was developed by the Service to identify migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the Service’s highest conservation priorities. The list encompasses three distinct geographic scales—NABCI Bird Conservation Regions, FWS Regions, and National—and uses assessment scores from three bird conservation plans: the North American Landbird Conservation Plan, the U.S. Shorebird Conservation Plan, and the North American Waterbird Conservation Plan. The assessment scores are based on several parameters including population trend, threats, distribution, abundance, and the importance of an area to a species.

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.

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:

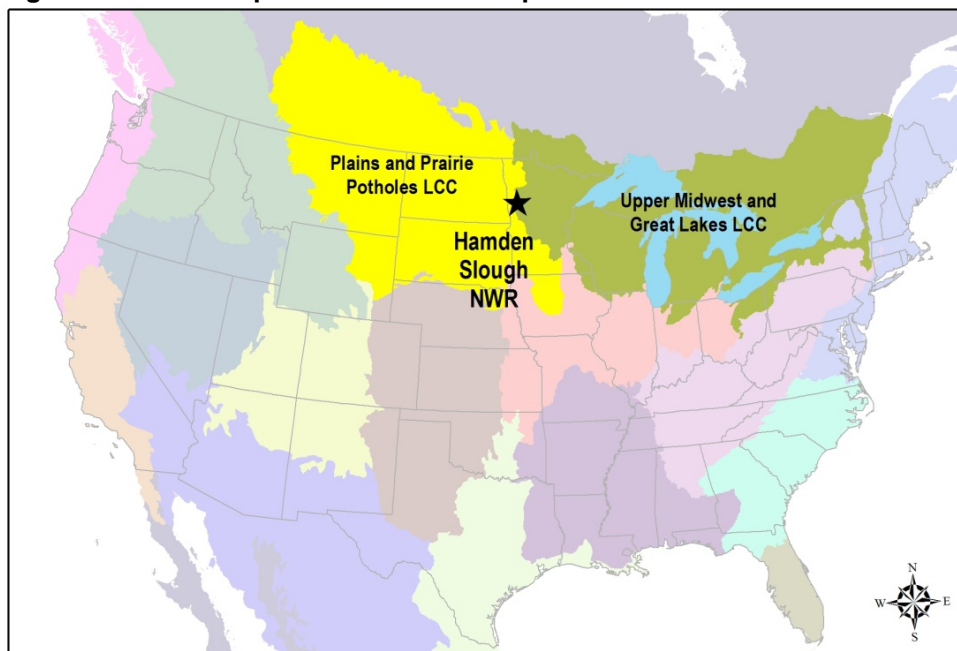
- Improve habitat for migratory birds, threatened and endangered species, inter-jurisdictional fish, marine mammals, and other declining species.
- Complement activities on Refuge System lands, or contribute to the resolution of problems on refuges that are caused by off-refuge practices.
- Address species 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.

Service biologists work one-on-one with landowners to plan, implement, and monitor their projects. This level of personal attention and follow-through is a significant strength of the Program. Through the Partners Program, the Service restored nearly 70,000 acres of wetland and 49,000 acres of upland on private lands in Minnesota between 1987 and 2008.

Landscape Conservation Cooperatives

The Service and the DOI have begun developing a national network of Landscape Conservation Cooperatives (LCCs). LCCs are management-science partnerships between the Service and other federal agencies, states, tribes, non-governmental organizations, universities, and other stakeholders. LCCs will inform management decisions 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. LCCs will connect site-specific protection, restoration, and management effort to larger goals supporting fish and wildlife populations and the natural systems that sustain them. They are intended to provide a strong link between science and conservation delivery without duplicating existing partnerships. By functioning as a network of interdependent units, LCC partnerships can accomplish a conservation mission no single agency can accomplish alone. Each LCC will focus on a defined geographic area. Although Hamden Slough NWR lies within the boundary of the Upper Mississippi and Great Lakes LCC (figure 1-2), it is better suited as belonging to the Plains and Prairie Pothole LCC due to its location within the PPR and NTGP ecoregion.

Figure 1-2: Landscape Conservation Cooperatives



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."

Recent Refuge Biological Initiatives

Starting in 2010, the completion of three biological initiatives was the focus of Refuge staff in preparation for the CCP: Contaminants Assessment Process (CAP), Water Resources Inventory and Assessment (WRIA), and Hydrogeomorphic (HGM) Evaluation. These initiatives have been instrumental in developing the CCP and will be critical in the formation of step-down plans to inform future restoration, management, and monitoring of Refuge resources.

Contaminants Assessment Process (CAP)

The CAP is a two-part process to evaluate whether environmental contaminants pose threats to lands or biota managed by the Service. Part 1 compiles and organizes existing information from a multitude of sources. Part 2 defines targeted contaminant investigations given information collected during Part 1. The CAP was completed in winter 2010. Significant findings include:

- The primary potential contaminant issues are associated with non-point sources including mercury in surface waters, and fertilizer/nutrient/turbidity issues associated with runoff onto Refuge lands.
- The drainage ditch system is a significant factor in the transportation and fate of contaminants existing and captured within the watershed; it is both a potential source and pathway of contaminants.
- A potential source for soil and groundwater contamination is concentrated animal feeding operations and manure storage within the watershed.

The primary recommendation of the CAP is to develop and implement a water quality monitoring program in close coordination with Minnesota Pollution Control Agency and the Buffalo-Red River Watershed District (BRRWD) to provide the Refuge with sufficient data for critical watershed land use decisions.

Water Resources Inventory and Assessment (WRIA)

The WRIA is a reconnaissance-level inventory of existing hydrologic data and assessment of threats to water resources on and adjacent to a refuge. It also provides forward-looking recommendations and a suggested monitoring plan. The Hamden WRIA was developed in conjunction with the CAP and was completed in spring 2011. Significant findings include:

- Climate change (higher frequency/magnitude of flood events) coupled with land-use practices, could result in increased runoff, threatening water quantity and quality, and wetland hydroperiods.
- Invasive species, such as hybrid cattail and fathead minnows, threaten the quality of wetlands on and off the Refuge due to increased sedimentation/eutrophication and flooding/connectivity.
- Periodic excavation of Ditch 15 disturbs sediments and increases erosion along stream banks, potentially increasing turbidity and sedimentation downstream.

Recommendations of the WRIA include:

- Pursue a three-year intensive water quality and quantity monitoring effort on ditches and wetlands.
- Develop a long-term management plan for Refuge wetland water cycles.
- Acquire additional information to aid in wetland restoration and water level management efforts.
- Identify areas of highest concern for excessive water quantity and contaminant inputs using newly-acquired runoff analyses.

Hydrogeomorphic (HGM) Evaluation

The HGM evaluates management strategies, as well as restoration potential and options based on historical information and GIS layers on vegetation, land use, hydrology, soils, geology, topography, and climate. It is a three-part process:

1. Identify the pre-European settlement ecosystem condition and ecological processes in the Hamden Slough region.
2. Evaluate changes in the Hamden Slough NWR ecosystem from the pre-settlement period with specific reference to alterations in hydrology, vegetation community structure and distribution, and resource availability to key fish and wildlife species.
3. Identify restoration and management options and ecological attributes needed to successfully restore specific habitats and conditions within the Hamden Slough NWR region.

The Hamden Slough HGM, completed in winter 2012, outlined multiple goals and subgoals focused on the restoration of the physical and biological character of tallgrass prairies and wetlands within the subwatershed, including on the Refuge. It also recommends emulating ecological processes to maintain Refuge habitats. The need for long-term monitoring was also highlighted.

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](#)
- [2.5 Public Comments on the Draft CCP](#)

2.1 Introduction

The Comprehensive Conservation Plan (CCP) process for Hamden Slough National Wildlife Refuge (NWR, Refuge) meets the dual requirements of compliance with the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and the National Environmental Policy Act (NEPA), both of which require the U.S. Fish and Wildlife Service (FWS, Service) to actively seek public involvement in the preparation of environmental documents. NEPA also requires the Service to 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:

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

2.2 Scoping and Public Involvement

The Notice of Intent to prepare a CCP and Environmental Assessment (EA) for Hamden Slough NWR was published in the *Federal Register* dated February 18, 2010 (Vol. 75, No.32, page 7289–7290).

Internal scoping began in August 2010 when Service planning staff and Hamden Slough NWR staff 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 at Fort Snelling, MN in March 2011 to get input on issues from regional supervisors, biologists, planners, and other program specialists.

Public scoping began in October 2010 when Refuge staff hosted an open house event in Detroit Lakes, MN to inform the public of the planning process and to solicit their input on issues of concern. About 12 people attended. In addition, a news release was distributed to area media, informational posters were displayed in local communities, and postcards soliciting comments were sent to several hundred names on the Refuge mailing list. Written comments were received from 59 stakeholders.

In December 2010, the Refuge convened a team of resource professionals to share their perspectives on the biological and visitor services programs at Hamden Slough NWR. Participants outside the Service included partner agencies, researchers, educators, and Refuge volunteers. Purposes of the workshop

were to define significant issues and opportunities facing the Refuge and identify potential options for addressing them: share knowledge, ideas, and perspectives to ensure that best available information is considered, and begin to develop a shared vision for the future of the Refuge and the ecosystem. In June 2011, the Refuge Manager met with both the Red River Basin Commission and the Buffalo-Red River Watershed District to provide information and solicit input on the Hamden Slough NWR CCP.

In July 2011, the Refuge Manager mailed letters to all landowners within the approved boundary inviting them to meet one-on-one to discuss their thoughts on the future direction of the Refuge. Meetings were completed by early August.

2.3 Summary of Issues

The following section summarizes the significant issues that were identified and analyzed as part of the CCP process. These issues represent input from the public, other agencies and organizations, and Service staff, as well as the requirements of the Improvement Act, NEPA, and other mandates and guidance. The issues were critical in framing the objectives and strategies for the various alternatives considered and formed the basis for evaluating environmental consequences.

Habitat and Wildlife

How will we sustainably restore Refuge wetlands and provide high-quality habitat for migratory waterfowl and other wetland wildlife?

Prairie Pothole Wetlands

Approximately 85 percent of Minnesota's prairie pothole wetlands have been drained, and the trend continues today as subsurface tile drainage systems improve. Temporary and seasonally flooded small pothole wetlands provide important habitat for migrating and pre-breeding waterfowl. The exact number of historical pothole wetland depressions on the Refuge is not known, although more than 200 have undergone at least partial restoration by plugging of ditches and removal of accumulated sediment. Individual basins have not been inventoried as to size, watershed, or hydrologic regime. Ongoing monitoring of the physical and biological condition of restored pothole wetlands and wildlife response has been minimal.

Managed Wetlands

The natural annual and long-term water level cycles that historically maintained wetland and wildlife productivity were heavily altered by drainage ditches and subsurface tiles in the early 20th century, primarily to improve agricultural production. Low-lying pothole wetlands and relict glacial lakes that historically captured and held water were converted to a flow-through system when the Ditch 15 system was constructed.

Several of these larger drained wetlands on the Refuge have been at least partially restored and some water level control is possible, although management capability is limited by the physical setting and lack of onsite staff. Additional restoration of Bisson Lake and the Big Six wetland complex may be possible through modifications to roads, weirs, stoplogs, spillway elevations, and/or topography.

Bisson Lake and the Big Six wetlands primarily are drawn down to provide mudflats during the spring shorebird migration and flooded to provide waterfowl breeding and brood habitat. Annual water levels also may be manipulated specifically for fall migrating shorebirds, overwintering resident wildlife, protection of roads from the freeze/thaw cycle, control of invasive plants and fish, or to alleviate downstream flooding. Hybrid cattails are an aggressive invasive plant in Refuge wetlands and invasive fish, especially fathead minnows, compete with ducklings and other wetland wildlife for food. The Refuge currently does not have an integrated wetland management plan.

Relict Glacial Lake Restoration

Although Bisson Lake and the Big Six wetlands have been partially restored, two of the largest relict glacial lakes—Pierce Lake and Hamden Lake—are still drained. The historic Hamden Lake/Slough appears to have covered as much as 25 percent of the current Refuge acquisition boundary. All of Pierce Lake and some of Hamden Lake remain as private inholdings within the approved Refuge boundary. Therefore, acquisition of these private lands must occur prior to lake restoration. Pierce Lake must be restored first in order to restore Hamden Lake.

Public Scoping

Comments generally supported continued wetland restoration and management on the Refuge, including restoration of Hamden and Pierce lakes. Commenters also wanted to see more ducks and fewer cattails. Water level drawdowns in the fall were recommended to minimize cattail germination on managed wetlands. The Matter Waterfowl Production Area was mentioned as a good model for pothole restoration on the Refuge.

How will we sustainably restore tallgrass prairie and provide high-quality habitat for migratory grassland birds and other prairie wildlife?

Tallgrass Prairie Restoration

Much progress has been made in converting former agricultural fields to native tallgrass prairie, although much work still remains. Many restored prairies on the Refuge have fairly low diversity of native plant species. A mix of warm and cool season grasses was used on initial restorations in the 1990s, and some later seedings were fairly conservative on forbs. Some sites are dominated by non-native cool season grasses such as Kentucky bluegrass and smooth brome. Non-native parsnip, spurge, knapweed, crown vetch, and tansy have been found on the Refuge; all are aggressive invaders. Fire and grazing regimes that historically sustained prairie diversity have been disrupted. Data on current condition of Refuge prairie restorations is limited.

Grassland-dependent bird populations have declined from historic levels far more than any other group of birds due to habitat loss and fragmentation. Many have begun to return to the Refuge as agricultural fields are converted back to prairie vegetation. Individual species of grassland birds show a variety of habitat preferences based on vegetation height, cover density, grass/forb ratio, soil moisture, litter depth, degree of woody vegetation, and plant species composition. It is important to maintain a mosaic of grassland habitats to meet the varying needs of grassland bird species of concern.

Tallgrass Prairie Remnants

About 22 acres of unbroken tallgrass prairie exists on the Refuge in small fragmented remnants. The location, size, and current status of most remnants are not well-documented, but most are thought to be in a degraded condition as evidenced by low native species diversity, and some could be lost to invasive and/or woody vegetation if not given management attention soon. These tallgrass prairie remnants are irreplaceable. Some may contain rare plant species and could provide a local seed source for upland restoration and diversification projects.

Management Tools

About 50 acres are farmed as wildlife food plots to mitigate crop depredation on neighboring lands, but little information is available on depredation levels or use of the food plots by target species. Cropped areas near Homstad, Hesby, and Eagle wetlands are increasing the fragmentation of restored prairie habitat. Habitat fragmentation has been associated with declines in locally breeding grassland birds. The crop fields do not provide critical habitat for Refuge resources of concern. One field is especially vulnerable to erosion, which may be increasing sedimentation in the shallow lakes and marshes below. Farming on the Refuge also is used as a short-term management tool to prepare fields for conversion to tallgrass prairie. All Refuge farming programs must be compliant with new regional policy that limits use of genetically modified glyphosate-tolerant corn and soybeans.

Grazing by bison and elk helped maintain the historic tallgrass ecosystem prior to European settlement, but that historic disturbance regime has been lost. Rotational grazing by cattle was used as a management tool in the early years of the Refuge to emulate the effects of bison and elk but was phased out as other management techniques became available. Reinstating a grazing program on the Refuge could increase prairie diversity and heterogeneity, improve wildlife habitat, provide economic benefit to local landowners, and generate additional support for the Refuge in the local community. Service policy (601 FW 3) allows for livestock grazing on national wildlife refuges to meet wildlife and habitat objectives only when more natural methods, such as fire or grazing by native herbivores, cannot meet refuge goals and objectives.

Haying was a traditional economic use when the Refuge was established, and about 100 acres are still hayed in late summer to provide lek habitat for greater prairie-chickens on the Refuge. The shorter vegetation is also attractive to birds such as marbled godwits and common snipe. Varying the haying regime and integrating it with other management tools, including prescribed fire and grazing, could increase the diversity of native plants and provide the habitat structure needed by breeding grassland birds throughout the Refuge.

Public Scoping

Public comments supported food plots on the Refuge as a way to provide food for wildlife and/or to reduce depredation of crops on private land by Canada geese. Grazing was recommended as a benefit both to wildlife habitat management and the local economy. Predator control was recommended. The importance of weed control was mentioned. A few commenters would like to see Refuge land sold back to farmers.

How will we stabilize soils, increase water retention, and improve water quality in the Hamden watershed?

Historically, the matrix of prairie vegetation interspersed with wetlands in the Hamden Slough watershed slowed surface water runoff, allowing soil infiltration and recharge of groundwater aquifers. This prairie wetland ecosystem provided habitat for wildlife, maintained water quality, and helped to mediate downstream flooding in the Buffalo River. Now, however, the watershed is dominated by row crop production. Prairie vegetation has been removed. Ditches and subsurface tile lines have accelerated water drainage and dried up wetlands. It is likely that elevated concentrations of nutrients, bacteria, and sediment are being transported downstream onto the Refuge during storm runoff events (Newman and Eash, 2011), which can affect recruitment, growth, productivity, and viability of wetland plants and animals (U.S. Environmental Protection Agency, 2002). Ongoing warmer and wetter climate conditions could further exacerbate these issues. Restoration of sustainable plant communities, wildlife habitat, and ecological processes (such as flood storage and groundwater recharge) on the Refuge will require restoration of more natural patterns of waterflow into, through, and out of the area (Heitmeyer, 2012).

Public Scoping

Public comments supported the capture and storage of water in Refuge wetlands to reduce downstream flood damage. The need to address issues related to climate change in the CCP was recognized.

People

How will we encourage people to connect with the Refuge while ensuring visitor safety and minimizing disturbance to wildlife and habitat?

Hunting

A late-winter deer muzzleloader season was initiated in 2008 on all Hamden Slough NWR lands. A one-day youth waterfowl hunt was opened in 2009 in the Audubon and Riceville township portions of the Refuge.

Public Scoping

Most comments received during the public scoping period addressed the Refuge hunt program. Some requested elimination of all hunting on Hamden Slough NWR to provide a sanctuary for wildlife. Some wanted elimination of the muzzleloader hunt only; some wanted a more controlled muzzleloader hunt including limits on the number of hunters allowed. The two primary reasons given were concerns about public safety and too much hunting pressure on area deer. Comments on the youth waterfowl hunt were generally supportive. Some comments suggested initiating a goose hunt to reduce crop depredation on nearby lands.

Wildlife Observation and Photography

Wildlife observation and photography are popular Refuge uses. Current opportunities include roadside viewing, one wetland overlook, one short hiking trail, and a seasonal prairie-chicken observation blind. Demand for additional Refuge access outside these areas is low, but disturbance could become an issue if opportunities and/or demand increase. Clear definition is needed of where these uses should be allowed and with what stipulations. We want to encourage visitor connections to the Refuge while also minimizing wildlife and habitat disturbance. The entire Refuge is sensitive to disturbance due to its small size; the prairie-chicken lek is especially sensitive.

Public Scoping

Comments described the enjoyment of exploring restored Refuge wetlands, especially with grandchildren. Bird-watching, hiking, and cross-country skiing were mentioned specifically as wildlife observation activities that should continue. One comment expressed support for a multi-use Refuge while also acknowledging the value of sometimes closing areas for management purposes. Traffic resulting from roadside wildlife observation was mentioned as sometimes hindering movement of farm machinery and causing additional road maintenance costs to local townships.

Environmental Education and Interpretation

The Refuge does not have a formal environmental education program due to lack of visitor services staff, although a prairie-chicken webcam and curriculum materials are available for educators, and a shelter for use by school groups recently was constructed. Interpretive programs for the public also are limited due to lack of staff, and more brochures and kiosks are needed.

Public Scoping

Local schools would appreciate more opportunities for hands-on environmental education and would like qualified staff and programs to be a part of Hamden Slough NWR. One rural school principal commented that, "Educational outreach is a wonderful way to plan for the future."

Outreach and Community Partnerships

Communication and partnerships with area residents and local communities are crucial to the success of Hamden Slough NWR. It is important that people, organizations, and agencies in the area know about the Refuge and support it as a valuable part of the community. Methods currently used include news releases, appearances on local television and radio stations, and presentations to community groups. The volunteer group "Friends of the Detroit Lakes Wetland Management District" participates in the annual Detroit Lakes Festive of Birds, which increases awareness of both the Wetland Management District and the Refuge. The Refuge has limited resources, so expansion of these programs must be carefully considered to generate the most positive impact for the Refuge and the local area.

2.4 Preparation, Finalization, and Implementation of the CCP

The Hamden Slough NWR CCP was prepared by a team of staff from the Detroit Lakes WMD and the USFWS Regional Office. The CCP was published in two phases and in accordance with the National Environmental Policy Act (NEPA). The Environmental Assessment, published as appendix A in the Draft CCP, presented three alternatives for future management and identified a preferred alternative. A 30-day public review period, including a public open house, followed release of the draft plan.

The alternative that was selected has become the basis of the Final CCP, which will guide management over the next 15 years. It will guide the development of more detailed step-down plans for specific resource areas and it will underpin the annual budgeting process through Service-wide allocation databases. Most importantly, the CCP lays out the general approach to managing habitat, wildlife, and people at Hamden Slough NWR that will direct day-to-day decision making and actions.

2.5 Public Comments on the Draft CCP

The Draft CCP was officially released for public review and comment on August 29, 2012; the comment period ended on September 28, 2012. A news release was sent to local media outlets and a summary of the document was mailed to more than 150 individuals and organizations. The complete Draft CCP was posted on the Service website and hard copies were available on request. Four people attended the open house event on September 6th in the city of Detroit Lakes. By the end of the comment period, four written responses had been received. Below is a summary of comments and the Service response.

Wildlife and Habitat

Respondents who commented on habitat restoration all supported the overall goal of wetland and prairie restoration. Concern was expressed that restoration of Pierce Lake within the next 15 years might be overly ambitious. The Buffalo Red River Watershed District (BRRWD) and Ducks Unlimited (DU) both indicated strong support for restoration of Pierce Lake and Hamden Lake and want to work in partnership with the Refuge to accomplish that objective. Several comments emphasized the importance of restored wetlands and prairies outside the Refuge boundary, especially on those lands that drain directly into Hamden Slough NWR.

Additional herbicide spraying to control invasive hybrid cattails was recommended. Concern was expressed about converting cropland to native prairie due to economic loss to the local community and potential crop depredation on nearby private lands. The local economic benefit of using haying and grazing as tools for habitat management was appreciated. The bobolink population estimate was thought to be too low, and several additions to the mammal list in Appendix C were proposed. Additional background information on several topics was provided to help document Refuge history and clarify current issues for future staff, Service partners, and the public.

Service Response:

It's true that restoration of Pierce Lake within the next 15 years is an ambitious objective and success is not guaranteed, but working with landowners, the BRRWD, DU, and other partners to make it happen is a high priority for Refuge staff. We also remain committed to working with willing partners to increase the conservation value of lands throughout the Hamden Slough watershed.

Invasive cattails usually can be adequately controlled with techniques other than herbicide application, including mowing, burning, and grazing. When feasible, these alternative tools are preferred in order to increase environmental benefits, reduce chemical use in wetlands, and reduce costs.

When Hamden Slough NWR was established in 1989, the Service agreed to maintain approximately 500 acres of cropland to address wildlife depredation and loss of income as the Refuge was restored. However, several changes that occurred since then have prompted a reexamination of the Refuge farming program: the Minnesota DNR began issuing landowner permits for Canada goose control to protect crops from depredation; there has been no evidence that waterfowl are using Refuge crops as an alternative food source; Refuge cropland is giving predators access to nearby waterfowl and songbird nests; and Service policy now limits use of GMO (Genetically Modified Organism) crops to no more than five years as part of the procedure for restoring lands to native vegetation. Through the process of developing this CCP, the Service determined that conversion of Refuge food plots to native vegetation is now the best option. This conversion will create a contiguous piece of wetland and prairie habitat totaling more than 800 acres.

Current survey data on Hamden Slough NWR bird populations is limited, so the bobolink objective was based on the best available science using population models developed by the Service's Habitat and Population Evaluation Team (HAPET). As additional monitoring data is collected, the population target can be revised if appropriate. The mammal list includes most of the species mentioned by the commenter.

A short description of the wildlife impact of overhead power lines on the Refuge has been added to chapter 3. Burial or removal of those lines is desirable over the long term, but is not a priority for the 15-year timeframe of this CCP. Additional detailed information on topics such as remnant prairies, historic fire shadows, and early habitat restoration efforts will be included as appropriate in the step-down Habitat Management Plan to be developed for Hamden Slough over the next few years.

People

The Service received comments both in support of and against continuing the muzzleloader deer hunt on the Refuge. Continuation of the youth waterfowl hunt was appreciated. The Minnesota DNR recommended implementation of a Canada goose hunt and increased deer hunting opportunities on the Refuge. The need to build more trust with local landowners on issues of mutual interest including weed control, ditch/drainage maintenance, and hunting was discussed.

Service Response:

The Refuge is one of the few wetland locations without goose hunting pressure so Refuge lands provide an important sanctuary for other migratory waterfowl species. The muzzleloader deer season occurs in late winter after the waterfowl migration, which also limits disturbance. The State already has an effective goose population reduction program and allowing goose hunting on the Refuge would do little to reduce population numbers. Goose and deer hunting opportunities are available to the public on all Waterfowl Production Areas adjacent to Hamden Slough NWR.

Public support for the muzzleloader deer hunt was strong when the program was initiated in 2008. However, the Service received numerous negative public comments during the initial public scoping period for this CCP in 2010, so the pros and cons of eliminating the deer hunt were carefully considered. Ultimately, the Service decided to continue the muzzleloader hunt and to explore opportunities to improve its quality. Refuge staff will work to improve communication with adjacent landowners and to keep them well-informed on relevant Refuge management activities.

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 Historical and Cultural Resources](#)
- [3.6 Current Refuge Programs](#)
- [3.7 Administration](#)

3.1 Geographic/Ecosystem Setting

Hamden Slough National Wildlife Refuge (NWR, Refuge) is located on the eastern edge of the Prairie Pothole Region (PPR), within the Northern Tallgrass Prairie (NTGP) ecosystem of northwest Minnesota (figure 3-1). The Refuge is in west-central Becker County, just northeast of the town of Audubon, MN. The landscape of west-central Becker County is dominated by row crop agriculture. Immediately east of the Refuge is the Prairie-Forest transition zone, which gives way to the Eastern Broadleaf Forest and Northern Coniferous Forest (figure 3-2). The 3,210-acre Refuge contains a diverse landscape of mesic and wet mesic tallgrass prairie, small prairie potholes, and larger wetlands and shallow lakes (Heitmeyer et al., 2012).

Figure 3-1: Prairie Pothole Region

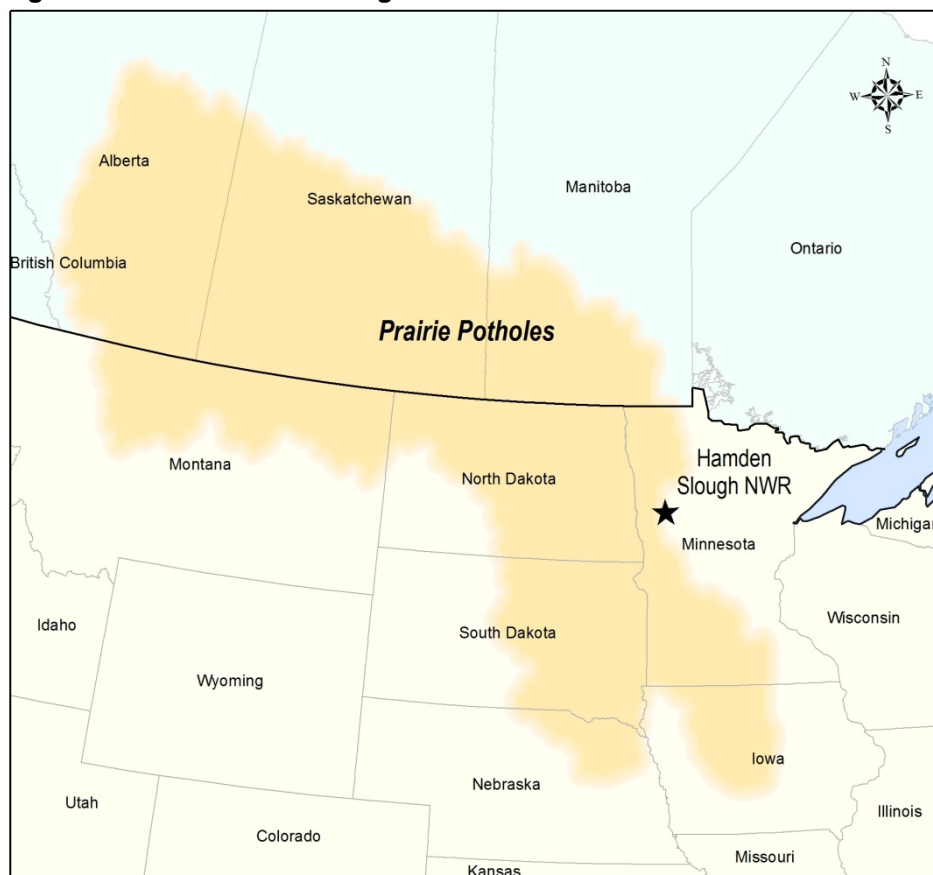
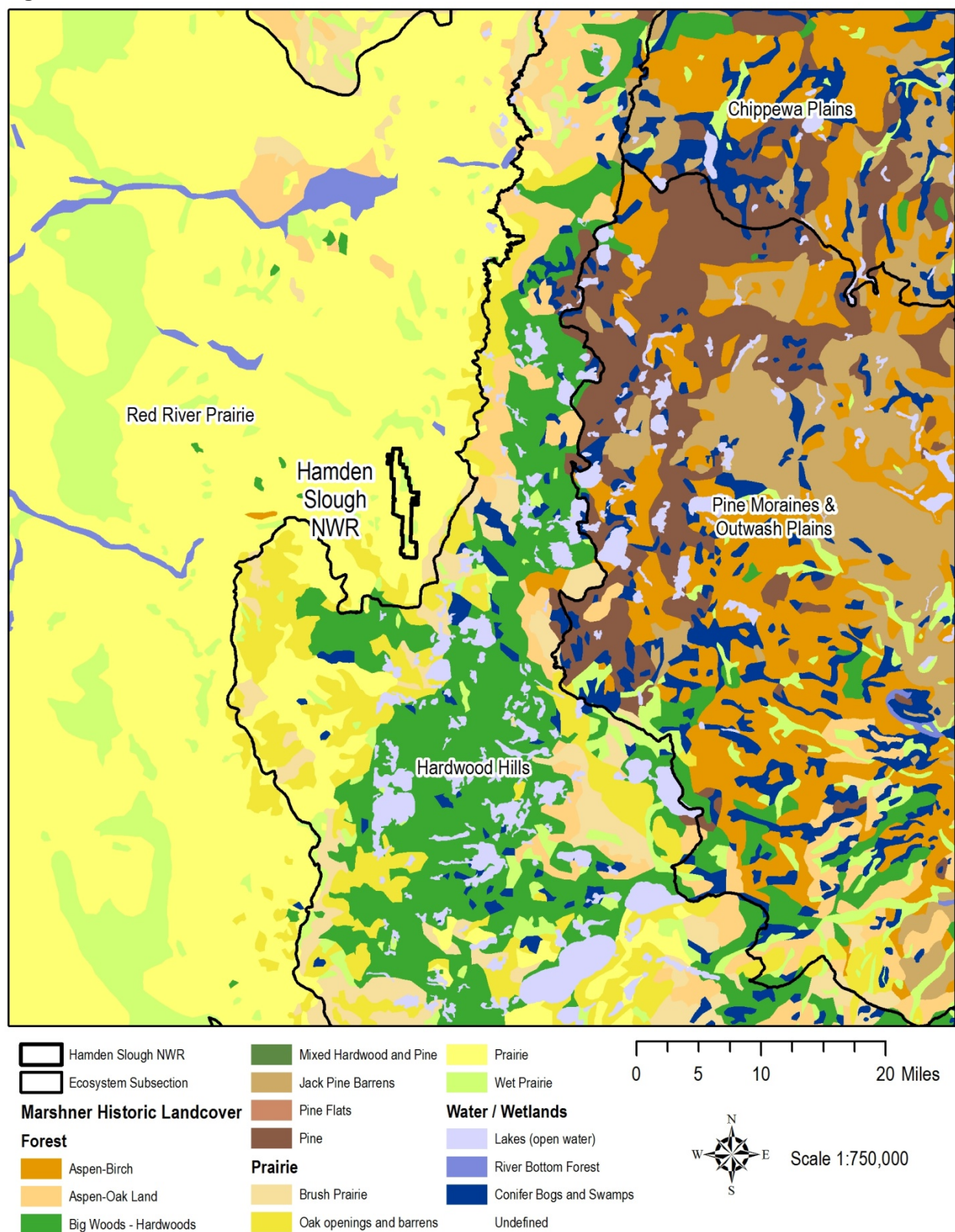


Figure 3-2: Prairie Forest Transition



Prairie-Wetland Complexes

The NTGP of Minnesota once covered 18 million acres (Sampson and Knopf, 1994). Numerous pothole wetlands dotted the landscape and were surrounded by prairie grasses and wildflowers. The original density of wetlands in the region averaged 83 per square mile. These prairie-wetland complexes provided habitat for a multitude of wildlife, especially birds. This is evident by the numerous historical accounts that remark on the abundance of birds using wetlands and prairies of the Hamden Slough area. For example, one account reads, “Hamden was worse than Cuba [Township] for sloughs and ponds; they were all alive with ducks and geese, and sand-hill cranes were seen stalking about over the prairies or flying overhead every day, and sharp-tailed grouse or native prairie hens were abundant, especially in the vicinity of the few small groves and patches of hazelbrush.” (Wilcox, 1907).

This vast system of prairies and wetlands, a relic of the Wisconsin glacier, is only a memory along with many of the wildlife species that inhabited the region. Roughly 85 percent of Minnesota's wetlands have been drained (Johnson et al., 2008), and only 170,000 acres of remnant tallgrass prairie remain in Minnesota (Minnesota County Biological Survey, 2008); a decline of roughly 99 percent.



Density of Wetlands

The Mississippi Flyway

Hamden Slough NWR is situated at the confluence of the Mississippi and Central flyways, a transition area between prairie wetlands and hardwood forest ecoregions (figure 3-3). The Mississippi flyway contains the longest migration route of any North American flyway, more than 3,000 miles (Lincoln et al., 1998). There are no mountain ranges or ridges to impede bird migration through this thoroughfare. In fact, the north to south orientation of the Mississippi River, one of two major river systems in the flyway, makes travel conditions even better for the large numbers of ducks, geese, shorebirds, and songbirds (Lincoln et al., 1998) that use this flyway.

Figure 3-3: Migratory Flyways



Historically, the area now known as Hamden Slough NWR also was important for migratory birds. Its location within the long, north-south corridor between glacial Lake Agassiz to the west and outwash slopes extending from the Great Lakes to the east made the region a natural “funnel” for migratory birds (Heitmeyer et al., 2012). The importance of the area is still evident today. Birds using the waters of Hamden Slough NWR include more than 20 shorebird species, all major waterfowl species, rail species, and Forster’s terns (Robert Russell, personal communication) among others. Under optimal conditions, Refuge wetlands can hold more than 10,000 waterfowl and other waterbirds during spring and fall migrations

Other Conservation Lands

Despite the large amount of cropland in the area, additional conservation lands in the vicinity of the Refuge do exist. Most are managed for prairie and wetland habitat that supports the foundation of Hamden Slough NWR (figure 3-4). The Detroit Lakes Wetland Management District (WMD, District) manages more than 45,000 acres of Waterfowl Production Areas (WPAs) in five counties of northwest Minnesota, including Becker County. Due to the base acres that Hamden Slough provides, the District has declared the area surrounding the Refuge a high priority for land acquisition. Within two miles of the Refuge boundary, ten WPAs containing approximately 2,865 acres of prairie-wetland habitat are managed for waterfowl and other migratory birds. In essence, Hamden Slough NWR acts as an anchor for these smaller Waterfowl Production Area (WPA) tracts. Together, the Refuge and nearby WPAs are managed as a corridor, providing habitat for waterfowl and other wetland-dependent birds as well as prairie-obligate species. Numerous other WPAs are located near the Refuge but do not fall within the two-mile boundary.

Wildlife Management Areas (WMAs) managed by the Minnesota Department of Natural Resources (DNR) also may contribute to the purposes of the Refuge. These are public lands managed primarily for resident wildlife, but migratory birds also benefit. Although there is only one WMA near the Hamden Slough watershed boundary, there are additional WMAs north and west of the Refuge that complement the nearby WPAs.

Private lands near the Refuge also can play an important role in conservation. Originally, the Refuge was buffered by an easement zone allowing an additional 2,600 acres of land to be protected via a combination of easements, leases, and conservation farming agreements. Today, under management of the Detroit Lakes WMD, the Service already has authority under the Small Wetlands Program for easements, leases, and agreements throughout Becker County, including adjacent to the Refuge. The Service has purchased wetland easements from some landowners within the watershed to benefit waterfowl and other wetland-dependent wildlife.

The Service's Partners for Fish and Wildlife Program (PFW, Partners Program) shares the cost and provides technical assistance to restore and manage wetland and prairie habitat on private land. A few PFW projects have occurred within the Hamden Slough watershed but most, if not all, are expired due to a minimum ten-year agreement requirement. Some landowners have enrolled land into U.S. Department of Agriculture (USDA) programs such as the Conservation Reserve Program and Wetland Reserve Program. These lands support the purposes of the Refuge by providing upland and wetland habitat for migratory birds and other wildlife. Private lands used for cattle production generally provide suitable habitat for some grassland birds during certain times of the year and are more beneficial than row crops to most wildlife.

The northernmost portion of Hamden Slough NWR, approximately 600 acres in Sections 27 and 34 of Riceville Township, lies within the boundary of the White Earth Reservation. The reservation was established in 1867 by a treaty signed between the United States and the Mississippi Band of the Chippewa (Ojibwe) Indians. It encompasses all of Mahnomon and parts of Becker and Clearwater Counties, roughly 1,300 square miles. The White Earth Band of the Ojibwe is a sovereign nation. The Tribal government ensures broad powers (self-governing) and is immune from state interference. It is also afforded certain immunities similar to other federal entities. The lands of the White Earth Reservation include vast prairies and wetlands, as well as broadleaf and pine forests, and are managed to allow maximum usage by Tribal members while maintaining wildlife populations capable of regeneration.

Within two miles of the Refuge boundary, more than 60 percent of the land base (approximately 24,000 acres) is farmed annually (figure 3-5). This acreage includes land used for hay, and although it may provide some cover, it is equally detrimental in that those fields typically are cut multiple times per growing season. It is clear that there is a lack of permanent cover for grassland birds within two miles of Hamden Slough NWR.

Figure 3-4: Other Conservation Lands

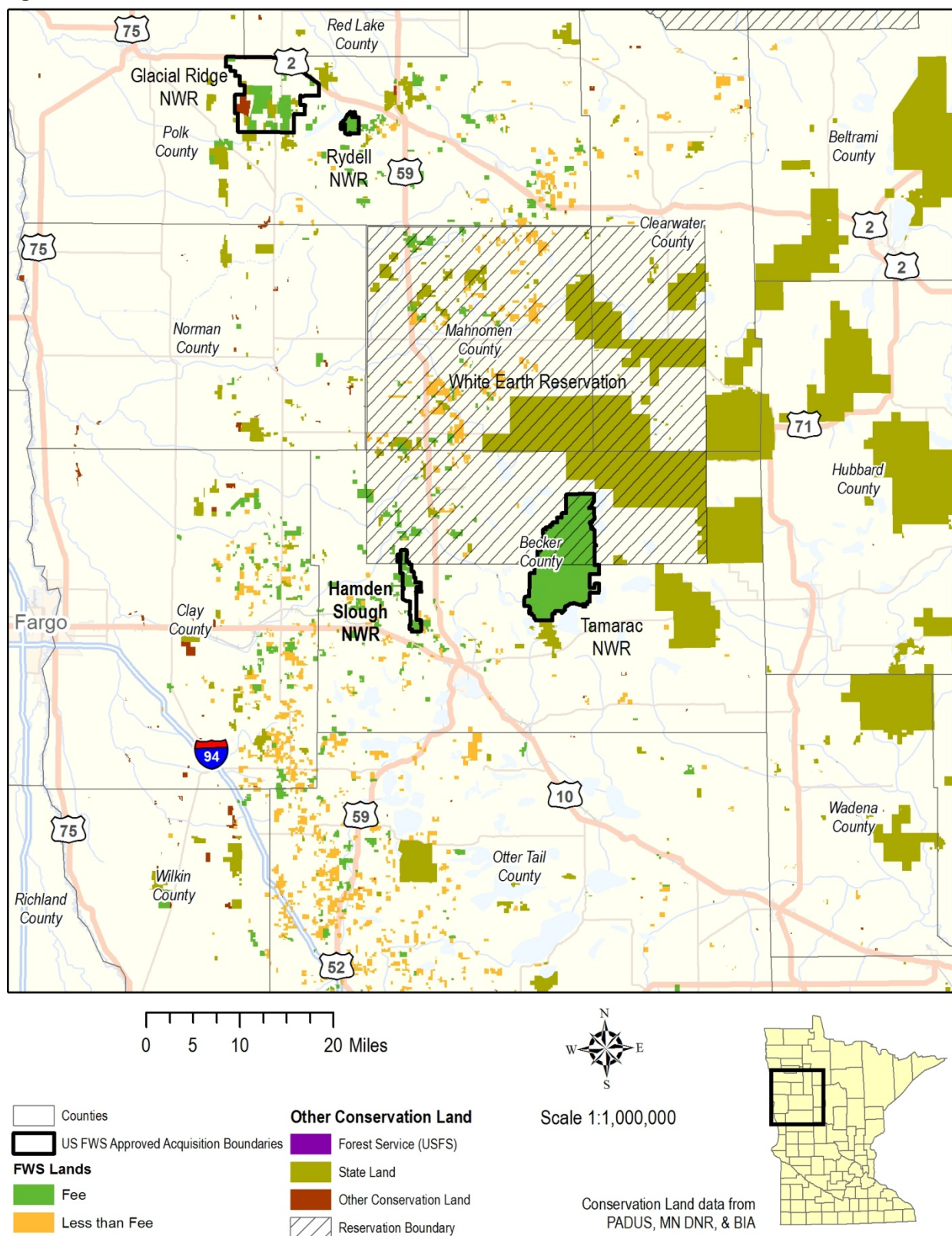
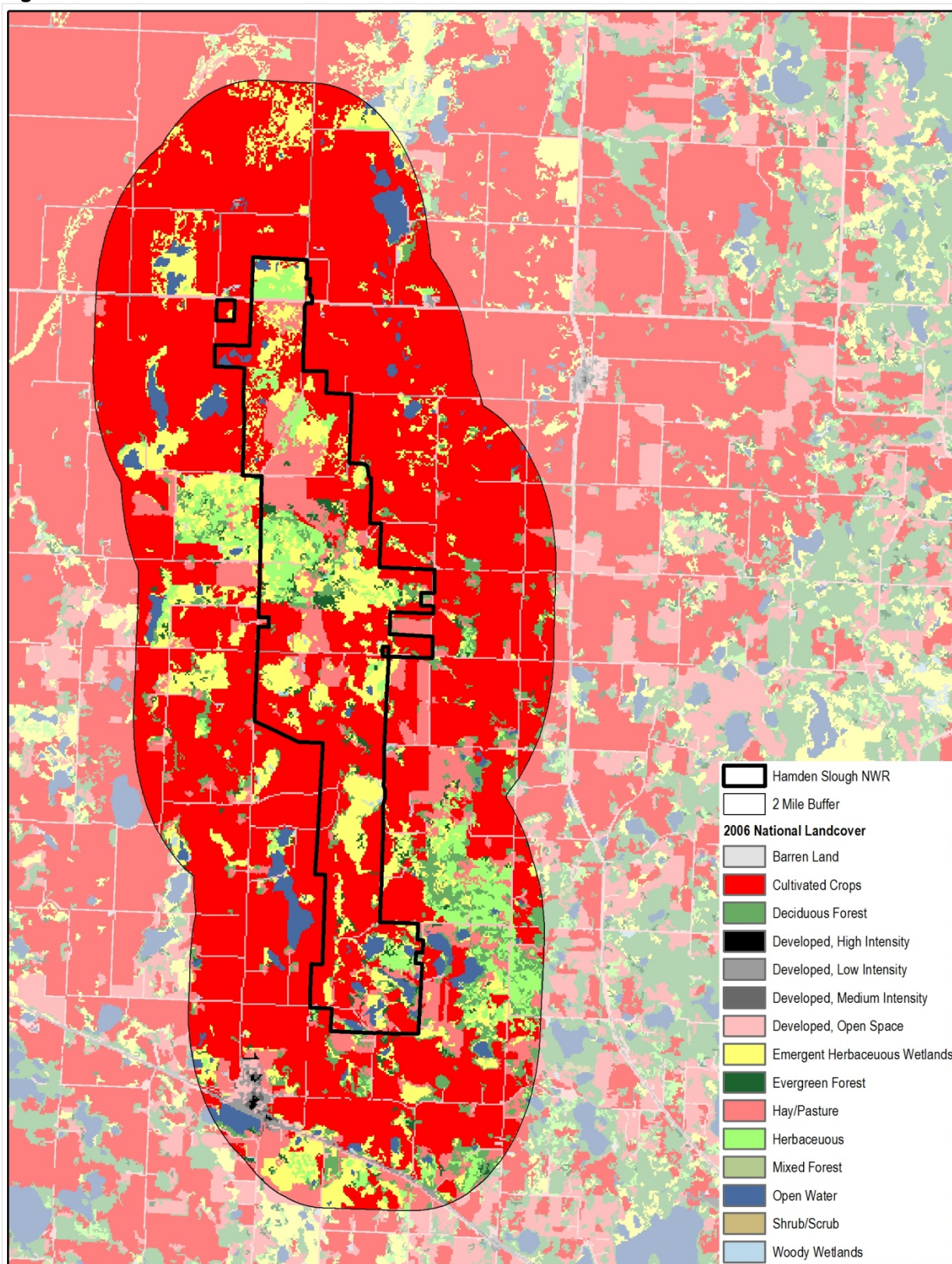
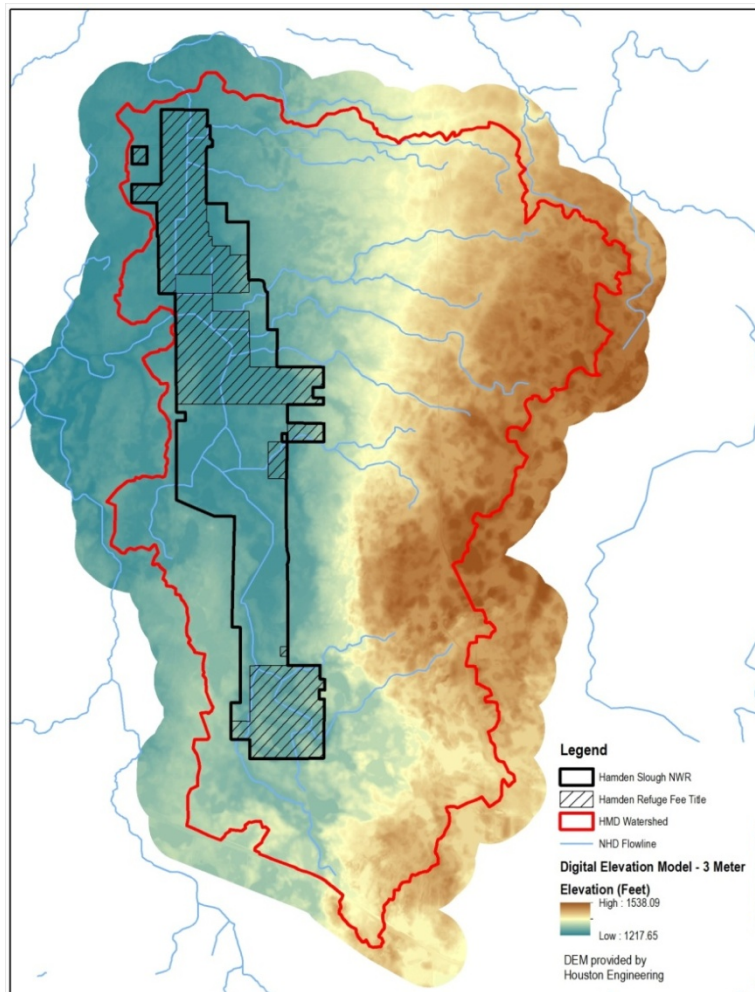


Figure 3-5: Two-Mile Buffer

3.2 Physical Environment

The landscape that encompasses Hamden Slough NWR is a direct result of the most recent glaciation, the Wisconsin, approximately 12,000 years ago. The recession of the glacier left a range of topographies from steep slopes to nearly level drainages. Uneven deposits of glacial till and loess (the foundation of the rich organic soils sought after for agricultural production), the scouring action of the glaciers, and the melting of large ice blocks created high densities of pothole wetlands (Euliss et al., 1999), the namesake of the PPR.

Figure 3-6: Elevation



Geology

The bottommost layer beneath Hamden Slough NWR is comprised of undifferentiated Precambrian crystalline rock. Cretaceous sedimentary rock overlies the Precambrian layer, followed by a top layer of unconsolidated glacial till 300 to 600 feet thick. This till layer is from the Wisconsin Glacier and is among the thickest in Minnesota (Christensen, 1998). Two lobes of the Wisconsin glacier helped form the surficial geomorphology of the Refuge. The Des Moines lobe, the more recent of the two, left most of the deposits in this portion of Becker County, including the northern and central parts of the Refuge. These areas are dominated by flat, wet ground moraine. The Wadena Lobe formed the Alexandria Moraine, a large glacial outwash slope that lies along the extreme eastern boundary of the Refuge. The south unit of the Refuge lies near the boundary of this advance. It is dominated by terminal moraine, which gives the area a distinct hill and lake appearance.

Topography

The topography of Hamden Slough NWR is heterogeneous due to the extensive glacial movements and scouring of moraine material (Heitmeyer et al., 2012). Recently completed digital elevation models for the Refuge indicate a range of elevations from 1,218 feet above mean sea level (amsl) to 1,500 feet amsl (figure 3-6, Heitmeyer et al., 2012). The northern portion of the Refuge, dominated by ground moraine and flatter northern till plain surfaces, contains the historic Hamden Lake. A higher density of larger pothole wetlands and shallow lakes are found in the southern portion of the Refuge due to the terminal moraine surfaces that exhibit greater changes in topography. The Refuge is the lowest elevation within the 48 square mile Hamden watershed, which provides excellent wetland conditions even in drier periods. The most prominent feature is the glacial outwash slope, the Alexandria Moraine, rising 200 feet on the east side of the Refuge.

Soils

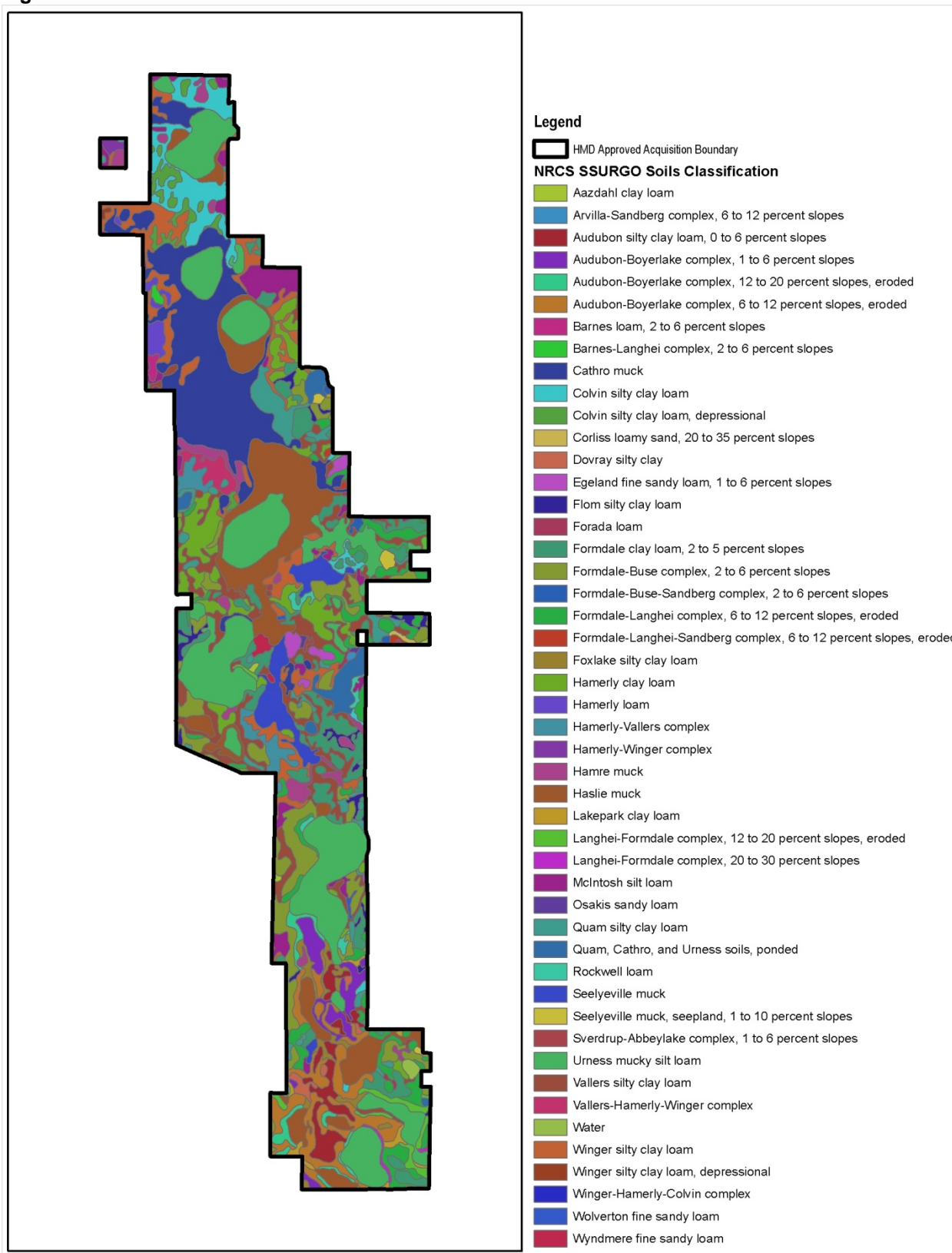
Over 30 major soil types can be found on Hamden Slough NWR (figure 3-7). Generally, the northern portion of the Refuge has nearly level, loamy and silty soils on ground moraines and contains the Hamerly-Winger-Vallers Association. These soils were formed in glacial till (Hamerly and Vallers) and in 20 to 40 inches of glacial lacustrine sediments overlying glacial till sediments (Winger). Slopes are nearly level, ranging from zero to three percent in most areas, and are poorly drained.

The central and southern portions of the Refuge contain nearly level to moderately steep, loamy, silty, and organic soils on lateral moraines and include the Formdale-Langhei-Flom Association (central portion) and the Birchlake-Audubon-Foxlake Association (southern portion). Both associations formed in glacial till sediments and slopes are nearly level to hilly (0 to 30 percent). These areas are moderately-to-well drained.

The prominent hydric feature of the Refuge, the relict Hamden Lake, is comprised of Cathro and Haslie muck soils. This is true for the other glacio-lacustrine depressions (Bisson, Pierce, and Homstad Lakes). Numerous depressional (or ponded) soils found in the pothole wetlands include Colvin, Dovray, Winger, Nidaros, Quam, Seeleyville, Urnerss and Vallers soils. Drainages between hills and slopes have Flom, Forada, Foxlake, and Lamoure silt clay loam soils.

Upland soils, forming slopes and hills of the Refuge, are mostly loam-dominant including Arvilla, Barnes, Formdale, Langhei, and Sverdrup-Abbeylake types and minor components of Bootlake, Eagleview, and Corliss sandy loams. One unique “seep” type soil, Seelyville, is present along a moraine side hill (Heitmeyer et al., 2012). Other seeps may be present on the Refuge, although none have been documented.

Figure 3-7: Soils



Hydrology

Hamden Slough NWR is located within the greater Red River Basin of the Buffalo River watershed. Water flows primarily northward through the Refuge and then west into the Buffalo River. The Buffalo River empties into the Red River, which flows north into Hudson Bay, Canada. The smaller Hamden Slough watershed is approximately 48.7mi² (31,200 acres) and 4.5 percent of the Buffalo River watershed (figure 3-8) (Newman and Eash, 2011). The Refuge lies over a fairly shallow aquifer and, thus, has an accessible water table supplying the area with relatively high yields of water at times. There is considerable surface-groundwater interaction (discharge-recharge), a key component of the water supply and function of Refuge wetlands. Groundwater movement tends to be of east-west flow, given the topography and soils (figure 3-9). Therefore, it is likely that additional seeps and fens exist along the base of the steeper slopes on the eastern edge of the Refuge (Newman and Eash, 2011).

Figure 3-8: Buffalo River Watershed

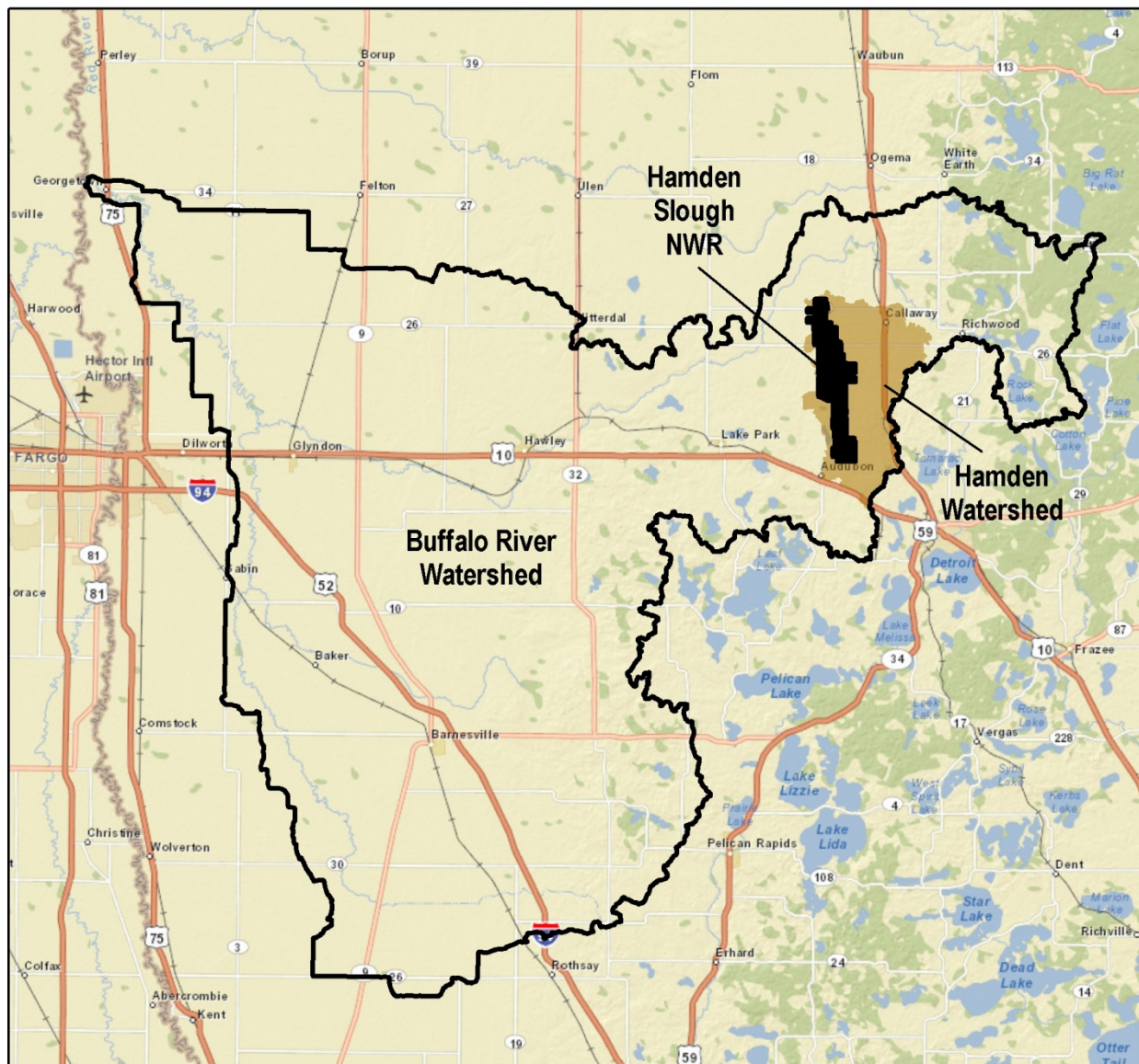
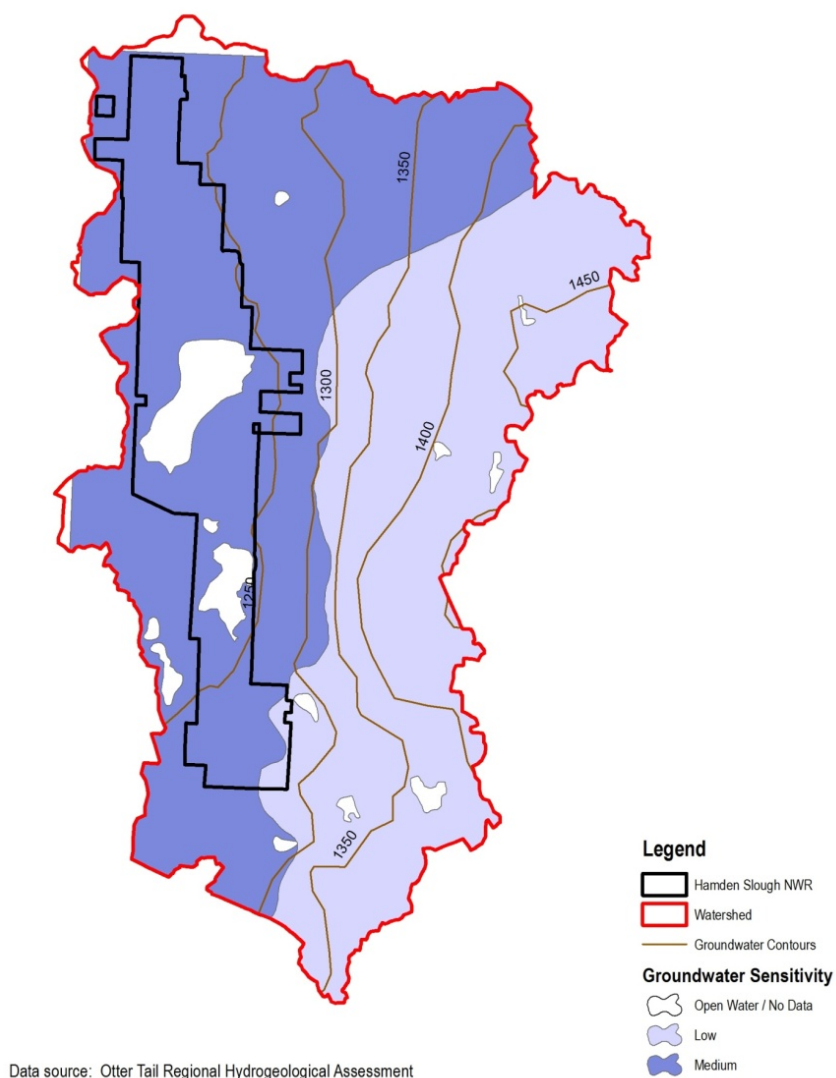


Figure 3-9: Groundwater

Historically, several small local streams drained from the east and south into and through the Hamden Slough area (figure 3-10). Water draining into the area was captured and held in several larger wetland basins that apparently were interconnected during high flow, wet years, and subsequently drained from the area into the Buffalo River. Local surface and groundwater runoff drained into several hundred small isolated wetland depressions or potholes on the Refuge (figure 3-11), but because of the topography, there was limited output into the larger system, except during wet years (Heitmeyer et al., 2012).

Figure 3-10: Watershed Drainage

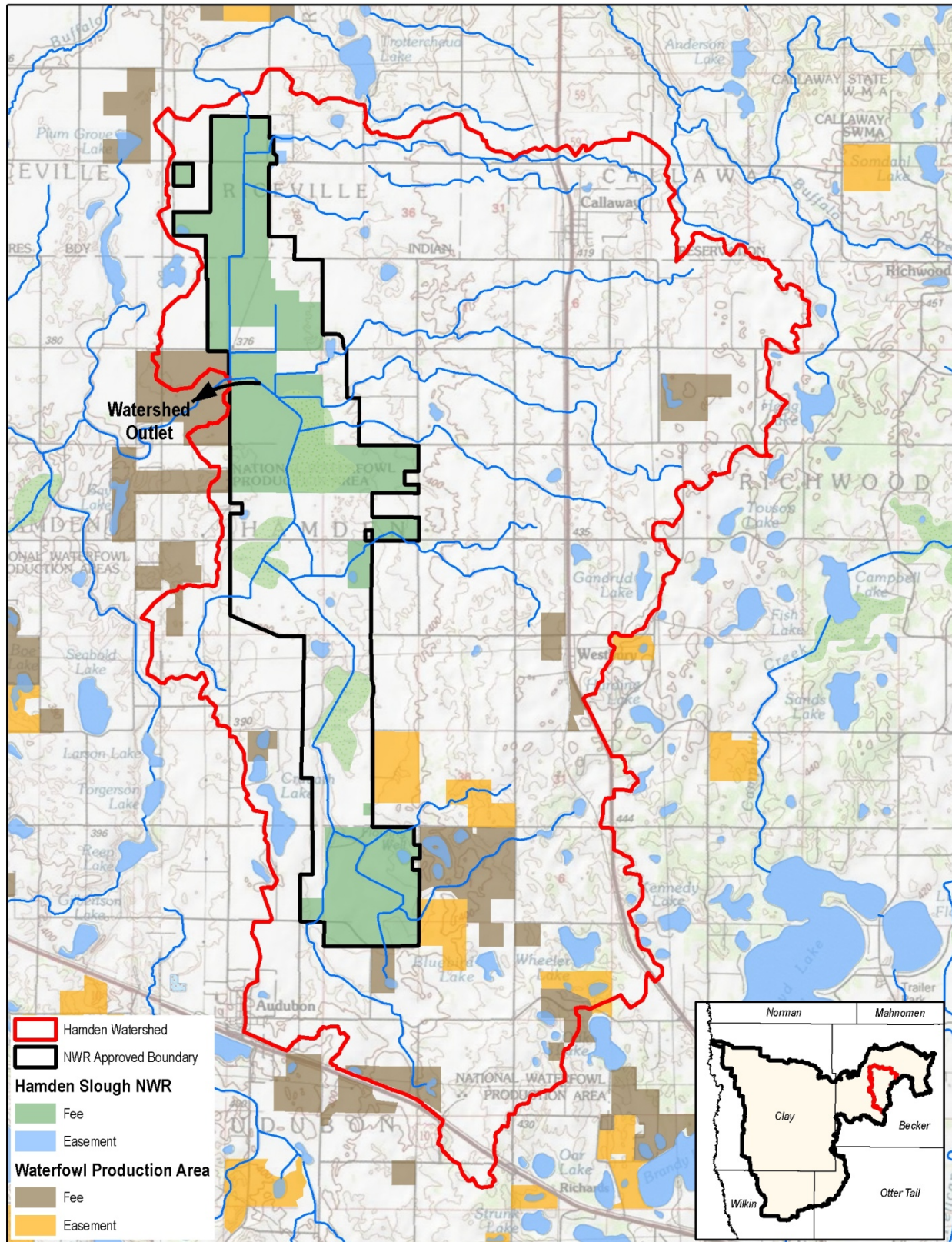
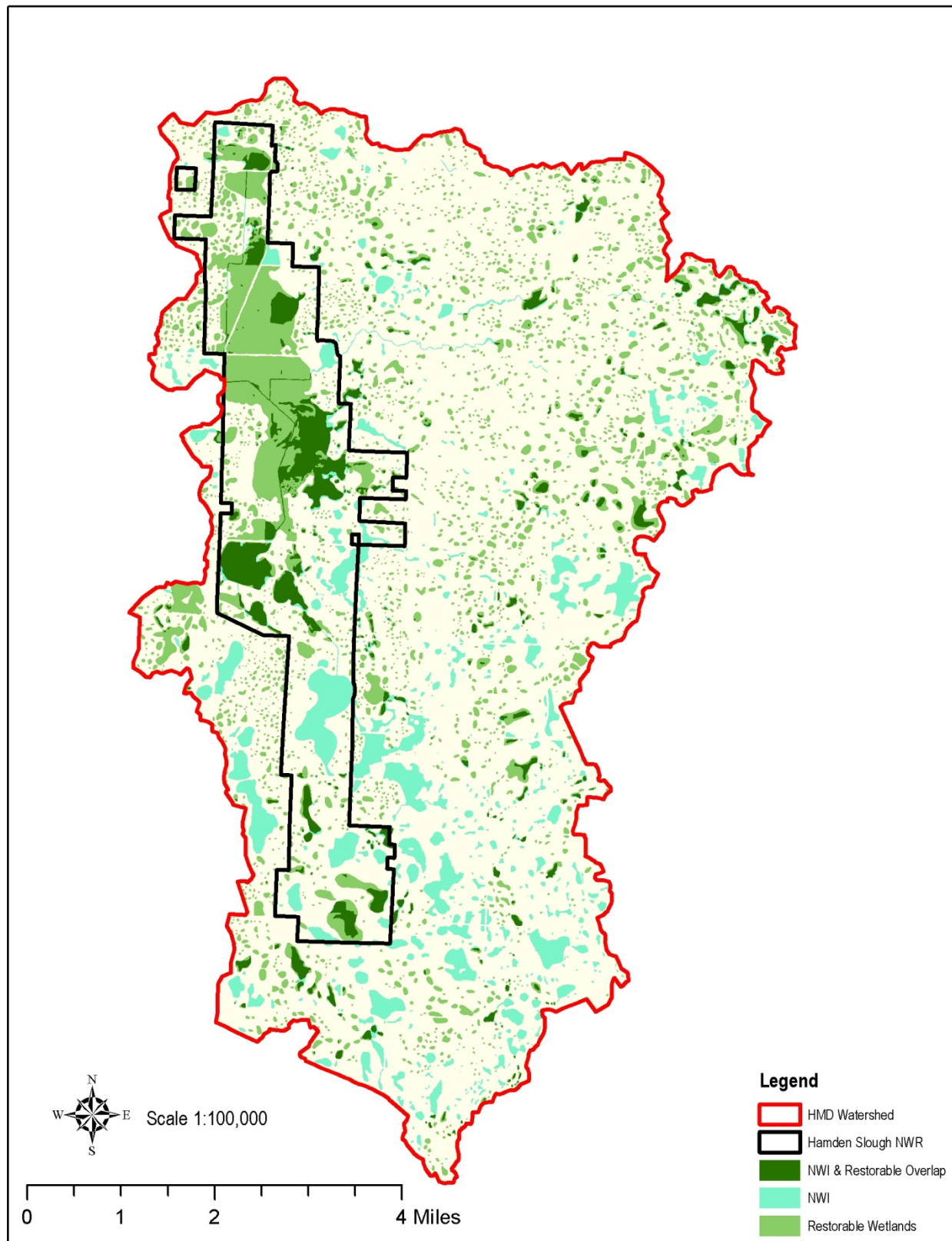


Figure 3-11: Distribution of Wetlands



The greater Red River Basin, including the Hamden Slough watershed, has been heavily altered by drainage ditches and tiles for the production of commodity crops such as sugar beets, corn, and soybeans.

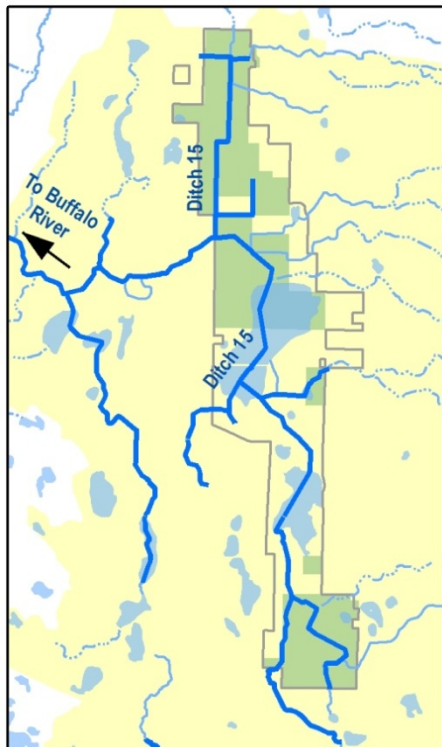
Extensive drainage of the Hamden Slough area began in the early 1900s with the construction of the Ditch 15 system, initially for mosquito control. This system drained the small, shallow temporary and seasonal wetlands effectively; however, some of the larger, dynamic wetlands and lakes were more difficult to fully drain. Today, this linear, interconnected system is the main transport of surface water through the Hamden watershed, including the Refuge, for agricultural purposes (figure 3-12). The



Ditch 15 System

The Ditch 15 system is managed by the Buffalo-Red River Watershed District (BRRWD). On Refuge property, maintenance of the main ditch and its laterals is jointly conducted under a cooperative agreement between the BRRWD and the Service. The cooperative agreement designates the Service as responsible for some ditch cleaning and maintenance to ensure the pre-established grade and depth are maintained unless changes are mutually agreed upon. Periodic excavations of the ditch involve disturbing sediments, which causes increased turbidity and sedimentation downstream (Heitmeyer et al., 2012). The ditch system also is highly susceptible to flash flooding during high precipitation events (Newman and Eash, 2011), which further impacts downstream lands within the greater Red River Basin.

Figure 3-12: Ditch 15 System

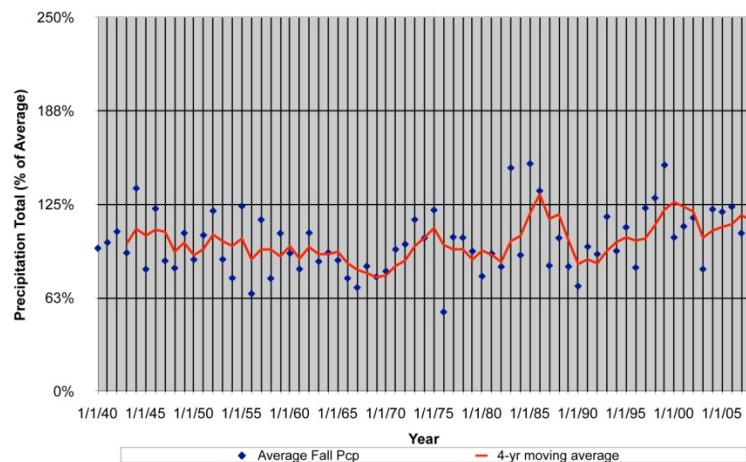


Current land use practices (pesticide and fertilizer applications, pasturing) and the alteration of hydrology (ditching and tiling) within the Hamden Slough watershed are primary sources of contaminants that could potentially impact the Refuge (Brozowski, 2010). Water chemistry and quality in the isolated depressional wetlands can be attributed to land use and runoff characteristics within the wetland basin, as well as the groundwater quality constituents discharged into the wetland. The ditch systems are potential primary source water for many of the larger flow-through wetlands and therefore, transport water-borne contaminants such as sediments, nutrients, animal waste (*E. coli*), pesticides, and fertilizers onto the Refuge (Brozowski, 2010). Based on current data from Minnesota Pollution Control Agency, the waters within the Hamden NWR boundary are not listed as "impaired," although the lower reaches of the Buffalo River downstream of the Refuge do have "impaired status" for turbidity and *E. coli*. The evaluation for the full extent of the Buffalo River watershed is still under development.

Climate

The climate of Hamden Slough NWR can be described as dynamic, attaining temperature and precipitation extremes at various times of the year and between years. Two topographically-influenced weather patterns dictate the climate of the Hamden Slough area at any given time. First, there is a steep precipitation gradient as weather moves east and lifts over the Red River Valley. For every ten miles of eastern movement, rainfall increases by one inch. In the 50 miles between the Red River and Hamden Slough NWR, annual precipitation increases from 19 to 24 inches, and the climate changes from semi-arid to subhumid. Second, Lake Superior's deep, cold waters during spring, summer, and fall influence the Refuge's weather when the airflow from the west is weak. This influence usually results in cooler than normal temperatures.

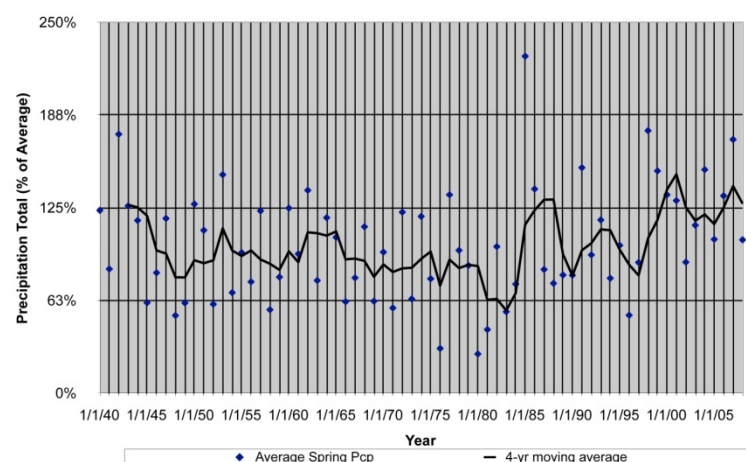
Figure 3-13: Annual Precipitation, 1940-2009, Detroit Lakes, MN



In general, summers are warm and moderately humid while winters are cold and dry. The warmest months of the year are July and August, with average temperatures in the 70s (degrees Fahrenheit), although temperatures often may be as high as 90 to 100 °F. January and February are typically the coldest months of the year, with average temperatures in the single digits to around 10 °F. However, it is not uncommon to experience temperatures in -20s °F and even lower wind chills. Average precipitation is 25 inches per year, most of it falling from April through

September. Heaviest rainfall occurs during June, July, and August. Average annual snowfall is more than 60 inches. Snowfall events in winter can range from light snow with little or no accumulation to heavy snow events of eight inches or more.

Figure 3-14: Spring Precipitation (Mar-May), Detroit Lakes, MN

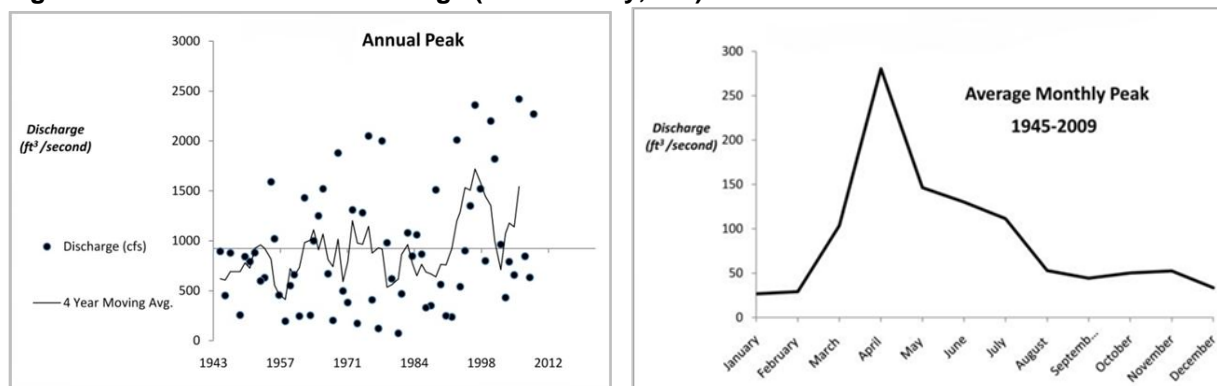


Since 1940, dry years with more or less than 60 percent average annual precipitation occurred seven different times, about 10 to 14 years apart (i.e., 1955–59, 1967–68, 1977, 1991) (figure 3-13, Annual Precipitation; Heitmeyer et al., 2012). In contrast, wet years with greater than 120 percent average annual precipitation occurred in the mid-1940s, early-1950s, mid-1970s, mid-1980s, late-1990s, and mid-2000s (Heitmeyer et al., 2012). Analyses of spring only (March through May) precipitation also suggest regularly alternating wet versus dry conditions in the region (figure 3-14) with highly dynamic

seasonal inputs of water to Refuge wetlands and streams, including the Buffalo River. The four-year running average annual peak discharge in the Buffalo River near Hawley, MN (where water from the Hamden Slough region drains) indicates alternating high (greater than 1,000 cfs) and low (less than 500 cfs) discharge at about 10 to 12 year intervals (figure 3-15, Buffalo River Discharge; Heitmeyer et al.,

2012). Depending on amount and moisture content of winter snowfall, and precipitation amounts and snowmelt duration in spring, large runoff events can occur in the Hamden Slough watershed and may add to flooding problems downstream in the Red River Valley.

Figure 3-15: Buffalo River Discharge (near Hawley, MN)



Climate Change and the PPR

Climate, as defined in *Climate Literacy: The Essential Principles of Climate Science* by the U.S. Global Change Research Program (USGCRP, 2009), is "the long term average of conditions in the atmosphere, ocean, and ice sheets and sea ice described by statistics, such as means and extremes." Climate change is a "significant and persistent change to the mean state of the climate or its variability" (USGCRP, 2009) and is likely caused by both natural and anthropogenic effects. The subject of climate change has been discussed, argued, and tested time and time again on whether or not it exists or has been exacerbated by human activities. However, the Intergovernmental Panel on Climate Change (IPCC) stated, in its Fourth Assessment (2007) that it had "very high confidence that the global average net effect of human activities since 1750 has been one of warming." This warming is mainly attributed to the trapping of three gases in the atmosphere: carbon dioxide, methane, and nitrous oxide.

Since the beginning of the 20th century, average surface temperature has risen 2.4 °F. Between 1996 and 2005, the earth experienced 11 of the warmest years on record since 1850 (IPCC, 2007), and 2009 and 2010 were reported as record-breaking years by NASA. Scientists predict that global climate change will accelerate in the 21st century. Potential consequences of increasing global temperatures include rising sea level and increasing frequency and intensity of heat waves, droughts, and floods (IPCC, 2007). In addition to the numerous direct and indirect impacts to humans, the world's wildlife also will be affected. The IPCC (2007) predicts that 30 percent of assessed species will have a greater risk of extinction with only a 3.6 to 5.4 °F increase in temperature.

Although wetlands are dynamic systems that fluctuate with changing weather, they also are very susceptible to climate change because of their shallow depths and high evapotranspiration rates (Johnson et al., 2010). Even slight temperature or precipitation changes could cause degradation or loss (North American Bird Conservation Initiative [NABCI], 2010). In nearly all climate simulation models, mean temperatures in the Northern Great Plains could increase between 6.5 °F and 11.0 °F over the next 100 years (Ojima and Lockett, 2002). Without a substantial increase in precipitation to counteract the increased temperature, severe impacts such as decreased water inputs (precipitation and groundwater sources), decreased storage capacity, timing of recharge (change in hydroperiod), and frequency of drought are expected to occur (NABCI, 2010), resulting in more frequent drought conditions in the PPR, especially in the Dakotas and Saskatchewan (Johnson et al., 2005). Climate simulations show that a temperature increase of 3.6 °F could cause nearly two-thirds of the highly productive wetlands in the Dakotas and Saskatchewan to go dry (NABCI, 2010), likely causing shifts once more in the breeding range of waterfowl (Johnson et al., 2010; Johnson et al., 2005). However, the majority of wetlands in the eastern PPR that historically supported waterfowl have been drained for agriculture, so pothole wetlands and the birds that depend on them are acutely threatened in the north central states of the PPR (NABCI, 2010).

Today, the continental population of breeding grassland birds continues to decline at a very high rate compared to other bird guilds of North America. Fifty-four percent of species showed a significant negative trend between 1966 and 2010 (Sauer et al., 2011). Fifty-seven percent of grassland bird species also show a medium-to-high vulnerability to climate change (NABCI, 2010). This added pressure could result in more birds listed as Species of Conservation Concern. Higher temperatures predicted for the Great Plains (Ojima and Lockett, 2002) would decrease productivity in many grasslands (NABCI, 2010) due to changes in vegetation community and structure, loss of water sources, and decreased prey, among others. Native game birds such as the sharp-tailed grouse and greater prairie-chicken already are declining due to habitat fragmentation and native prairie loss. Because these birds are non-migratory and lack the ability to travel long distances, they may be unable to shift their distribution in the wake of climate change (NABCI, 2010). Finally, long distance migrants such as the bobolink and dickcissel may not be able to adapt quickly enough in response to effects of climate change (NABCI, 2010).

Wetlands and grasslands not only provide functional habitats for a wide variety of wildlife and plants, they also provide many ecosystem services for humans. Benefits of grasslands and wetlands include improving water quality, retaining floodwater, sequestering carbon, anchoring soil, capturing sediment and other contaminants, recharging groundwater, producing livestock, controlling exotic species and diseases, providing recreational opportunities, and more. Many of these benefits are lost every time grassland is plowed or a wetland is drained. This loss will only be accentuated as climate change progresses.

3.3 Biological Environment

Historical accounts from the settlement of Hamden Township in the 1870s describe “the grass in some places was two and a half feet high, the rolling prairie was dotted with lakes and groves here and there”; (Wilcox, 1907). More specifically, the area encompassed by the Hamden Slough NWR boundary, as depicted on the original General Land Office survey map, was an open prairie with abundant wetlands and lakes, including a large “impassable marsh” named Hamden Lake (figure 3-16). Historic vegetation communities were further described and mapped in 2012 by Heitmeyer et al. based on these historic documents, as well as information on geomorphology, soils, topography, and hydrology (table 3-1; figure 3-17).

The tallgrass prairie evolved under three ecological pressures (Anderson, 2006): grazing by herds of bison (Knapp et al., 1999), fire (Collins and Wallace, 1990), and a highly variable climate (Knapp and Smith, 2001). Specific to the Hamden Slough area, precipitation both as winter snows and summer rains varied annually as well as over decades, such as the Dust Bowl droughts of the 1930s or floods of recent years. This created a high level of variability in the number and persistence of wetlands. In drought years or periods, even the largest wetlands would dry out. However, dry periods actually allow wetlands to rejuvenate themselves. The prairie was and is a harsh place to live, with winter winds, summer sun and heat, herds of grazers, and fires. The wildlife and plants were adapted to these conditions. It wasn't until European settlement that the prairie and its inhabitants would face the greatest threat to their existence.

Table 3-1: Historic Vegetation

Hydrogeomorphic (HGM) matrix of historic distribution of vegetation communities/habitat types on Hamden Slough NWR. Relationships were determined from old aerial photographs, plat and GLO maps, geomorphology maps, soil maps and survey publications, LIDAR topographic maps, various historical accounts of the region, botanical relationships, and land cover maps (Heitmeyer et al., 2012).

Habitat type	Geomorphic surface*	Soil type	Flood frequency
Mesic prairie	Moraine hill tops and high slopes	loam and sandy loam*	On-site precipitation
Wet mesic prairie	Lower moraine slopes, higher drainage edges	loam	On-site precipitation and surface/ground water discharge
Hill seeps	Seeps on moraine side slopes	Seeleville seep	Groundwater seeps
Wet meadow	Moraine drainages and high edges of wetlands and lakes	silt loam	Seasonal
Seasonal herbaceous marsh	Type I, II potholes and bands in deeper wetlands	silt clay loam	Seasonal
Persistent emergent marsh	Type III and IV potholes and deeper parts of glacial lakes	silt clay loam	Semi-permanent
Open water- aquatic	Deep zones in Type III and IV potholes and glacial lakes	silt clay loam	Semi-permanent to permanent

*Mesic prairie separated into sandy and non-sandy types based on soil type.

Figure 3-16: General Land Office Survey Map, circa 1870

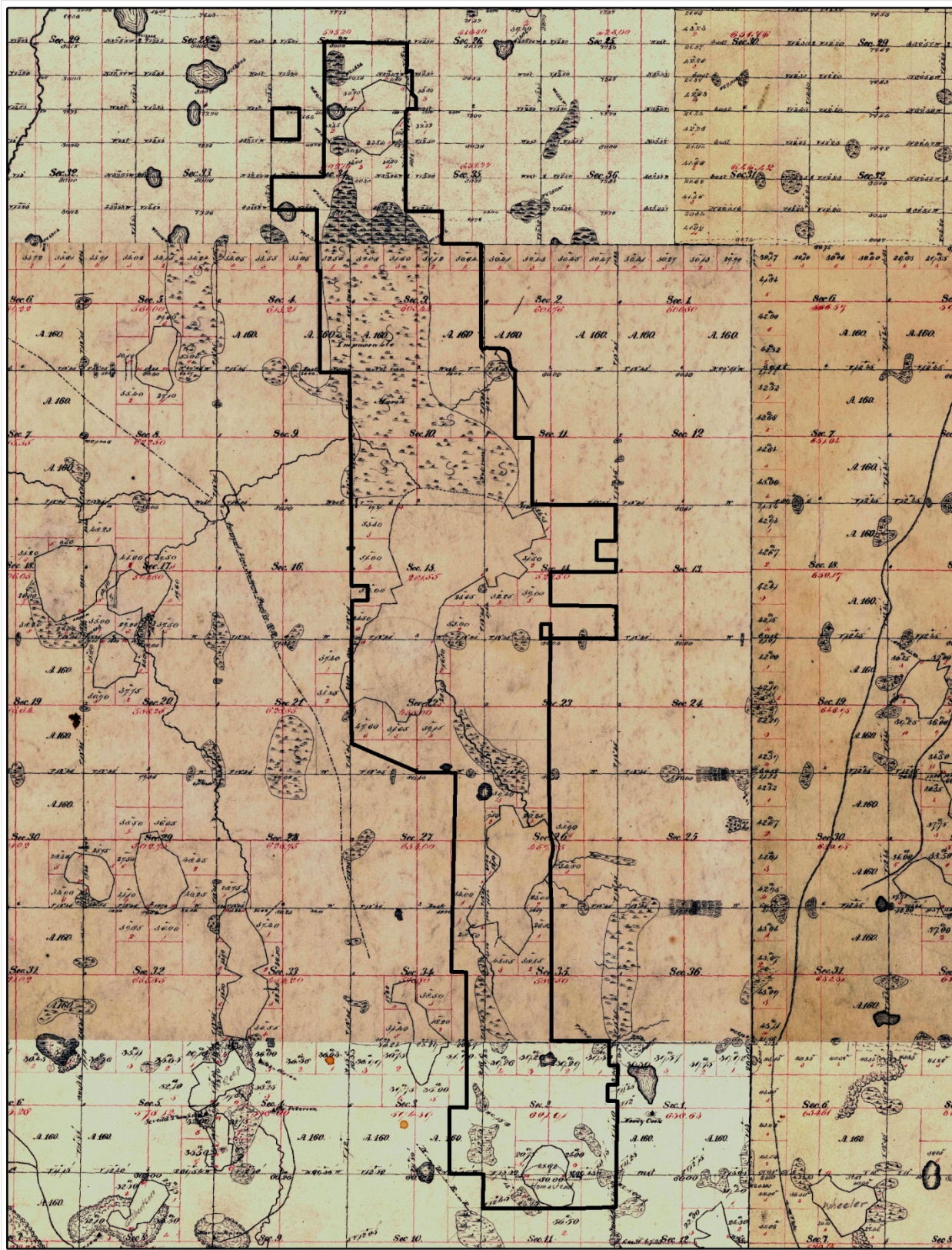
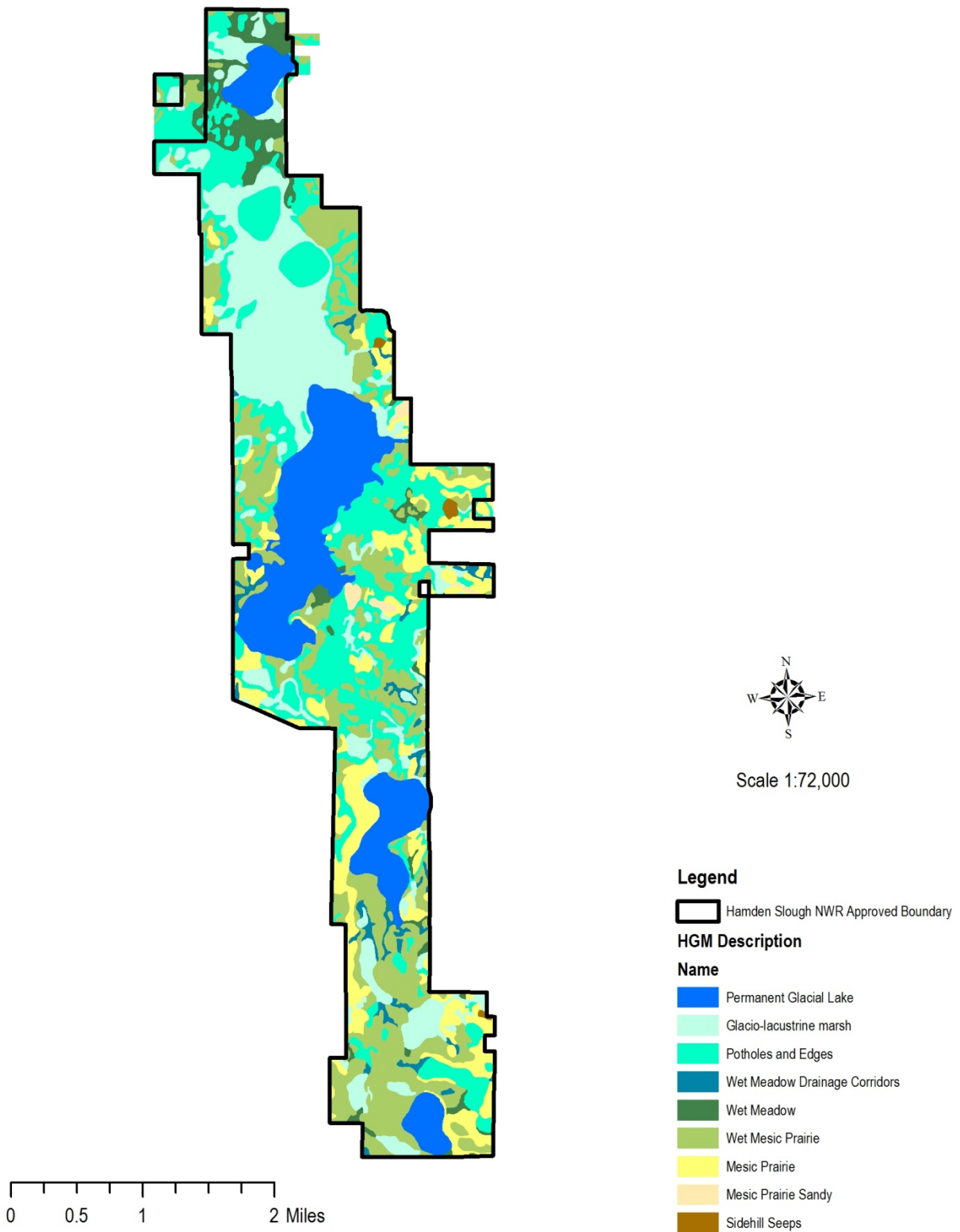


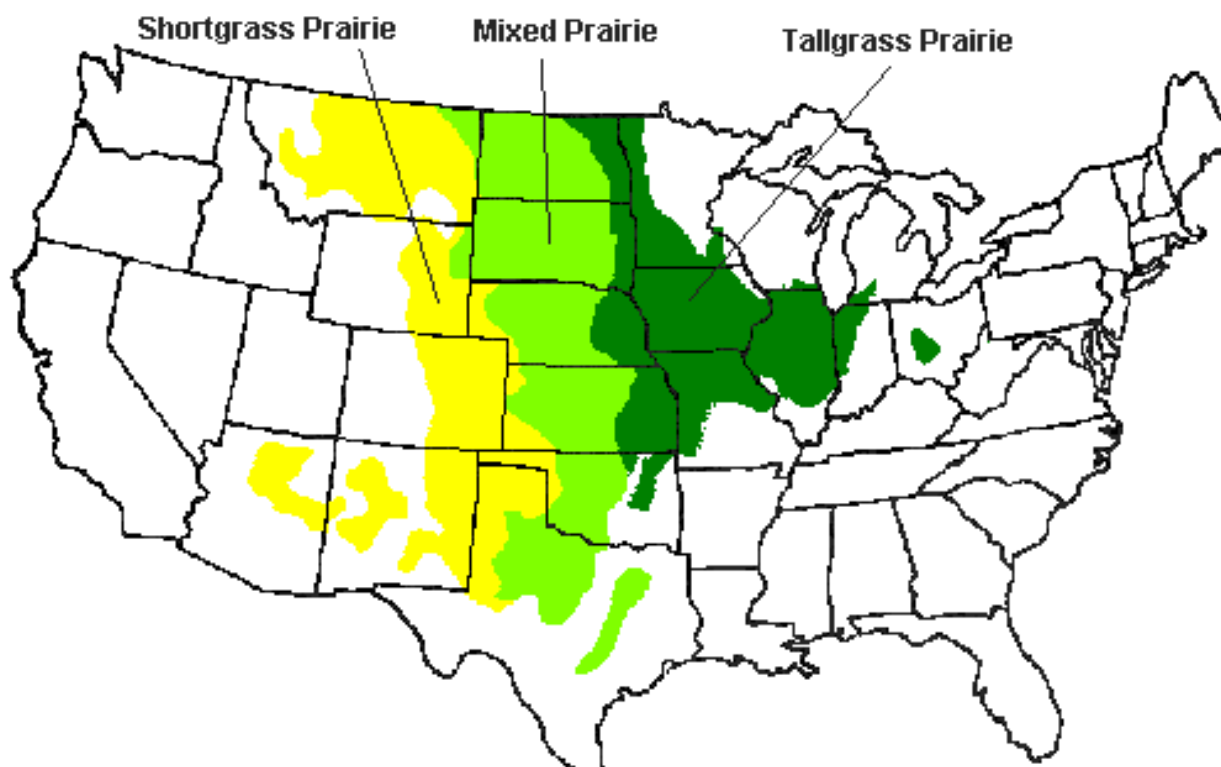
Figure 3-17: Historic Vegetation



Prairie Habitat

Hamden Slough NWR is at the northern end of the tallgrass prairie region, which forms a rough triangle from central Indiana to eastern Kansas to northwest Minnesota (figure 3-18, Transeau, 1934). Tallgrass prairie is the easternmost and most productive of the three American grassland ecosystems because it receives much more rain than the short-grass steppe and mixed grass regions to the west. Tallgrass prairie is dominated by grasses and forbs (wildflowers), many of which are known for their extensive root systems (Weaver 1954). Approximately 90 percent of the biomass of the prairie is underground in the root systems. It is these roots that largely created the productive soils of the Midwestern cornbelt.

Figure 3-18: Tallgrass Prairie Region



Prairie plants can be divided into two groups: grasses and forbs. While grasses make up 90 percent or more of the biomass of the prairie, there are relatively few species. Forbs account for 90 percent or more of the diversity. Prairie grasses and forbs separate along moisture gradients. Given the topography and soils, most Hamden Slough NWR prairies probably were typical of the pre-settlement tallgrass prairies described as Northern Mesic Prairie (Minnesota DNR, 2005). Along the margins of wetlands and in wet-mesic prairies, prairie cordgrass (*Spartina pectinata*) is the dominant species.

Moving to more mesic soils, big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*), the characteristic species of the prairie, are dominant. On hilltops or in sandier soils, prairie dropseed (*Sporobolus heterolepis*), little bluestem (*Schizachyrium scoparium*), porcupine grass (*Stipa spartea*) and side oats grama (*Bouteloua curtipendula*) are the most abundant grasses.

The diverse set of prairie forbs is dominated by two families: asters and legumes. These include asters (*Symphyotrichum spp*), blazingstars (*Liatris spp*), sunflowers (*Helianthus spp*), coneflowers (*Ratibida spp*), and goldenrods (*Solidago spp*). Legumes include prairie clovers (*Dalea spp*) and vetches (*Astragalus spp* and *Vicia spp*). Common woody shrubs include western snowberry (*Symphoricarpus occidentalis*), red osier dogwood (*Cornus sericea*), and wild plum (*Prunus spp*). Specific prairie assemblages representative of the area can be found in Refuge and District inventories (Pemble, 1995), scientific literature, and local knowledge.



Aster and legume species

Tallgrass prairie is a fire-dependent ecosystem (Collins and Wallace, 1990). The climate is actually wet enough to support trees (Briggs, 2005), but fire kept the trees in check and favored grasses (Leopold, 1949). Fire removes residual vegetation and litter layers, allowing seeds to germinate and new plants to become established. It also revitalizes the soil, building up nutrients important for flower and seed production. When fire is removed from the system, prairie is quickly converted to trees and forests (Heisler et al., 2003). The three questions surrounding historic fire regimes are: 1) what time of year were most fires, 2) how frequent were the fires, and 3) were the ignition sources lightning or human?

Most accounts from the historic literature show that fires in the tallgrass prairie region were most common in the fall (Wilcox, 1907; Higgins, 1986; McClain and Elzinga, 1994; Pyne, 1997), primarily the month of October. These same sources show that fires were quite frequent, with fires often referred to as “annual,” but not necessarily in the same location. Given the topography of the tallgrass prairie, Wright and Bailey (1980) suggest a fire frequency of five to ten years is reasonable. However, a more recent literature review suggests fire frequencies in the tallgrass region of Minnesota and Wisconsin were between two and three years but were highly dependent on the climate (Dickmann and Cleland, 2002).

While lightning is the primary source of ignition in western forests, lightning in the Midwest is usually accompanied by heavy rains. Lightning does cause fires in tallgrass prairie, but rarely. The vast majority of historic fires were set by indigenous people. The frequent records of October fires are during a time of the year when lightning storms are rare, lending more evidence that most fires were started by people. As Europeans settled the tallgrass prairie region, most fires were caused by locomotives and equipment used to clear the land, and fire frequencies remained high. By the 1920s, fire frequency and intensity waned as settlement increased and effective fire suppression programs began.

Grazing also is important to the maintenance of tallgrass prairie (Biondini et al., 1998). Bison were the primary grazers in western Minnesota, with deer and elk browsing on shrubs and young woody vegetation. Over 95 percent of the bison diet is grasses (Plumb and Dodd, 1993). Removal of these grasses releases the forb community from competition, dramatically increasing plant species diversity in grazed prairie (Hartnett et al., 1996; Towne et al., 2005). The increased plant diversity increases the diversity and abundance of invertebrates (Joern, 2005). Grazing creates a patchwork of vegetation structure from ungrazed to lightly grazed to heavily grazed areas. Patterns of standing vegetation affect fire pattern and behavior.

Fire and grazing interactions were important in the distribution of prairie vegetation communities across the landscape. Based on historical fire and grazing patterns, animals preferentially selected burned areas because of the young, green shoots and grazed them heavily. When another area burned, they moved to the newly burned patch. The interaction between fire and grazing created a shifting mosaic of microhabitats for grassland birds, prairie invertebrates, other wildlife, and vegetation.

As white settlers arrived in Becker County, they discovered a precious resource in the prairie—its soils. Soils were described for their richness, especially in the western portion of the county, “with no superior on the face of the globe” (Wilcox, 1907). This discovery ultimately led to the conversion of prairie to cropland in western Becker County, including the area of Hamden Slough NWR. Today, only about 22 acres of remnant prairie remain on the Refuge, all in small, highly fragmented parcels.

Wetland Habitat

The retreat of the Wisconsin glacier left approximately 25 million depressional wetlands of all shapes and sizes in the PPR. A variety of typical wetland types are found on Hamden Slough NWR, defined by soil type, duration of standing water, and vegetation communities. Some are fed by groundwater, but most are fed by rain and snowmelt. Temporary and seasonal wetlands, those that hold water for a few days to a couple months after thaw, make up the greatest number but the least acreage of the all wetland types. Semi-permanent and permanent wetlands, which typically hold water for an entire growing season or longer, are found at lesser densities but have the most surface acres of water (Stewart and Kantrud, 1971; Kantrud and Stewart, 1977). Each of the four types is described below (based on Cowardin et al., 1979).

Temporary wetlands only hold water for days or weeks, usually drying out by the start of the growing season. Most of the vegetation consists of annual plants that have adapted to the continually fluctuating and ultimately receding water levels. These plants begin to grow when the soils have little or no standing water. Some of the more common annuals found in temporary wetlands include beggarsticks (*Bidens* spp), smartweeds (*Polygonum* spp), barnyardgrass or wild millet (*Echinochloa muricata*), and weedy species such as common ragweed (*Ambrosia artemisiifolia*) and common cocklebur (*Xanthium strumarium*). Because of the high density of these wetlands during normal and wet years (Kantrud and Stewart, 1977), and the abundance of early aquatic invertebrates (Swanson, 1989), temporary wetlands provide important habitat for breeding waterfowl pairs (Kantrud and Stewart, 1977) and laying females (Swanson, 1989). Temporary (and seasonal) wetlands often are called “pair ponds.”

Intact or restored seasonal wetlands, which typically hold water throughout much of the growing season, provide the highest quality habitat for breeding waterfowl during years of average or above-average water conditions (Kantrud and Stewart, 1977). Seasonal wetlands also supply rich invertebrate food sources for laying hen waterfowl (Swanson and Duebbert, 1989), especially early in the spring when most of the larger wetlands are still ice-covered or warming up. Common vegetation includes some grasses: bulrush (*Scirpus* spp), sedges (*Carex* spp), spikerushes (*Eleocharis* spp), arrowhead (*Sagittaria* spp), and even cattail (*Typha* spp). In areas where water levels have receded, vegetation found in temporary wetlands may also be present.

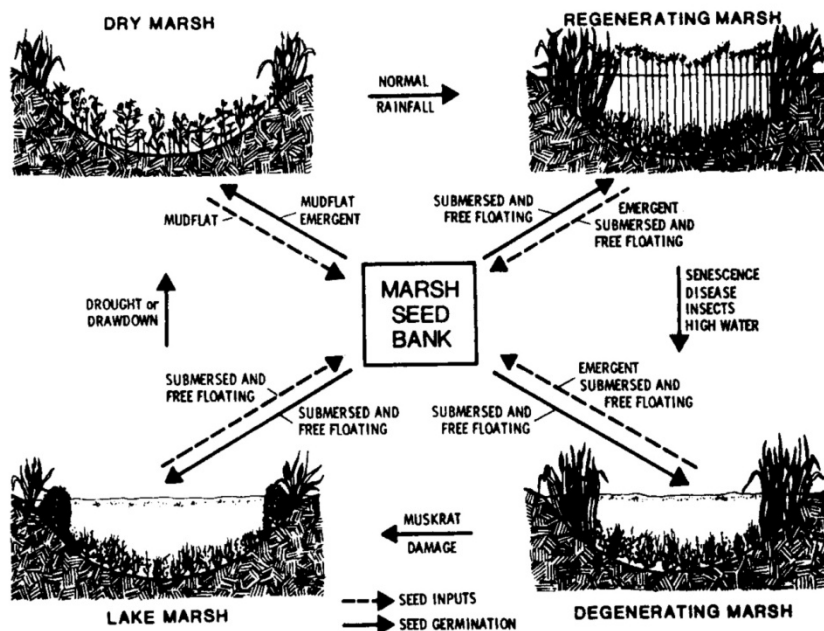
Semi-permanent wetlands hold up to three feet of water or more throughout the entire growing season. Because semi-permanent wetlands are productive season-long, they include some of the best breeding/brood marshes in the PPR, especially in dry years when temporary and seasonal wetlands go dry. Semi-permanent wetlands usually have a combination of robust, emergent vegetation such as cattails and bulrushes, and submerged vegetation important for invertebrate establishment. Examples of submerged vegetation include coontail (*Ceratophyllum demersum*), watermilfoil (*Myriophyllum verticillatum*), and pondweeds (*Potamogeton* spp). Hesby, Eagle, Hass, Office, South, and the Frog Pond are semi-permanent wetlands (Heitmeyer et al., 2012).

Permanent wetlands hold up to ten feet of water throughout the entire year. Usually they are dominated by open water and fringed by a border of emergent plants similar to those found in semi-permanent wetlands. Permanent wetlands are used as waterfowl brood marshes late in the breeding season when other wetland types have begun to dry out. During molt and fall migration, they provide important staging, resting, and feeding habitat for waterfowl. The relict glacial lakes of Hamden Slough NWR (Bisson, Homstad, Pierce, and Hamden) are classified as permanent wetlands (Heitmeyer et al., 2012) and also could be called “shallow lakes.”

Under natural conditions, wetlands of the PPR go through short- and long-term wet/dry cycles that vary with climate and drive nutrient cycling, vegetation growth, sediment oxidation, and invertebrate populations (Murkin, 1989). These cycles result in four distinct wetland phases which are described below for prairie pothole wetlands (van der Valk and Davis, 1978) (figure 3-19).

During drought, the bottom of the wetland basin is exposed and conditions become suitable for annuals and perennials. This is referred to as the “dry marsh stage” when most use by wildlife is for cover or consumption of annual seeds. The regenerating marsh stage occurs when water returns to the basin. Annual plants are drowned out, returning nutrients to the wetland and providing food and habitat for invertebrates. Emergent plants continue to expand, water remains stable, and the wetland eventually enters the degenerative marsh stage. This typically is when “hemi-marsh” is reached—the equal interspersed or 50:50 ratio of open water and emergent vegetation (Weller and Spatcher, 1965). The wetland is at peak productivity and is used by the greatest diversity of wildlife due to abundant food and cover. Finally, as the wetland enters the lake marsh stage, only a ring of emergent vegetation, typically cattail, remains around the outside of the basin. Cover availability and invertebrate abundance and availability typically decrease except around basin edges. Wetlands stay in this stage until a drought begins the cycle once again (Van der Valk and Davis, 1978).

Figure 3-19: Wetland Phases



Wetlands of the PPR are extremely important to North American waterfowl populations. The availability of wetlands (Kantrud and Stewart, 1977) and distribution of emergent cover (Weller and Spatcher, 1965; Murkin et al., 1982) drive the numbers of breeding waterfowl in the PPR. Hemi-marsh (equal interspersed of open water and emergent vegetation) has been shown to support the greatest waterfowl breeding pair density and species diversity (Kaminski and Prince, 1981; Murkin et al., 1982) and can be present in seasonal and semi-permanent wetlands. While only 10 percent of the available waterfowl breeding habitat is found in the PPR, nearly 50 percent of waterfowl production occurs there. Historically, when the Dakotas and Saskatchewan experienced drought conditions, waterfowl shifted to the eastern and northern fringes of the PPR to breed, including the area of Hamden Slough NWR.

Many wetlands were drained for farming as settlers began making their livelihood in the PPR. Rudimentary drainage ditches were dug to release water from small temporary or seasonal basins. As

technology advanced, larger networks of surface ditches were created or subsurface tile installed to more efficiently drain all types of wetlands. Today, interconnected temporary, seasonal, and semi-permanent wetlands are drained into basins at lower elevations, which increases their water level and permanence; a process known as consolidation drainage (Krapu et al., 2004).



Consolidation drainage

Consolidation drainage changes the hydrology and chemistry of wetlands, favoring the establishment and proliferation of cattail (Kantrud, 1986c), sustaining introduced fish communities (Anteau 2011), and ultimately diminishing wetland quality for waterfowl breeding and brood rearing (Krapu et al., 2004, Anteau 2011) and shorebird foraging (Anteau 2011). This practice continues in force today. It is estimated that over 85 percent of wetlands in Minnesota's PPR have been lost to drainage (Johnson et al., 2008). However, more than 200 wetlands of all types have been restored on Hamden Slough NWR, adding to the important conservation role of the Refuge.

Wildlife and Fish Communities of the Prairie-Wetlands

Before European Settlement

One can only imagine what it was like living on the prairies of western Becker County in the early 1800s prior to the arrival of white settlers. Just like historical accounts from other areas of the Northern Great Plains, western Becker County was alive with large and small mammals, hundreds of species of birds, reptiles, amphibians, fish, and insects galore. But as prairies and wetlands were destroyed with the advancement of settlers, many wildlife and fish that depended on that habitat began to disappear, too.

The western part of Becker County, including the area of Hamden Slough NWR, was a favorite summer range of the buffalo (*Bison bison*), though their visits were not only confined to that season. While on his travels through western Becker County, Alvin H. Wilcox, an early surveyor, stumbled across many bison bones scattered in Hamden and Cuba townships. The last of the buffalo were seen in this area in the late 1860s. Elk (*Cervus elaphus*) was the other major mammal of the Hamden Slough area prior to settlement, likely browsing on shrubs in the prairie or tension zone between the prairies and woods. Elk left suddenly as Becker County was settled. Other mammals that likely roamed the prairies and wetlands of the Refuge were the prairie wolf or coyote (*Canis latrans*), moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), jackrabbit (*Lepus townsendii*), badger (*Taxidea taxus*), pocket gopher (Geomyidae), muskrat (*Ondatra zibethicus*), jumping mouse (*Zapus hudsonius*), and the occasional antelope (*Antilocarpa americana*) among others (Wilcox, 1907).

However, it wasn't the mammals that defined Hamden Slough, it was the abundance birds. W.A. Wilkin, one of the first settlers of Hamden Township states, "Game was very plentiful, especially ducks, geese and prairie-chickens. It was no trouble to keep our families in meat, as all we had to do was to look out on the lake in the morning and see where the ducks were . . . and with a double-barreled shotgun, we could usually kill enough to last the whole day" (Wilcox, 1907). Waterfowl was probably the most plentiful of all the game due to the complex of wetlands and shallow lakes, including Hamden Lake. Other birds of interest recorded include whooping cranes (*Grus americana*), common moorhens (*Gallinula chloropus*), Eskimo curlews (*Numenius borealis*), and passenger pigeons (*Ectopistes migratorius*) near the town of Detroit in 1883 (Wilcox, 1907). Today, the passenger pigeon is extinct and it is likely the Eskimo curlew is too. Whooping cranes are a federally endangered species, and common moorhens rarely visit the area, with the last recorded sighting in 2003.

Donald P. Larson, a descendant of some of the early inhabitants of Hamden Lake wrote a historical account titled *The Hamden Slough and Lake Looked Like this 100 Years Ago*. His descriptions give a poignant perspective of life on Hamden Lake prior to major alterations of the land and resulting impacts to the area's wildlife.

The Hamden Slough and Lake Looked Like this 100 Years Ago

My grandfather (Sivert Larson) lived 6 miles north of Audubon. He built a log house where he and my grandma lived after they got married. He had seven sons and two daughters. My father's name was Peter. All the boys loved to hunt and fish. Hunting at that time was terrific! My father shot whooping cranes, swans and blue cranes. My uncle Max had an old 10 gauge shot gun and he sneaked down in the weeds and got 13 mallards with one shot!

My grandfather would go to Audubon and meet the train and pick up hunters from the cities and other towns around. He had two lumber wagons to haul the hunters out to the farm. If they had too much baggage they had to walk behind the wagon which was six miles. He had as many as 15 tents that they would set up on the east side of the grove. There was one problem though, he was very religious and would not let them hunt or fish on Sundays!

My other grandparents (Mr. and Mrs. Thorvald Erickson) lived on the east side of the lake. They had four girls and one boy. My mother's name was Clara. There was a spring fed creek that ran behind the barn and ran out to the lake. It had a very strong current. My mother used to take an old spool and tie a hook on to it and bait it and the current would take it down the creek. She used to catch Northerns that weighed 11 pounds! My uncle Elmer would trap all winter and sometimes my mother would go on skates to look at his trap lines if it wasn't too cold. In the spring he would have a whole triple wagon box of hides to sell. He would go and sell the hides in Lake Park.

My grandfather Sivert was against draining the lake. A government agency came around and said the water level was too low and they also said it was not healthy so he finally gave in. After the government agency got the ditch dug the government then turned around and charged him \$4,000.00 ditch tax! My grandfather thought when God created lakes they should be left alone!

In the morning if it was still and a little foggy, my grandfather said you could hear the prairie chickens drumming, also the trumpet swans, whooping cranes, geese, loons and many species of ducks. He said it sounded like a symphony. In the fall if it was snowing you had to practically lay down so you wouldn't get hit by ducks coming in!

The log cabin Sivert built stood about 90 years. He built around it and on top so he had a big home when he got done. The house was tore down in 1972 which was the end of an era for the Larson family.

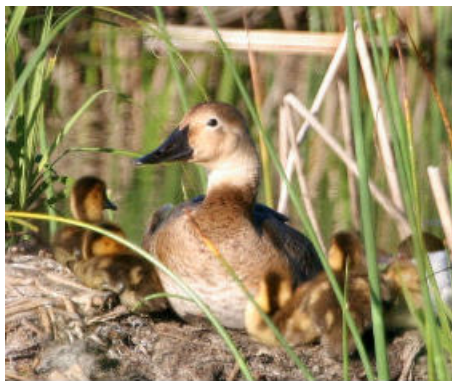
Hamden Slough Today

In 2004, Hamden Slough NWR was named an Important Bird Area (IBA) by Audubon Minnesota (National Audubon Society), one of the original IBAs in the state. Since the Refuge was established, over 200 species of birds have been recorded (see appendix C for species lists), including more than 20 species of shorebirds, nearly every major waterfowl species, and many grassland-dependent birds. This extraordinary result is likely due to the restoration of the prairie-wetland complexes located on Hamden Slough proper.

The greatest number of shorebird species is observed during spring and fall migration. Over 17 species, including but not limited to, Hudsonian godwits (*Limosa haemastica*); white-rumped (*Calidris fuscicollis*), western (*Calidris mauri*), and pectoral (*Calidris melanotos*) sandpipers; short-billed dowitchers (*Limnodromus griseus*), and semi-palmated plovers (*Charadrius semipalmatus*), have been recorded. Only the marbled godwit (*Limosa fedoa*), greater yellowlegs (*Tringa melanoleuca*), and killdeer (*Charadrius vociferus*) are known shorebird breeders of Hamden Slough NWR. Marbled godwits are unique shorebirds attracted to wet prairies during the breeding season.



Marbled Godwit (*Limosa fedoa*)



Canvasback (*Aythya valisineria*)

Waterfowl species, like shorebirds, are seen in large numbers during the spring and fall migrations. Snow goose (*Chen caerulescens*), American wigeon (*Anas americana*), northern pintail (*Anas acuta*), ring-necked duck (*Aythya collaris*), and common goldeneye (*Bucephala clangula*) are some of the migrants. Regular breeders include Canada geese (*Branta canadensis*), trumpeter swan (*Cygnus buccinator*), mallard (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), wood duck (*Aix sponsa*), and canvasback (*Aythya valisineria*), among others.

Additional species of interest drawn to the complex of wetland types on Hamden Slough NWR include American White Pelican (*Pelecanus erythrorhynchos*), Pied-billed Grebe (*Podilymbus podiceps*), Virginia Rail (*Rallus limicola*), Franklin's Gull (*Larus pipixcan*), Black Tern (*Chlidonias niger*), and American Bittern (*Botaurus lentiginosus*). Just about every niche of every wetland, from dense cattail to mudflats to open water, is utilized by waterbirds.

Similar to wetland birds, grassland birds responded to the addition of upland habitat when Hamden Slough NWR was established. Grassland birds of Hamden Slough NWR include, but are not limited to, bobolinks (*Dolichonyx oryzivorus*), clay-colored (*Spizella pallida*), grasshopper (*Ammodramus savannarum*), and field sparrows (*Spizella pusilla*); western meadowlarks (*Sturnella neglecta*), and northern harriers (*Circus cyaneus*).

Birds that frequent the wet margins between grasslands and wetlands are common yellowthroats (*Geothlypis trichas*), LeConte's sparrows (*Ammodramus leconteii*), sedge wrens (*Cistothorus patensis*) and savanna sparrows (*Passerculus sandwichensis*), among others.



Bobolink (*Dolichonyx oryzivorus*)



Short-eared Owl (*Asio flammeus*)

Portions of the Hamden Lake bottom are annually mowed, which attracts upland sandpipers (*Batramia longicauda*) and greater prairie-chickens (*Tympanuchus cupido*) for breeding and foraging activities. Short-eared owls (*Asio flammeus*) have also been observed in the Hamden lakebed.

While bison, elk, and antelope no longer exist naturally in this portion of Minnesota, many of the mammals common to western Minnesota grasslands and woodlots historically are still found on the Refuge today. These include white-tailed deer, coyote, badger, northern raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), mink (*Mustela vison*), muskrat, and a variety of small mammals. Mammals rarely seen that potentially use the Refuge are gray wolves and moose.

Amphibians and reptiles use Refuge wetlands for part or all of their life cycle, including the common eastern garter (*Thamnophis sirtalis*) and less common smooth green (*Liochlorophis vernalis*) snake; tiger (*Ambystoma tigrinum*) salamander; plains leopard (*Rana blairi*), wood (*R. sylvatica*), and tree (*Hyla arborea*) frogs; northern spring peeper (*Pseudacris crucifer*); common snapping (*Chelydra serpentine*) and western painted (*Chrysemys picta*) turtles; and the 12-lined skink (*Eumeces fasciatus*). Historically, wetlands at Hamden Slough NWR did not contain sustainable fish

populations because of winter freezing and interannual drying.

Although they are critical components of grassland and wetland habitats, information on invertebrate communities is lacking for Hamden Slough NWR. Aquatic and terrestrial invertebrates serve as an important food source for waterfowl, shorebirds, grassland birds, small mammals, reptiles, and amphibians. Invertebrates also consume plant and animal matter necessary for these systems to continue functioning. Finally, some prairie wildflowers are dependent on butterflies and other insects for pollination. Samples of aquatic invertebrates have been collected from Refuge wetlands although no complete inventories have been conducted. Some of the more common aquatic invertebrate collected during sampling were predaceous diving beetles, dragonfly and damselfly larvae, caddisfly larvae, backswimmers, and freshwater shrimp. Shrimp are important components of waterfowl diets, while dragonfly and damselfly larvae are consumed to a lesser extent. There are no known inventories of terrestrial insects on Hamden Slough NWR.

Priority Resources of Concern

The management direction of each refuge is driven first and foremost by a refuge's purpose(s) and statutory mandates, coupled with species and habitat priorities. The priorities that will guide wildlife and habitat management on Hamden Slough NWR can be found in appendix B. These priorities meet the migratory bird purposes of the Refuge and all Service mandates and policies including the Refuge Improvement Act. They were selected from a larger comprehensive list of Species of Concern (also found in appendix B) using the process detailed in *Identifying Refuge Resources of Concern and Management Priorities: A Handbook* (FWS, 2010).

Federal T&E Species

The Poweshiek skipperling (*Oarisma poweshiek*) was added as a candidate species in Minnesota, including Becker County, in October 2011. This moth-like butterfly is closely tied to high quality remnant prairie and therefore, is unlikely to inhabit Refuge remnants due to their small size and isolation. In addition, the Refuge's restored uplands contain few, if any, grasses and wildflowers critical to the larval and adult butterflies (e.g., little bluestem, side-oats grama, purple coneflower, and prairie lily). Larger, remnant prairie tracts do occur near the Refuge; however, it is unknown whether Poweshiek skipperlings occur in those locations.

In January 2012, the Service concluded that the gray wolf (*Canis lupus*) population was sufficient to no longer warrant protection under the federal Endangered Species Act and was delisted. The gray wolf is likely an uncommon visitor of Hamden Slough NWR. In 2009, a pack was observed on Buchl WPA, and again on Donley Tilman WPA in 2010; both WPAs are located four miles north of the northernmost portion of the Refuge.

State Species of Concern

One of the most prolific species of the NTGP, the greater prairie-chicken, is a species of concern in the state of Minnesota and a popular bird of Hamden Slough NWR. On the north end of the Refuge, there is a known lek located in a portion of the Hamden Lake bottom. The marbled godwit, a wet-prairie dependent bird of Hamden Slough NWR, is also a species of concern. Both birds use shorter grasses for foraging and breeding activities and nest in tallgrass sites on and off the Refuge. There are also many other state-listed species that have or could be found using the Refuge (see <http://www.dnr.state.mn.us/rsg/index.html>).

3.4 Socioeconomic Environment

Demographics

Hamden Slough NWR is located in Becker County in west central Minnesota, about forty miles east of the North Dakota border. The population of Becker County was 32,504 in the 2010 census, which is an 8.3 percent increase over 2000 numbers (U.S. Census Bureau, 2012). The Refuge lies seven miles northwest of the city of Detroit Lakes (county seat, population 8,570) and one mile from Audubon (population 520). Becker County has a total area of 1,315 square miles (841,600 acres); about 91 percent is terrestrial (primarily farm land and forests) and 9 percent is water (more than 400 lakes).

Nearly 90 percent of county residents are of European descent, primarily German and Norwegian; about 7.5 percent are Native American. About 31 percent of residents are under the age of 18, and 17 percent are over 65 years of age. The county has four school districts associated with the communities of Detroit Lakes, Lake Park-Audubon, Frazee-Vergas, and Pine Point. Ninety percent of the population 25 years or older has attained at least a high school level of education; 21 percent has a Bachelor's degree or higher (U.S. Census Bureau, 2012).

Becker County has more than 18,000 housing units, with nearly 25 percent used only seasonally, occasionally, or for recreational uses. Median value of owner-occupied housing units is \$166,800 (U.S. Census Bureau, 2012).

Income, Employment, and Local Economy

Median household income in Becker County is just over \$46,000; about 11 percent of the population has income below the poverty line. The five-year estimate (2006–2010) of unemployment is 5.3 percent. Private non-farm employment decreased between 2000 and 2009 by 28 percent (U.S. Census Bureau, 2012).

About 75 percent of workers are private wage and salary earners, another 14 percent work for the government, and 11 percent are self-employed. Employment sectors and percentages in the county include:

- 29 percent – management, business, science, and arts
- 25 percent – sales and office
- 17 percent – service
- 13 percent – natural resources, construction, and maintenance
- 16 percent – production, transportation, and material moving

Agriculture

In 2007, Becker County had 1,202 farms totaling nearly 400,000 acres. Total market value of products sold was \$150 million, about evenly divided between crops and livestock/poultry. Crops included about 70,000 acres of soybeans, 46,000 acres of wheat, 38,000 acres of corn, and 8,300 acres of sugar beets. Another 37,000 acres were classified as forage (land used for hay and haylage, grass silage, and green chop). Net income averaged \$40,137 per farm. Sixty percent of operators had a primary occupation other than farming (USDA, 2007).

Tourism

In 2009, the leisure and hospitality industry generated about \$62.6 million in gross sales in Becker County and supported 1,310 jobs, contributing \$4 million in sales tax to the state economy (Explore Minnesota Tourism, 2011). The region offers visitors water-based recreation, cultural attractions, and multiple festivals and special events.

In 2007, the University of Minnesota's Tourism Center published the results of a survey of visitors to the Detroit Lakes-Mahnomen area (Salk and Schneider, 2007). The study was designed to inform tourism planning and development and subsequently enhance visitor experiences and destination revenue. Nearly 90 percent of respondents identified their primary destination as Detroit Lakes, 36 percent were traveling for pleasure or recreation, over half had traveled less than 100 miles, and 85 percent were repeat visitors. Visitors indicated that nature-based opportunities were important to their destination choices. Among the top ten most important features, six were nature-based, although approximately one-third or fewer of visitors experienced or participated in nature-based activities during their trip. Reasons for this could include a lack of awareness or a lack of time. The report noted that additional attention to nature-based opportunities could benefit the local economy.

3.5 Historical and Cultural Resources

Area History

Prehistoric

The Refuge landscape is the product of a long and complex series of climatic changes and glaciations. The final retreat of the Red River Lobe of the Laurentide Ice Sheet occurred during the late Pleistocene Epoch approximately 12,000 years ago, forming the large glacial Lake Agassiz. The Red River Drainage was not accessible to human settlement until the recession of Lake Agassiz started around 11,500 before the present (BP) and was not fully accessible until at least 9,500 BP. The Hamden Slough NWR area conceivably could have been used by Paleo-Indian hunter/gatherers during this period (Ward et al., 1997).

The Archaic Tradition (8,000 to 4,000 BP) generally is characterized by the development of efficient hunting and gathering cultures and greater exploitation of local environments for food and tools. The large mammals of the Pleistocene Epoch (mammoth, horse, camel, etc.) were by then extinct and environmental conditions had largely stabilized. Increasing regionalization occurred throughout the Archaic that appears to be linked in part to major biomes (e.g., prairie, deciduous forest, lake-forest).

Native populations apparently increased dramatically from 4,000 to 1,500 BP during the Woodland period. Increases were related to rapid diffusion of techniques for obtaining, storing, and processing food. This late-Prehistoric period was a time of lake-focused subsistence settlement in the Hamden Slough and receding Lake Agassiz region and included semi-permanent villages, many of which were fortified, and gardens used for active plant production (Heitmeyer, 2012).

Historic

The Cheyenne were the first known historic Native American group to live in the upper reaches of the Red River Valley. The Cheyenne were decimated by smallpox during the early 1780's, leaving the upper Red River Valley open for the Ojibwe who became the dominant people in the region until the mid-1800s. The Eastern Dakota, Teton, and/or Yankton people were present in the lower reaches of the Red River

Drainage when the first Euro-American explorers arrived. Available evidence indicates that Eastern Dakota people occupied most of the lake-forest biome of central and northern Minnesota.

Pierre Gaultier de Varnennes Sieur de LaVerendrye, a fur trader and explorer for the French government, was the first European in the Hamden Slough NWR region in 1731. At the end of the French and Indian War in 1763, the French abandoned fur trading activities in the Red River Valley to British- and American-born traders. The British regime ended with the purchase of the Louisiana Territory by the United States in 1803. The period between 1803 and 1837 was characterized by the exploration and mapping of the region. The first land cession by the southern Ojibwe was made in 1837. Multiple treaties with the Ojibwe, Dakota, and Winnebago tribes soon opened up central Minnesota to logging and settlement.

The first permanent white settlers arrived in the Hamden Slough region in 1871 in association with construction of the Northern Pacific Railway. This line stimulated tremendous population growth as well as the founding of four towns in southwestern Becker County: Detroit Lakes, Frazee, Audubon, and Lake Park. The Soo Railroad was constructed on a north-south line through Detroit Lakes in 1903; it lies just east of Hamden Slough NWR. Detroit Lakes developed into an important agricultural market center. The railroads also brought tourists to the area, attracted by prime hunting, fishing, and recreational opportunities. By 1923 Becker County had a population of nearly 23,000 people.

Refuge Cultural Resources

The presence of prehistoric cultural artifacts in this region of Minnesota is light and can only be expected in areas with specific defining characteristics such as high relative elevation, the banks of waterways and large lakes, and the beach ridges of glacial Lake Agassiz. The Indian Springs Site is the only known prehistoric site within the authorized Refuge boundary. It was discovered during the 1997 cultural resources survey (Ward et al., 1997). Three working basalt tools were found, but a period of occupation could not be pinpointed. Avoidance of the area was recommended to prevent disturbance.

Ward et al. (1997) also determined that a total of 12 historic farmsteads or other historic sites could be located within the authorized Refuge boundary. These rural residential/agricultural complexes date back as far as 1875. Only one standing structure—a farm outbuilding—was identified. Due to absence of the farm house and significant structural instability, the structure was thought to be ineligible for the National Register of Historic Places. Sheet midden deposits associated with the structural complexes are relatively light, but the presence of shaft features (wells and privy pits) is nearly certain.

The north end of Hamden Slough NWR encompasses a portion of the White Earth Reservation. Through consultation with the White Earth Band of Ojibwe, no known traditional cultural properties have been identified on the Refuge. Other tribes associated with the region such as the Red Lake, Upper and Lower Sioux, and Cheyenne have not indicated any knowledge or expectation of traditional cultural areas on the Refuge.

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 Current Refuge Programs

Hamden Slough NWR is a relatively new refuge and many of the programs are still evolving and expanding. The Refuge never has had a large staff. In the beginning, three dedicated staff built the Refuge from the ground up and managed all programs. Currently, with decreased budgets, no Refuge staff, and an incomplete boundary limiting further restoration and management options, the programs have endured change. But regardless of change, the goal is to maintain a balanced and functioning prairie-wetland landscape that meets the collective needs of both wildlife and people in a sustainable way.

Biological

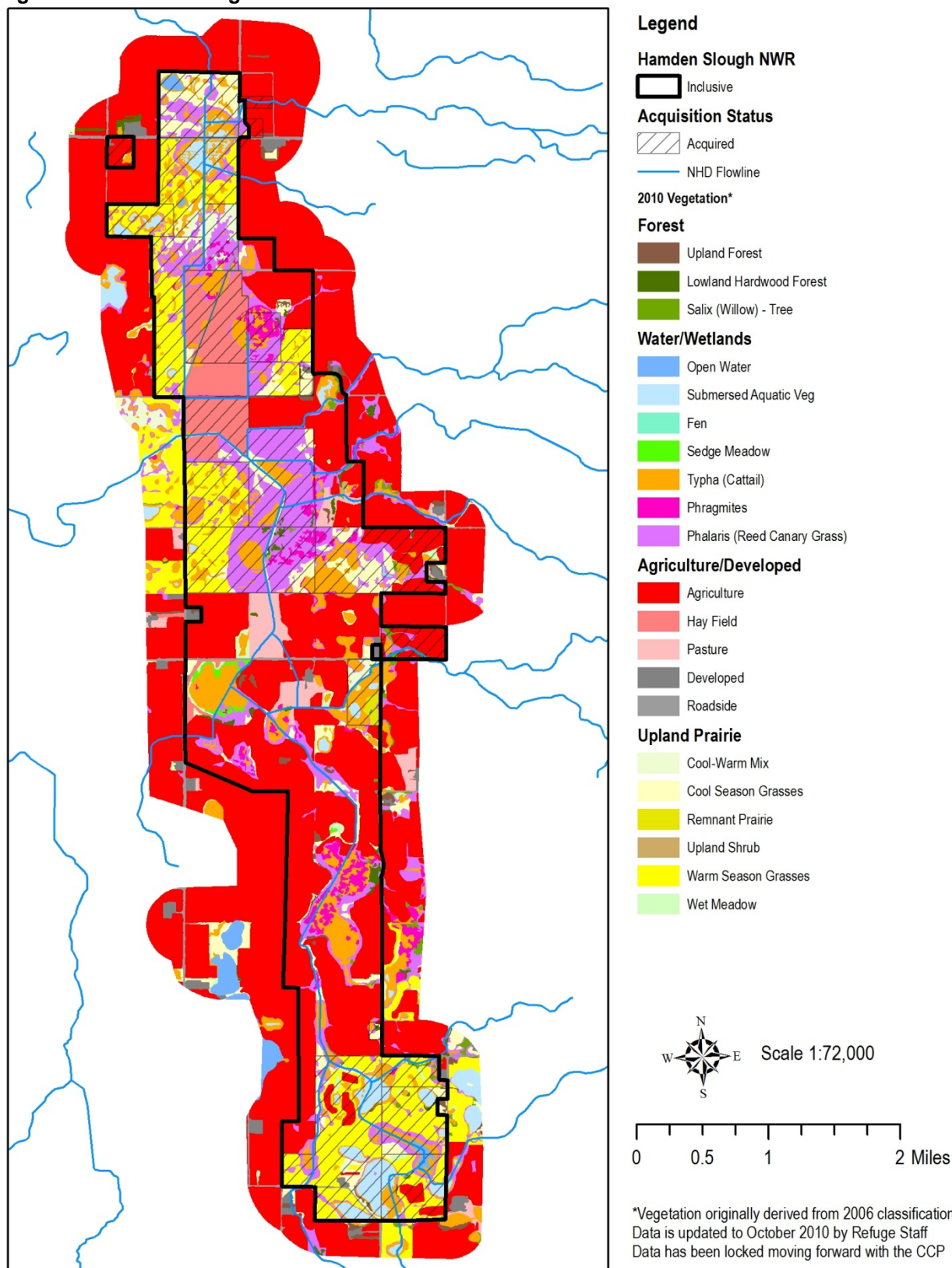
Currently, most of the Refuge is composed of planted grasslands, drained lakebed, and restored wetlands; while trees, remnant prairie, and food plots make up a small percentage of fee land (figure 3-20). The biological programs of Hamden Slough NWR have a rich and varied history.

A Concept Plan was developed for Hamden Slough NWR in the early 1990s to provide initial restoration and management guidance for the newly established Refuge. The biological program emphasized management for migratory waterfowl (especially breeding ducks) and resident wildlife (especially furbearers, ground-nesting birds, and white-tailed deer).

As land was acquired, a primary focus was providing wetland habitat by using ditch plugs, dikes, and water control structures to restore drained wetlands and facilitate water level management. Uplands were planted to a mixture of grasses to provide nesting habitat for migratory waterfowl and resident prairie-chicken, pheasant, and grey partridge. Some fields were kept as cropland to provide food for Canada geese, migrating ducks, deer, prairie-chickens, and pheasants. Numerous waterfowl nesting islands and structures were planned, as well as a predator management program.

During the past 20 years, some aspects of the Refuge biological programs have been modified in response to changing conditions. The landscape has undergone changes that affect wildlife and habitat, new threats to the Refuge are emerging, new laws and policies have been put in place, and new scientific data are available. This CCP redefines future management direction and priorities based on updated information. It is the first comprehensive planning effort undertaken for Hamden Slough NWR since the Concept Plan was developed.

Figure 3-20: Current Vegetation



Because of extensive wetland and upland restorations, evolving management and monitoring techniques, and guidance provided by recent assessments of Refuge resources (CAP, WRIA, and HGM), Hamden Slough NWR will continue to be capable of supporting a diversity of migratory birds, and other native wildlife and plants for future generations.

Wetland Restoration and Management

The landscape of Hamden Slough NWR has been highly altered for agricultural production. Many ditches have been constructed to aid in wetland drainage. The Ditch 15 system was constructed in the early 1900s and is still maintained today. Approximately ten miles of the Ditch 15 system lie within the approved Refuge boundary; six miles of which are located on acquired Refuge property (Newman and Eash, 2011). Additional unnamed intermittent streams and smaller surface ditches are also located within the approved boundary, including Refuge fee land. When large ditch systems were built, the spoil probably was placed outside and along the ditch, sloughing off into the waterway. When small surface ditches were dug or scraped, the spoil often was placed in the wetland bottom, filling it with sediment. A large number of wetlands were restored during the first 20 years of Hamden Slough NWR's existence.

Between 1991 and 2002, more than 200 temporary and seasonal wetlands, the most "at-risk" wetlands of the PPR, were restored (table 3-2). Most were restored by scraping sediment deposits from the basin bottom and using it to construct ditch plugs to hold back water. The remaining fill was spread on adjacent uplands. Some of the small surface ditches were never filled, so natural hydrology of the wetland was not fully restored and water movement is likely impeded today. As techniques evolved, wetlands were restored by scraping the sediments and completely filling in the surface ditches that drained them, restoring not only the wetland but also the hydrology.

Table 3-2: Pothole Restorations

Year	Tract Name/#	Pothole Wetlands	Wetland Acres
1991	Spring Marshes	29	16.3
1991	Hass #32	4	8.2
1992	Elleson/S Unit	5	8.5
1996-1997	Hass #32	11	4.2
1996	S Unit #10,11,12	21	7.5
1997	Amundson #43	15	10.2
1997	near Hamden Lake	1	37
1998	Scherzer W #45	2	4.8
1998	Scherzer E #45	14	6.1
1998	Amundson N #43	23	9
1998	Flottesmesch #44	14	7.2
1998	Matter #41	22	8.1
1998	Unknown	6	3.3
1999	Unknown	22	8.1
1999	Zurn #42	2	13.6
2000	Zurn #42	18	4.2
2002	Matter #37	19	5.4
Total		228	161.7

Two major wetland restoration projects, the "Big 6" and the "North Star 2000," added significant semi-permanent and permanent wetland habitat back to the Refuge (table 3-3). These larger, managed

wetlands were restored with surface water inlets and outlets, receiving and discharging most of their source water from and back into the ditch system or its tributaries.

Table 3-3: Managed Wetlands

Water Feature Name	Type of Surface Water	Extent (Full Pool/River miles)	Elevation (Full Pool)	Volume (FP)	Remarks
Ditch 15	Ditch/Canal	6 mi	NA	NA	County ditch system. Ten miles total within acquisition boundary
Unnamed Tributaries/ Ditches	Stream/river				
Ditch/canal	4.5 mi	NA	NA	Multiple unnamed intermittent tributaries are located on the Refuge; approximately 12 tributaries spanning 8 mi within total acquisition boundary.	
Office Wetland	Wetland, Managed	10.3 ac.	1263.0 ft.	29.4 ac. ft.	Emergent Wetland
Hass Wetland	Wetland, Managed	12.0 ac.	1260.0 ft.	26.0 ac. ft.	Emergent Wetland
Homstad Lake	Wetland, Managed	71.3 ac.	1260.0 ft.	238 ac. ft.	Open Water Wetland
Hesby Wetland	Wetland, Managed	60.9 ac.	1258.0 ft.	233 ac. ft.	Open Water Wetland
Eagle Pond	Wetland, Managed	43.5 ac.	1252.0 ft.	124 ac. ft.	Open Water Wetland
South Wetland	Wetland, Managed	20.1 ac.	1262.0 ft.	49.0 ac. ft.	Emergent Wetland
Bisson Lake	Wetland, Managed	112 acre	1231.5 ft.	110 ac. ft.	Emergent Wetland
East Frog Pond	Wetland, Managed	13.7 ac.	Unknown	Unknown	Emergent Wetland
West Frog Pond	Wetland, Managed	9.9 ac.	Unknown	Unknown	Emergent Wetland

Restoration of the Big 6 wetlands was completed in 1995 after years of gathering data, cost-estimates, permits, and agreements. Ducks Unlimited (DU), the Izaak Walton League, Safari Club International, and the BRRWD were key partners. The Big 6 wetlands (Haas, Homstad, Office, South, Hesby, and Eagle), neighboring wetlands on Anderson WPA, and private land form a large, interconnected complex in Sections 1 and 2 of Audubon Township. Water enters the complex from the south, east, and west and flows north, exiting Eagle pond onto private land via Ditch 15. Water control structures with stoplogs were installed to facilitate water level manipulation.

There are limitations, however, to water management capabilities, and it is not always possible to achieve intended levels given certain situations upstream. Large rain events or structure deficiencies can cause water to flow in places it wasn't originally intended. Therefore, due to the interconnectivity of the Big 6, it is critical to consider all pool levels when planning, as well as conditions within the greater watershed.

In the end, Hamden Slough NWR regained 218 surface acres of water on the south end, all with management capabilities to attract and support a variety of wetland wildlife throughout the year (figure 3-21).

Figure 3-21: Big 6 Wetland Restoration

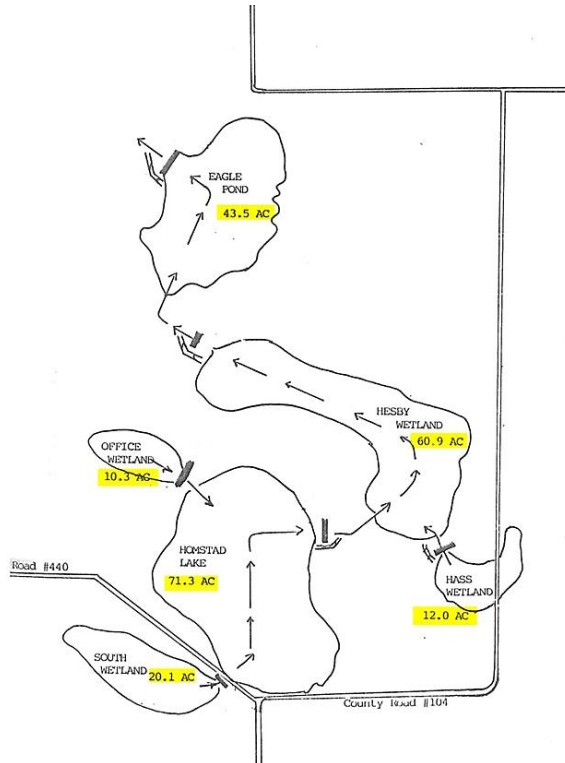
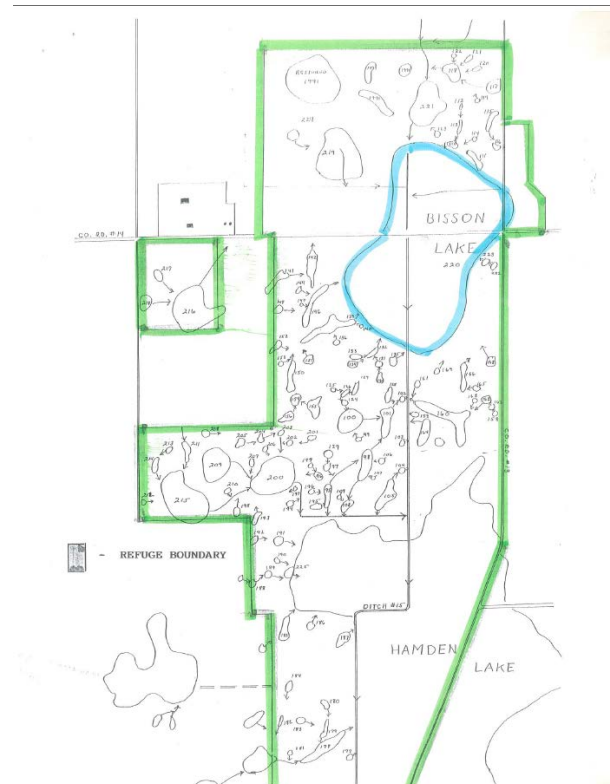


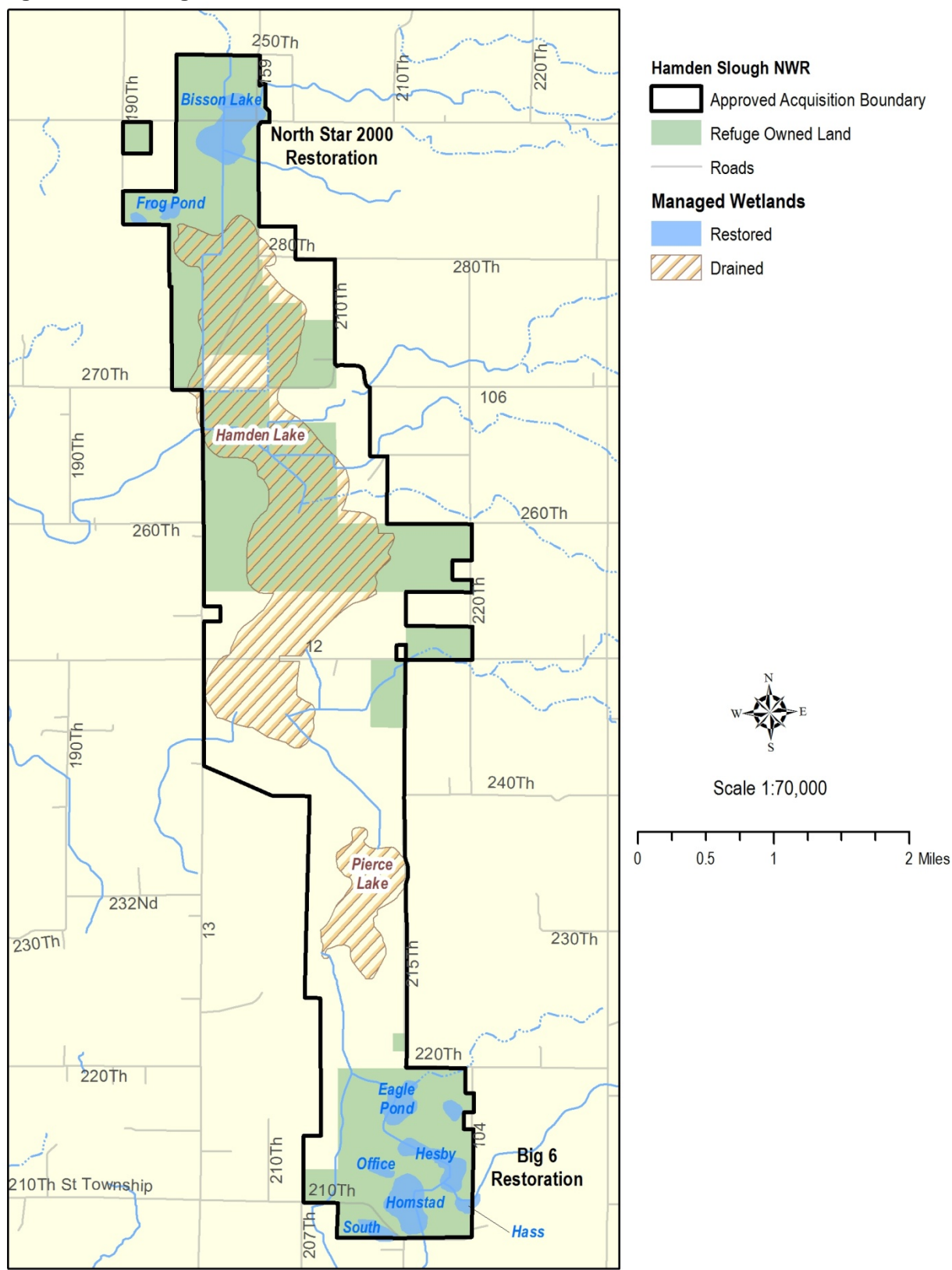
Figure 3-22: North Star 2000 Wetland Restoration



The goal of North Star 2000, the flagship project of DU at the time, was to restore 220 wetlands and 965 upland acres on the Refuge and surrounding state and federal lands by the close of the millennium. The project centerpiece was restoration of Bisson Lake, a 112-acre permanent wetland on the northern end of the Refuge (figure 3-22), along with two semi-permanent wetlands known as Frog Pond East and West (approximately six acres each). All three had been drained by construction of Ditch 15 and its laterals. However, prior to restoration, during spring melt when ice blocked the ditches, water pooled in the drained basin and attracted thousands of migrating waterfowl, which illustrated Bisson Lake's importance.

The *partial* restoration of Bisson Lake was completed in 2000. Historically, the water backed farther northwest and southeast into marsh, pothole wetlands, and edge habitats. If the complex was restored fully, the water would not only impact the adjacent private land, but would also overtop Becker County Highway 14. Currently, the Service has agreed to hold the water at a reduced "full" pool, with water only partially covering the historic lake-portion of the wetland complex to avoid impacts to the county road base. A flood easement was acquired from the landowner east of Bisson to allow saturation when managed at full service level or full pool. In addition to DU, other Partners that contributed to the restoration of Bisson Lake and associated habitat were the BRRWD, the Red River Water Management Board, the Minnesota DNR, and the National Fish and Wildlife Foundation.

Figure 3-23: Managed Wetlands



Two significant water bodies within the approved Refuge boundary remain drained today: Hamden Lake and Pierce Lake (figure 3-23). The original land survey maps describe the area as being open prairie with abundant wetlands and lakes, including a large “impassable marsh” named Hamden Lake. The size of Hamden Lake, which included both open water and marsh habitat, is estimated to be more than 1,500 acres or one-quarter of the entire Refuge after complete acquisition. Hamden Lake was known for an abundance of waterbirds during pre-settlement and early settlement times (see Donald P. Larson’s account, earlier in this chapter under “Before European Settlement”). The Service owns the majority of the lake; however, key portions needed for complete restoration are still in private ownership. Pierce Lake currently is under private ownership and when restored, is estimated to be nearly 200 acres. Pierce Lake lies southeast of Hamden Lake and must be restored first due to the connection between the two water bodies. If Hamden Lake were restored first, water would back into Pierce Lake preventing restoration. With the restoration of both these lakes, Hamden Slough NWR could once again serve as a major breeding and stopover area for thousands of waterbirds, rivaling its pre-settlement state.



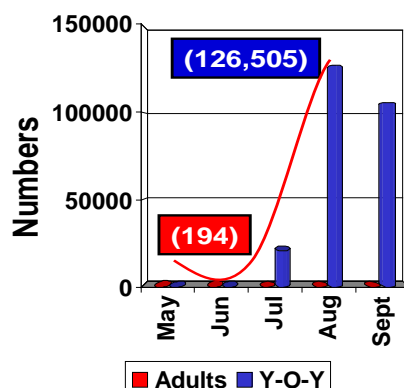
Cattail ring around Hesby Wetland

An annual water level management plan is developed based on the previous year’s climate, emergent vegetation cover, extent of hybrid cattail or other invasive species, and wildlife needs. However, because water levels can fluctuate depending on precipitation and other unforeseen events (i.e., beaver dam, structure damage, etc.), the management plan is flexible. Currently, most management is conducted to benefit migrating and breeding waterfowl and shorebirds, but human benefits are also considered. In late winter/early spring when ice conditions allow, most wetlands are drawn down to collect spring runoff. Water levels may be held high for a period of time to help alleviate downstream

flooding. Water levels are typically drawn down again to provide mudflats for shorebirds during spring migration. Levels are brought back up again at the end of shorebird migration for quality waterfowl breeding and brood habitat. Some levels may be dropped again in late summer for shorebirds on their way back south. Some wetlands are kept fairly high overwinter to benefit species that depend on substantial water levels to survive through the winter, while others are kept at a lower level to protect roadsides through the frost-thaw cycle in early spring. Although water level management occurs annually, different wetlands receive different treatments depending on desired outcomes.

Emergent vegetation is important to wetland productivity, providing cover for many wetland-dependent birds, habitat for invertebrates, and a critical food source for many bird species. Many Refuge wetlands have either too much or too little emergent vegetation. Water levels are sometimes dropped to expose soil and promote seed germination of emergent plants such as sedges, cattail, and rushes. The highest waterfowl breeding pair density and species diversity is found in wetlands under the hemi-marsh conditions (Kaminski and Prince, 1981; Murkin et al., 1982). Hybrid cattail, an aggressive invasive emergent, forms dense stands when conditions are right and can become established during drawdowns. In addition, when wetlands are in the “lake marsh phase” for prolonged periods of time, cattail will also form around the wetland edge.

Most vegetation management on the Refuge is to reduce stands of hybrid cattail. Water level management to control cattails usually is done in conjunction with mechanical treatment. When cattail stands become too widespread and dense, water typically is drawn down in fall after migration and the cattail is cut over the ice. Water is held at full service level the following year to drown out the cut cattail and new shoots. Where water level management is limited (e.g., Bisson Lake), aquatic application of glyphosate has been used to control cattail advances.

Figure 3-24: Fathead Minnow Fecundity Rates

From Payer and Scalet, 1978

Invasive fish species, such as fathead minnows (*Pimephales promelas*), brook sticklebacks (*Culaea inconstans*) and roughfish, are another potential problem in Refuge wetlands. Fathead minnows seem to be of most concern because they have a very high fecundity (reproduction) rate (Payer and Scalet, 1979) (figure 3-24) and compete with ducklings and other wetland-dependent wildlife for invertebrate foods. Often, due to high rain events, minnows actually can travel overland from wetland to wetland in water sheetflow. As a means of getting rid of baitfish, minnows also are dumped into wetlands that are easily accessible from roads. In addition, with consolidated drainage via surface ditches or tile, minnows have the ability to move from smaller to larger water bodies with little problem. Water level management is used quite often to rid a basin of invasive fish by drying out the wetland in summer or creating anoxic (no oxygen) conditions in the winter. Complete drawdown of wetlands has occurred on Hamden Slough NWR in the past for invasive species control and to mimic the wet-dry cycle.

However, this strategy is currently not considered in the annual water management plans.

Refuge pothole wetlands receive little, if any, direct management because they lack water control structures. Instead, pothole wetlands rely on nature to determine the wetland phase and thus, the amount of water and wetland vegetation species and distribution. Many wetlands on the Refuge currently contain open water surrounded by a ring of cattail (lake phase), possibly due to a combination of factors including consolidated drainage and the recent 15-year wet cycle. One way to indirectly manage pothole wetland vegetation is through management of the adjacent uplands using grazing, haying, or prescribed fire. Whether the wetlands receive that disturbance or not depends on factors such as soil moisture, amount of standing water, and time of year.

Upland Restoration and Management

Restoration

Only 20 acres of remnant tallgrass prairie exist on the Refuge in small, fragmented pieces; most locations are unknown to current staff. The majority of the land acquired had been previously farmed and was in need of restoration. The cooperative farming program was initiated to involve area farmers in the restoration process while also raising a cash crop; it is still used today to prepare the seedbed for planting. Beginning in 1991, Refuge uplands were restored to a mix of warm and cool season grasses, including non-native species, often using seed from an area other than northwest Minnesota. Seed typically was drilled into soybean stubble in the spring. But as restoration knowledge advanced, so did the restoration methods. Diversity of the seed mixes increased, with a stronger emphasis on using forbs (wildflowers) and obtaining local ecotype seed.



Snow seeding

Local ecotype, or local origin of the seed, is critical for upland restorations to withstand natural conditions, ward off disease or other threats, and provide food sources for wildlife. Wildflower starter sites, where forb seed was hand-broadcast over a grass-dominated stand, were planted to increase diversity of select areas and use as harvest sites. In 2000, a new technique called “snow seeding” was tested.

The mix of native grasses and forbs was broadcast over the snow in late winter, taking advantage of the freeze-thaw cycle. Nearly 1,500 acres of grasslands have been restored on Hamden Slough NWR (table 3-4).

Table 3-4: Grassland Restoration

Year	Grassland Restoration
1992	39 acres drill-seeded with grass (native and non-native); 2 acres broadcast seeded over the snow
1993	35 acres drill-seeded with grass (native and non-native)
1996	153 acres drill-seeded with grass (native and non-native)
1997	76 acres drill-seeded with grass (native and non-native)
1998	362.5 acres drill-seeded with grass (native and non-native); 31- ¼ acre wildflower sites were over seeded with forbs
1999	188 acres drill-seeded with grass (native and non-native); 15 of those acres over seeded with forbs
2000	106.7 acres broadcast-seeded with diverse mix (in collaboration w/DLWMD)
2001	145.6 acres broadcast-seeded with diverse mix (in collaboration w/DLWMD); 15-¼ acre wildflower sites were over seeded with forbs
2002	147.5 acres seeded with diverse mix (in collaboration w/DLWMD)
2005	45 acres seeded with native grass; 9 of those acres over seeded with forbs
2008	45 acres broadcast-seeded with diverse mix (under mgmt. of DLWMD)
2010	36 acres broadcast-seeded with diverse mix (under mgmt. of DLWMD)
2011	33 acres broadcast-seeded with diverse mix (under mgmt. of DLWMD)
2012	50 acres broadcast-seeded with diverse mix (under mgmt. of DLWMD)

DLWMD = Detroit Lakes Wetland Management District

Invasive plants are probably the biggest threat to the uplands of Hamden Slough NWR. Currently, a host of invasive plants can be found at varying levels across the entire Refuge. Canada thistle (*Cirsium arvense*) and plumeless thistle (*Carduus acanthoides*) typically are present only in young restorations and rarely pose a threat to the long-term quality of the uplands, although they are visible, easy to identify, and culturally the most-hated group of weeds to the agricultural community. Crown vetch (*Securigera varia*), wild parsnip (*Pastinaca sativa*), and common tansy (*Tanacetum vulgare*) are of greatest concern to District staff. Three qualities make them a real threat: they are prolific seeders, have a long-lasting seedbank, and are easily moved around by mowing or other means.

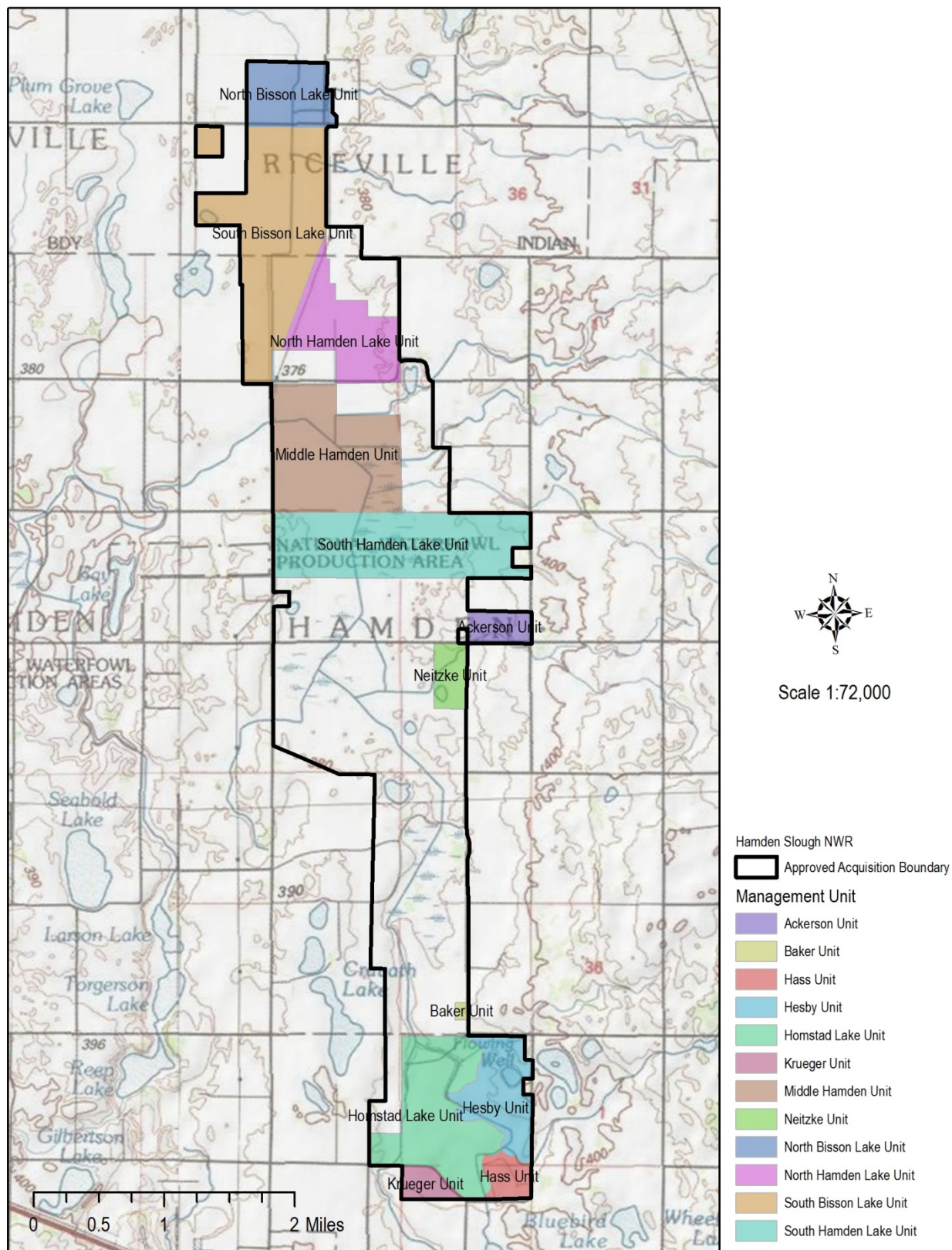
Usually, these are the only invasive plants that are controlled with herbicides. Other invasive species found on the Refuge to a lesser extent include purple loosestrife (*Lythrum salicaria*) and leafy spurge (*Euphorbia esula*). Both are monitored and treated either by hand-pulling or with biological controls as needed. Reed canarygrass (*Phalaris arundinacea*) is found primarily in the Hamden Lake bottom. It is aggressive and forms monocultures, offering little habitat to wildlife seeking structural diversity. Smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*) are common in Refuge uplands but are not seen as an immediate threat. Proper upland (and lake) restoration and management should keep reed canarygrass, smooth brome, and Kentucky bluegrass in check.

Management Tools

Prescribed Fire

Fire is probably the most widely used and critical tool for tallgrass prairie management. As with herbivore grazing, tallgrass prairie evolved and adapted with fire. The Refuge is divided into different management units (figure 3-25), and those management units may be broken down further depending on specific management needs such as burning. In general, burn units are on a five-year rotation (used by Detroit Lakes WMD staff), although depending on the specific state of the vegetation (i.e., encroachment of trees, etc.), the rotation may be hastened.

Figure 3-25: Management Units



Traditionally, prescribed burning in the tallgrass prairie by managers occurs in mid-spring when resources (people, funds) are more available. However, it is suspected continual early spring burning may favor warm season grasses and forbs, while edging out cool-season grasses and early-emerging forbs. This is not a factor on Hamden Slough NWR due to the lack of native cool season grasses and forbs. As areas on Hamden are diversified with a wider range of native vegetation, burning at times other than the spring should be considered. The Detroit Lakes WMD staff is beginning to experiment with more late summer and fall burns, along with related monitoring.



Prescribed fire for tallgrass prairie management

Grazing

Grazing with cattle was used during the early years of the Refuge to emulate historical grazing by bison and elk prior to European settlement. Grazing not only gave Refuge staff another upland management option, it also demonstrated the willingness of the Refuge to work with local landowners. Usually, these landowners owned land within or next to the designated Refuge boundary and wanted to work with Refuge staff. The grazed uplands usually were of lower quality, dominated by invasive cool season grasses such as reed canarygrass, Kentucky bluegrass and smooth brome; and were primarily located in that portion of the Refuge within the drained Hamden lakebed. As time passed, producers stopped grazing, potentially due to the rising commodity crop market. Grazing on the Refuge diminished and other management tools took its place. The last grazing permit on Hamden Slough NWR was issued in 2000. The reintroduction of cattle grazing on Hamden Slough NWR will be explored with the implementation of this CCP.

Haying

Haying was a traditional economic use when the Refuge was established. Today, about 100 acres of the Hamden lakebed are still hayed in late summer to provide lek habitat for greater prairie-chickens and to simulate wet meadow habitat attractive to birds such as the marbled godwit and common snipe. Western meadowlarks and short-eared owls have also been observed in the hayed portion of Hamden Lake. Varying the haying regime and integrating it with other management tools, including prescribed fire and grazing, could increase the diversity of native plants and provide the habitat structure needed by a suite of breeding grassland birds throughout the Refuge.



Lek habitat for Greater Prairie-Chickens

Farming

Many tracts purchased during the initial establishment of the Refuge were in agricultural production and in need of restoration. Most of the uplands were planted to permanent grass cover, while a small percentage remained in agricultural production. These farmed units were planted to "lure crops" by the Service in hopes of enticing waterfowl to feed in these areas as opposed to the private farmlands surrounding the Refuge. Over the years, these food plots have been farmed to either corn or soybeans. There has been no documentation as to whether or not these plots are being used by waterfowl or neighboring private crops are being depredated. Today, there is a permit available for private landowners with depredation complaints to "take" Canada geese. This permitted "take" coupled with the fragmentation of the south unit supersedes the necessity for maintaining the food plots.

Today, acquired land is converted from row crops to a diverse mix of local ecotype tallgrass prairie vegetation using cooperative farming and following recent Regional guidance. This guidance states that genetically modified organisms can be used for restoration purposes but for no more than five years. Typically, the seedbed is prepared by farming the area with Roundup Ready® corn and soybeans in alternate years; ensuring the final crop year prior to restoration is planted in soybeans. Using Roundup Ready® crops safeguards the fields from significant broadleaf weed infestation with minimal chemical carryover, resulting in successful prairie vegetation establishment. Fields are planted within five years of acquisition based on seed availability, resources, weather, and other factors.

Mowing

Mowing as a prairie management tool is only used if there is a weed complaint on new prairie restorations. If a weed complaint is voiced and no resolution is made, the unsightly vegetation (usually thistle, *Cirsium spp.*) is removed by mowing (hand-clipping if the area is small). Otherwise, the native grasses and forbs are allowed to become established and out-compete the unsightly weeds, producing a healthier, more diverse native prairie.

Tree Removal

Tree removal is a critical tool used today in grassland management. Since European settlement, the number of trees (native and non-native) on the landscape has increased dramatically due to factors such as fire suppression, wildlife plantings, and shelterbelt establishment. Trees out-compete prairie forbs and grasses for the necessary light, water, nutrients, and space needed to flourish. Tree encroachment fragments the grassland landscape, decreasing its suitability for area-sensitive grassland birds. Areas of trees also provide predator lanes for some mammals and perch sites for avian predators and parasites. Tree removal will be a continuing practice on the Refuge to ensure longevity of tallgrass prairie vegetation and improve habitat for grassland nesting birds and other prairie-obligate wildlife. High voltage power lines on the Refuge also provide predator perches, so removal or burial of power lines, while costly, is desirable over the long term.

Partners for Fish and Wildlife Program

The Partners for Fish and Wildlife Program provides technical and financial assistance to willing landowners wanting to restore and/or manage prairie wetland habitats within the Hamden watershed and beyond. Currently, working with partners and landowners to improve watershed sustainability occurs mostly in an opportunistic manner. The number of projects since Refuge establishment is minimal. Potential benefits of private lands habitat improvements within the watershed include preserving wildlife species for future generations, helping recover endangered or threatened species, improving quality of life, enhancing recreational opportunities, providing flood reduction, and recharging local and regional groundwater (FWS, 2005).

Research and Monitoring

Monitoring and research has always been a focus at Hamden Slough NWR. Collaborations with local universities, other government agencies, conservation organizations, and others have provided important information to support and strengthen the case for conserving prairie-wetland habitat and the benefit it provides to both wildlife and people.

Research

Seepage Analysis of Bisson Lake

During the mid-1990s, many landowners voiced concerns about potential seepage and flooding of nearby private land as a consequence of the proposed Bisson Lake restoration. Because of potential impacts to local farming economy near the Refuge, the BRRWD was hesitant to approve permits for the North Star 2000 project, which involved the restoration of 130 wetlands including Bisson Lake. The Service submitted a Challenge Cost Share Grant, partnered with BRRWD and the Red River Water Management Board, for the analysis. The grant was funded and the seepage analysis was conducted by North Dakota State University Soil Science Professor Jim Richardson from 1996–1999. A summary of findings included that groundwater moves into Bisson Lake, not out of it, and moves south to the Hamden Lake basin.

Where the potential of water movement to private land existed (northeast side), easements were already in place.

Simulation of Runoff and Wetland Storage in the Hamden and Lonetree Watershed Sites within the Red River of the North Basin

After the 1997 flooding of the Red River Valley, U.S. Geological Survey (USGS) began investigating sites to explore the potential increase or decrease of flood effects due to wetland restoration. The seepage analysis conducted from 1996–1999 sparked the interest of USGS and the National Soils Lab in groundwater movement. Bisson Lake was selected as one of the study sites in 1998 to examine precipitation and storage capacity of wetlands. All factors affecting water movement into and out of Bisson Lake including light reflection, sublimation, and transpiration, were closely monitored. The four-year study, published in 2004, concluded that: 1) peak streamflows during a flood can be reduced 1–6 percent with a restored wetland; 2) soils of the Hamden site stored as much water as the wetlands; and 3) soil management practices in combination with water storage practices may result in reduced waterflow from wetlands during large precipitation and snowmelt events.

Soil and Water Phosphorous Interaction in Restored Wetland Landscapes of Western Minnesota

Soil sampling and mapping were conducted as part of a North Dakota State University Ph.D. research project to investigate changes in soils as related to wetland restoration. The research suggests that runoff containing fertilizers and sediments causes an increased collection of phosphorous in wetlands. As a result, normal aquatic vegetation establishment is disrupted and the consequence is a monotypic stand of hybrid cattail. The study was finalized and published in 2005.

Refuge Cooperative Research Program (RCRP) Impoundment Study

From 2005–2007, the Refuge participated in a joint FWS/USGS study to monitor the effects of drawdowns on waterbird and waterfowl use during spring and fall as part of the RCRP. Participants were provided with a drawdown prescription and monitoring protocol to follow during the three-year study. Field work involved weekly survey of waterbirds and waterfowl, weekly activity surveys of four waterbird guilds, waterbird flushing counts, water and invertebrate sampling, vegetation sampling, water level management, depth readings, and vegetation manipulation. A cooperative agreement with Concordia College (Moorhead, MN) was signed to help carry out all the field activities. Although preliminary results were shared, further data analysis was recommended. We are still awaiting the final results and recommendations.

Fish, Invertebrate and Waterfowl Numbers on Hamden Slough NWR and Adjacent Anderson WPA

Fish, especially fathead minnows (*Pimephales promelas*), have become an increasing detriment to the health of northwestern Minnesota wetlands, and in turn, may impact waterfowl use. Students from Concordia College (Moorhead, MN) conducted waterfowl surveys on Hamden Slough NWR (2007–08) and Anderson WPA (2008) from spring to fall migration. On those same study wetlands, both invertebrate and fish were sampled and analyses run. Preliminary conclusions support that wetlands with less or no fish had higher numbers of invertebrates and duck use, although future research may be prompted.

Avian Influenza Monitoring

During July and August of 2006, Bisson Lake was one of many sites sampled for a USDA nationwide study exploring avian influenza (AI) in shorebirds. The goal was to collect cloacal samples from 200 shorebirds in every state; a total of 193 shorebirds from nine species were sampled at Bisson Lake. The project was coordinated by Pete Sahr, USDA Animal and Plant Health Inspection Service-Wildlife Services. Mist-netting was conducted by Dr. Greg Hoch and student volunteers from Concordia College, Moorhead, MN. All samples were sent to Vet Med Diagnostics Laboratory in St. Paul, MN. None of the shorebirds collected from Bisson Lake tested positive for AI.

Secretive Marshbird Surveys

From 2003–2005, the Refuge was the site for marshbird survey protocol trials developed by Dr. Courtney Conway, USGS-Biological Resources Division, University of Arizona. Dr. Conway believes that marshbirds are considered indicator species, because they consume a wide variety of invertebrates, another indicator of wetland health. Their presence could, therefore, be a measure for wetland quality and

restoration success. Contractor Sherri Norland conducted the marshbird surveys during the trial on Hamden Slough NWR.

Monitoring

Over the years, although not strongly linked with research, regular monitoring of bird populations existed on Hamden Slough NWR. From spring to fall migration and beyond, wetland birds especially were monitored for time of arrival, departure, and breeding, if possible. This was due to their obvious visibility on Refuge wetlands. The regular monitoring of Refuge wetlands led to the discovery of nesting American avocets and visits by common moorhens and a piping plover.

A more structured approach was used for grassland bird monitoring, because they are more difficult to detect. Point counts, a common way to estimate breeding grassland bird pairs, were conducted from 1994–1996. During the three years of point counts, 45 species (including incidentals) were detected at 34

points. Again in 2009, point counts were conducted in three different grassland habitat types: mowed reed canarygrass, standing reed canarygrass, and restored tallgrass prairie. During the season, 561 birds of 31 species were detected. Although species richness among habitat types was generally the same, the greatest abundance of birds was found using the tallgrass prairie. However, a more unique guild of birds associated with shorter vegetation was observed in the mowed area including upland sandpipers, field sparrows, greater prairie-chickens and marbled godwits. These birds were not found in the other two habitat types due to the taller, dense vegetation.



Nesting American Avocets

Today, monitoring daily bird use of the Refuge is more difficult because no staff is located onsite. Fortunately, two Refuge volunteers conduct weekly roadside bird surveys from ice-out to freeze-up every year. Although Refuge-managed wetlands are the focus of the surveys, all incidental birds are recorded, which gives staff valuable information on arrival of species and areas of use. In addition, staff maintains and checks eight nest baskets on or near the Refuge annually. A duck banding program in conjunction with Tamarac NWR began in 1998. Since the onset of the program, 1,599 ducks have been banded; 1,444 were mallards (*Anas platyrhynchos*). The majority of banded ducks have been recovered along the Mississippi flyway in states such as Iowa, Missouri, Arkansas, Mississippi, and Louisiana.

Information is lacking as to the extent of vegetation monitoring of Refuge habitat while the Refuge was staffed. Monitoring of Refuge habitat will be a focus when this CCP is implemented.

Visitor Services

Offering programs for visitors is a way to connect people with nature at Hamden Slough NWR. By participating in these programs, people will learn how the integrity of the prairie-wetland landscape is relevant in their daily lives, enjoy the abundance of wild places and things around them, and deepen their personal connections to the natural world.

Hunting

Hunting programs on the Refuge are relatively new. Muzzleloader deer hunting began during the winter of 2008 on all Refuge fee lands. This option allows for a quality deer hunt while helping maintain the white-tailed deer population on and adjacent to the Refuge (FWS, 2007). The muzzleloader season occurs in late winter after the waterfowl migration, thus limiting any disturbance.



Mentored youth hunt on the Refuge

The sport of waterfowl hunting is declining in not only Minnesota but throughout the United States. To encourage youth interest in hunting, the Minnesota DNR selects one day each year during which any Minnesota youth, age 15 or younger, can participate in a quality hunt when accompanied by a non-hunting adult. The youth waterfowl hunt on Hamden Slough NWR was established under the same hunting plan as the deer hunt (FWS, 2007) but opened a year later in 2009. The Refuge youth hunt is open only in Audubon and Riceville Townships, which is approximately 60 percent of the Refuge, to reduce wildlife disturbance and maintain 40 percent of the land and water as sanctuary. The Service partners with DU

and the Minnesota DNR to sponsor a mentored youth hunt on the Refuge, a more formalized program to introduce youth to the sport of waterfowl hunting.

On Refuge lands within the White Earth Reservation (Sections 27 & 35 of Riceville Township), legal hunting (and other uses) is not bound by Refuge seasons or state or federal regulations. Hunting is allowed by tribe members in accordance with Tribal regulations.

Wildlife Observation and Photography

Wildlife observation and photography are favorite pastimes at Hamden Slough NWR. Although roadways fragment habitat and create dangerous places for wildlife, they also allow for easy viewing of the area's natural resources. Many roads intersect the Refuge. On the south end, Becker County Road 104/144 runs alongside most of the Big 6 wetlands, allowing for great views of wildlife on the water. On the north end of the Refuge, staff worked with Becker County to widen and slope Becker County Highway 14 to allow easy pullover access for viewing Bisson Lake during spring and fall migrations. This is also a favorite stop on the annual Hamden Slough NWR field trip as part of the Detroit Lakes Festival of Birds (figure 3-26).

In addition to roadsides, there are two locations that provide great viewing and photography opportunities. On the south end of the Refuge, the Hesby Memorial Trail and overlook offers a short, accessible walk through a restored prairie ending with a breathtaking view of Hesby wetland and beyond. To the north, a prairie-chicken lek is located in the hayed portion of the drained Hamden lakebed, off County Road 113 and County Highway 13. Each spring, male prairie-chickens dance on the lek, booming to attract females for breeding. Observation from the road is possible, but the Service places a viewing blind on the lek for people to reserve and observe the spectacle up close. Although there are no established photography blinds on Hamden Slough NWR, great opportunities for wildlife photography are possible along roadsides and above-mentioned structures.



Great views of wildlife on the water



Environmental Education and Interpretation

Currently, the Refuge does not have a formal environmental education program due to lack of trained, available staff. On request, District staff or volunteers may work with educators and other leaders to present programs at local schools and organizations. Expansion of environmental education opportunities at Hamden Slough NWR is a high priority in the coming years.



Learning at the Refuge

Recently, the “Prairie-Chicken Cam” project was initiated to help connect children to the natural world of Hamden Slough NWR. First, a live webcam was mounted on the blind at the prairie-chicken lek to record and display breeding behavior on an updated version of the Hamden website. Although technical issues still require resolution, the goal is to “stream” the video to the website for live viewing. Second, a spring prairie curriculum, centered on the prairie-chicken, was developed for 4th grade students. This curriculum can be used in conjunction with the webcam. Finally, an updated Prairie Trunk, funded by the Minnesota Prairie Chicken Society, was developed for educators to use with the prairie curriculum or as a stand-alone aid in teaching about prairie ecology.

To further environmental education opportunities at Hamden Slough NWR, the Service staff worked with multiple partners to construct and furnish an environmental education building at the headquarters area. This shelter will expose local school children to the prairie-wetland setting by incorporating the ecology of the area into the STEM (Science, Technology, Engineering, and Mathematics) curriculum.

District staff, partners, and volunteers will work with area educators to expand the current curriculum to meet the needs of the local school districts.

Interpretation at the Refuge is minimal due to lack of staff. Currently, no formal Refuge brochure exists; only a bird list and informational leaflet are available. One kiosk and one interpretive panel are at the old headquarters area, and one interpretive panel is near the prairie-chicken lek. Prairie Fun Day, an annual public event celebrating prairie-wetland habitats, was held at Hamden Slough NWR in 2010 and 2011. Finally, an interpretive program is held in conjunction with the mentored youth waterfowl hunt at the Refuge.



Environmental education building

Friends Group and Volunteers

The Refuge always has relied on volunteers to help sustain the biological and visitor services programs. In the past, volunteers helped clean up building sites, greet visitors, and assist with management and maintenance activities. Today, volunteers continue to assist with weekly roadside bird surveys, habitat restoration and management activities, maintenance of equipment, cleaning of duck nest baskets, and more. Finally, volunteers are integral to the continuation of the Prairie-Chicken Cam and related projects. In all, volunteers contribute approximately 75 hours annually.



Hamden Slough NWR is served by Friends of the Detroit Lakes WMD. The Friends group was organized in 2003 and only just began to expand their activities to include the Refuge. Currently, the Friends group sponsors and assists with two events on the Refuge: Prairie Fun Day and the mentored youth waterfowl hunt. In addition, the Friends group participates in the Detroit Lakes Festival of Birds to help increase awareness of Hamden Slough NWR and the Detroit Lakes WMD.

Outreach and Partnerships

The current level of outreach for Hamden Slough NWR is limited and dictated by available staff time. The primary method of outreach is submission of new releases to local and regional papers to promote special events or to provide Refuge-specific information. In addition, District staff, volunteers, or Friends group members may appear on the local-access TV channel or present information for local radio stations, but that is dependent on staff time as well. Refuge volunteers participate each year in a variety of events such as parades, fairs, and more in order to bring awareness of the Refuge and District to local communities.

Partners continue to play a critical role in the function of Hamden Slough NWR. These partnerships allow opportunities to accomplish goals that any one organization could not achieve alone. The Service works with a wide variety of partners including but not limited to: Red River Basin Commission, Buffalo-Red River Watershed District, Minnesota DNR, White Earth Band, Ducks Unlimited, Isaac Walton League, Safari Club International, Minnesota Prairie Chicken Society, Lakes Area Birding Club, and more. Many of these partners were instrumental in the initial establishment and restoration of the Refuge.

Administration

In late 2006, the decision was made to combine the staff and management of Hamden Slough NWR with the Detroit Lakes WMD. Although Refuge staff was moved to the WMD office, some buildings such as the old Refuge office, garage, and equipment shed still exist. Plans are to demolish the old office building and garage in the very near future. Because the staff was moved, there are no Refuge points of contact for visitors to Hamden Slough NWR. All staff is located roughly ten miles from the Refuge, which can be an inconvenience to visitors who have questions or need information. Therefore, an environmental education classroom was constructed onsite at the Refuge headquarters area with the help from many partners. This will serve, in part, as a contact station for visitors, as well as an educational classroom for students, groups, and other organizations. Ultimately, the goal is for volunteers to serve the role as contact for Refuge visitors and education building users.



Old headquarters

Law Enforcement

Law enforcement officers at Hamden Slough NWR help the public understand and obey the laws that protect our natural resources. They work closely with state, tribal, and local government offices to enforce federal and state hunting regulations that protect numerous wildlife and plant species from unlawful take or destruction.

Easements

There is currently one private easement totaling 24 acres that borders the east side of the North Bisson Unit. It is a flowage and wetland easement that allows for manipulation of water levels on the north end of the Refuge without objection or retaliatory action by the owner. The flowage and wetland easement is perpetual.

Chapter 4: Future Management Direction

In this chapter:

[4.1 Introduction](#)

[4.2 Goals, Objectives, Strategies, and Rationales](#)

4.1 Introduction

The Environmental Assessment in appendix A describes and analyzes three management alternatives for Hamden Slough National Wildlife Refuge (NWR, Refuge). The U.S. Wildlife Service (FWS, Service) identifies one as its preferred alternative, and it is described in this chapter as the proposed management direction defined by a series of goals, objectives, and strategies.

Goals are broad descriptive statements of desired future conditions. There are two goals for Hamden Slough NWR. 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 Service intends to meet these objectives within the next 15 years.

4.2 Goals, Objectives, Strategies, and Rationales

Wildlife and Habitat

Goal: Habitats on Hamden Slough NWR will be restored, protected, and actively managed to provide a diversity of native wetland and grassland habitats. These efforts will be further leveraged by partnerships and conservation actions outside the Refuge, resulting in a resilient and balanced landscape, meeting the needs of migratory birds, threatened and endangered species, and other wildlife in an uncertain future.

Wetlands

Objective 1-1: Prairie Pothole Wetlands Inventory

Within three years, conduct a baseline inventory of all prairie pothole wetlands within the Refuge acquisition boundary to guide future restoration.

Strategies

- Locate and mark boundaries of all prairie pothole wetlands using aerial photos, maps, soils data, wetland inventories, and field reconnaissance.
- Evaluate the physical and biological condition of each previously restored pothole. Record if drainage ditches need fill or other maintenance is necessary to maintain hydrologic functionality. Inventory vegetation communities. Note wildlife use. Create a GIS layer with associated attributes of all restored pothole wetlands in the Refuge Lands Geographic Information System (RLGIS) database.
- Develop a long-term monitoring plan for all Refuge wetlands to continue evaluation beyond the life of this Comprehensive Conservation Plan (CCP).

Rationale

Approximately 85 percent of Minnesota's prairie pothole wetlands have been drained (Johnson et al., 2008) and the trend continues today as subsurface tile drainage systems improve. The result has been loss of native plant communities, wildlife habitat, and other benefits such as water storage and groundwater recharge. Wetland restoration is a high priority on Hamden Slough NWR.

The exact number of historical pothole wetlands on the Refuge is not known, although more than 200 have undergone at least partial restoration by plugging of ditches or removal of accumulated sediment. Approximately 40 pothole wetlands remain to be restored on acquired Refuge lands. Their general location is known, but more specific information is needed on wetland boundaries, basin size, soil types, historic hydrologic regime, etc. in order to restore the appropriate physical and hydrological character of each wetland. Onsite reconnaissance will be used on acquired Refuge lands. Private lands within the Refuge acquisition boundary will not be visited without landowner permission.

Post-restoration observations initially indicated high use of prairie pothole wetlands by waterfowl and other wetland-dependent wildlife, as well as healthy vegetation communities. Very little information has been collected in recent years. With fast-paced agricultural practices on surrounding private lands, such as consolidated drainage and the use of highly evolved pesticides for crop production, it is imperative to inventory the current state of these wetlands. Impacts could include alterations in wetland hydrology (e.g., increased water depth/lack of drying), domination by invasive species such as hybrid cattail or fathead minnows, and increased sediment loads from runoff, to name a few. All of these impacts could have drastic effects on the quality of wetland habitat, reducing overall suitability for Refuge resources of concern. Long-term monitoring is crucial in tracking wetland condition in response to management, outside threats, and climate change.

Objective 1-2: Prairie Pothole Wetlands Restoration

Within 15 years, restore all prairie pothole wetlands on acquired Refuge lands to their natural hydrology and historical type.

Strategies

- On drained wetlands, determine watershed size and note hydrologic connections to other wetlands. Estimate sediment accumulation in each basin. Classify each wetland according to type. Restore inflow, outflow, and topography using ditch fills and sediment removal (when appropriate). If found, break/remove drainage tile.
- On existing wetlands, fully restore topography using ditch fills.
- Seed ditch fills to appropriate native prairie vegetation.

Rationale

Wetlands on Hamden Slough NWR were driven primarily by seasonal and annual water inputs from the surrounding watershed and some discharge from groundwater (Heitmeyer et al., 2012). They ranged from small, temporary, and seasonal types to larger semi-permanent or permanent types. Concentric bands of vegetation were present in each wetland depending on depth and degree of water permanence. Small shallow potholes often have only wet meadow and some seasonal herbaceous plant species, while larger and deeper potholes (and relict lakes) typically have the full range of vegetation communities including open water, persistent emergent, seasonal herbaceous, and wet meadow associations. Given dynamic seasonal and interannual precipitation, it is likely that wetland types and extent of vegetation varied among years (Heitmeyer et al., 2012). Detailed descriptions of vegetation associations, vegetation cycles, and hydrologic regimes characteristic of each prairie pothole wetland type are included in chapter 3.

Most, if not all, pothole wetlands needing restoration on the Refuge are temporary or seasonal. Both wetland types are critical for breeding waterfowl, migratory shorebirds, locally breeding amphibians, and other wetland wildlife (Heitmeyer, et al., 2012). They are found in high densities across the landscape and warm up early, providing an abundance of protein-rich invertebrates. Because of these characteristics, temporary and seasonal wetlands are very attractive to breeding waterfowl such as blue-winged teal and mallards, and they are often referred to as “pair ponds.” Temporary wetlands, however, are very short-lived and highly dependent on localized precipitation. Typically, they last a few days to a few weeks. Seasonal wetlands, on the other hand, provide the highest quality habitat for breeding waterfowl during years of average to above-average water conditions (Kantrud and Stewart, 1977) due to water retention throughout much of the growing season. Once temporary and seasonal wetlands go dry, birds and

mammals consume seed from annual plants, while residual vegetation affords great cover for a multitude of species.

Emulating natural water regimes and topography in pothole wetlands will improve waterflow patterns and establishment of diverse wetland vegetation, resulting in long-term sustainability of habitats that meet the varied life-cycle needs of waterfowl and other wetland-dependent wildlife. In addition to providing essential habitat for wildlife, fully restored wetlands will provide ecosystem benefits by storing water and reducing runoff, filtering sediment and pollutants from waters upstream, and permitting groundwater recharge.

Objective 1-3: Managed Wetlands

Develop and implement a new approach to wetland management that emphasizes sustainability by restoring the physical and hydrological character of all managed wetlands (Big 6, Bisson Lake, and Frog Ponds).

Strategies

- Ensure that all water control structures are up-to-date, functioning, and installed at optimum elevations. Install staff gauges at all outlets to allow wetland hydroperiod monitoring.
- Manage water levels for more natural seasonal and interannual water regimes and dynamics to maintain composition and distribution of native vegetation communities. Heitmeyer et al. (2012) identifies an average 10 to 12-year climate pattern of wet and dry cycles.
- Work with Becker County and FWS Regional Hydrologist to develop realistic options for fully restoring Bisson Lake, given the current constraints of Becker County Highway 14.
- Control invasive plants and fish.
- Develop a long-term monitoring plan.

Rationale

Initially, water level management at Hamden Slough NWR was active, drawing down and re-flooding the wetlands when needed for wildlife benefits. Active water level management declined due to lack of onsite staff when the Detroit Lakes Wetland Management District (WMD, District) assumed responsibility for Refuge management in the mid-2000s. Other than short-term drawdowns for shorebird migration, water levels in managed wetlands have been held high to decrease hybrid cattail. This management routine has resulted in areas of open water with little to no emergent vegetation.

Wetlands are dynamic systems. Implementing an active water level management regimen that more closely emulates historic seasonal and long-term patterns will restore natural wetland vegetation zones and provide all stages of wetland conditions for the benefit of wetland-dependent wildlife year round. Mudflats and exposed shorelines attract foraging shorebirds and loafing waterfowl. Shallow water zones with submersed vegetation provide quality foraging conditions for dabbling ducks, waterfowl broods, and wading birds alike. Overwater nesting waterfowl and other wetland-dependent birds will take advantage of emergent vegetation interspersed throughout the wetland. Deeper water affords water column foraging for diving ducks, as well as space for molting and staging waterfowl. A variety of wildlife including the sora, American bittern, sedge wren, and black tern benefit from vegetation along the wetland edges during the warmer months. Over winter, white-tailed deer, greater prairie-chickens, and other wildlife find reprieve from the cold, harsh temperatures and wind.

The Big 6 wetlands (Haas, Homstad, Office, South, Hesby, and Eagle) were restored in 1995–96; whereas, Bisson Lake and Frog Ponds were restored in 2000. All outlet elevations were agreed upon by the Refuge and the Buffalo-Red River Watershed District (BRRWD) resulting from a Cooperative Agreement signed in 1989. Currently, there is speculation that Homstad Lake could be deeper. In addition, due to impacts to Becker County Highway 14, Bisson Lake was never fully restored. Bisson and Homstad “have been partly restored with water-control and levee structures, modifying outlet and inlet drainage structures, and with some re-contouring of natural topography in Bisson Lake. Additional

restoration of Bisson and Homstad Lakes may be possible by modifying roads that impact water movement into and from the lakes, evaluating changes in weir and stoplog structures and by changes in the management of spillway elevations on Bisson Lake. These changes obviously must be carefully engineered to make sure adjacent non-Service lands are not adversely affected but with the objective of effectively managing natural water and vegetation dynamics in the relict lake basin and to reduce downstream runoff and discharge into the Ditch 15 system (Heitmeyer et al., 2012). The new elevations also must be agreed upon by the BRRWD.

Restoring the natural topography and hydrology of these managed wetlands will improve patterns of waterflow and native vegetation, resulting in a more sustainable shallow-lake/wetland system.

Objective 1-4: Relict Glacial Lakes

Restore the physical and hydrological character of Pierce Lake while continuing to work toward full restoration of Hamden Lake.

Strategies

- Acquire land from willing sellers within the Refuge boundary. Pierce Lake is the number one priority over the next 15 years; Hamden Lake is a close second.
- Strengthen partnership with BRRWD to accomplish mutual goals for restoration of Pierce and Hamden Lakes.
- Continue to coordinate conservation and restoration programs with Natural Resources Conservation Service, and other partners. Encourage use of conservation options such as easements, Partners for Fish and Wildlife Program (PFW, Partners Program) agreements, and Wetland Reserve Program on non-Service lands.
- Develop outreach plan in conjunction with partners to include project plan, information packet, and stakeholder meetings.
- Restore former lake hydrology and topography where possible without compromising drainage of the Ditch 15 system.

Rationale

Historic documents describe the area encompassed by the Hamden Slough NWR acquisition boundary as covered by numerous prairie potholes and large, impassable marshes. The location in the landscape coupled with the restored wetland complexes on Hamden Slough NWR result in attracting thousands of migratory waterfowl, shorebirds, and other waterbirds to the area every spring and fall. The drainage of Pierce and Hamden Lakes occurred with the construction of the Ditch 15 and its laterals. The extent of that drainage system changed the functionality of these lakes from water storage to a flow-through system. As drainage of larger wetlands and shallow lakes continues today, along with the deteriorating quality of those still intact, the restoration of Pierce Lake is even more critical. Restoring the physical and hydrological integrity of the relict lakes on Hamden Slough NWR will meet Refuge purposes by providing critical breeding and nesting habitat for waterfowl such as canvasbacks and ring-necked ducks, as well as foraging, loafing and staging habitat for a variety of additional waterfowl species. Other wetland-dependent birds including migratory shorebirds, foraging waterbirds, and breeding secretive marshbirds will take full advantage of the varied habitats afforded by these large, glacial lakes. In addition to meeting Refuge purposes, full lake restoration will also help restore waterflow patterns, regional water runoff and discharge regimes, and contribute to reduced flooding problems downstream in the Buffalo and Red River basins.

Currently, all of Pierce Lake and a portion of Hamden Lake are in private ownership. It is imperative, because of topography, that Pierce Lake be restored prior to Hamden Lake. The restoration of the relict lakes is dependent on the willingness of private landowners. Securing the necessary funding and partnering with organizations with similar goals will be crucial to achieving restoration. The BRRWD is one of those key partners. The mission of the BRRWD is to “alleviate flooding and to manage the water resources of the District [BRRWD] in a manner that best protects this valuable resource.” Hamden Slough

NWR lies within the Mainstem Planning Region of the BRRWD. Flood damage reduction is one of many issues identified in the Draft BRRWD Management Plan, Mainstem Region Planning Summary (Houston Engineering, Inc., 2010). There is an overall reduction goal of 33,000–34,000 acre-feet. Within the Becker County Ditch 15 subbasin, a reduction goal of 11,000–12,000 acre-feet has been set. Action items of the Mainstem Planning Region include investigating locations and developing and implementing plans for natural resource enhancement/flood damage reduction in the Hamden Lake watershed. Addressing these action items will produce multiple benefits. The BRRWD recognizes the important existing natural resources of the Hamden Slough area and takes those into consideration when selecting potential projects. Restoring these water bodies within the landscape increases habitat for wetland-dependent birds and provides ecosystem benefits due to a more hydrologically-sound wetland system.

Uplands

Objective 1-5: Uplands Inventory

Within three years, conduct a baseline vegetation inventory of all Refuge uplands (approximately 2,630 acres including Hamden lakebed) to guide future tallgrass prairie restoration and management decisions.

Strategies

- Locate and GPS specific Refuge fields using aerial photos, maps, Resource Inventory Plan (RIP) cards, and restoration plans.
- Record vegetation types. Assign prairie type (mesic or wet-mesic) according to the historic distribution of vegetation communities (table 3-1). Note wildlife use.
- Develop habitat layer in Refuge Lands Geographic Information System.
- Evaluate information to determine restoration or management needs. Combine with District restoration and management needs; prioritize within the District's Annual Work Plan (AWP).
- Develop a long-term monitoring plan for all Refuge uplands to continue evaluation beyond the life of this CCP.
- Acquire lands suitable for upland restoration from willing sellers.

Rationale

The 3,210-acre Hamden Slough NWR acts as an anchor for other conservation lands surrounding the Refuge, which are primarily Waterfowl Production Areas (WPAs). Ten WPAs totaling 2,865 acres are located within two miles of the Refuge boundary. Together, the Refuge and WPAs of the greater Hamden Slough area total just over 6,000 acres. In contrast, approximately 25,000 acres of land within two miles of the Refuge boundary are cropped, making up 60 percent or more of the land base. With fast-paced agricultural practices and high commodity crop prices, more and more acres within and surrounding the acquisition boundary are being farmed. This results in a decrease in the number of acres available for grassland-dependent wildlife, many of which are experiencing steep population declines.

Nearly 1,500 acres of uplands were planted to permanent cover on Hamden Slough NWR in the past 20 years. There are also 20 acres of remnant prairie on the Refuge. However, other than old restoration plans and maps, little if any vegetation information exists, especially from recent years. The same can be said for the surrounding WPAs. Therefore, the District will aim to start managing the Refuge and adjacent WPAs as one "system" or "complex," and this upland inventory is that start. Dominant plant communities recorded will tell whether restoration or focused management is needed. This information will be incorporated into District upland restoration and management planning. By assessing the state of the complex uplands, we will be able to accomplish a more holistic approach to providing quality nesting habitat for waterfowl and grassland-nesting birds. Long-term monitoring will be crucial in following upland conditions and use by Refuge grassland focal species and other wildlife in response to restoration and management activities, outside threats, and climate change.

Objective 1-6: Tallgrass Prairie Remnants

In conjunction with the Refuge uplands inventory (see Objective 2-1), verify and map the remaining 20 acres of remnant tallgrass prairie on the Refuge. Inventory *all* plant species possible in each remnant.

Strategies

- Locate, verify, and GPS remnant prairie parcels using RIP cards, maps, other historical information, and local knowledge.
- Visit the parcels at least three times during the course of one growing season to inventory *all* plant species taking note of non-native/invasive species and cover approximations.
- Create and maintain a GIS layer with associated attributes of all remnant prairies in the RLGIS database.

Rationale

Over 99 percent of Minnesota's tallgrass prairie has been lost to agriculture or development (Minnesota County Biological Survey, 2010). Most of the remaining prairie tracts are in small, disjointed pieces; many do not support prairie-obligate species due to their size and isolation from other prairie habitat. This is true of the remnant prairie fragments on Hamden Slough NWR. The location of most Refuge remnants is not well-documented or known by current staff. Knowing and recording the locations will provide important information for prairie restoration and management.

Remnant prairies can provide valuable information about the species composition of local native prairies and use it to develop species lists for tallgrass prairie restorations. Grasses and forbs of remnant prairies can also serve as a local seed source for tallgrass prairie restorations in localized areas. It is even possible that remnant prairie species could become established on adjacent grasslands. If managed in conjunction with diverse tallgrass prairie restorations, the total area could support some prairie-obligate species over time. Remnant prairies are irreplaceable; not only are they a part of our prairie heritage, but remnant prairies are also important in sustaining tallgrass prairie habitats for future generations.

Objective 1-7: Diversify Grasslands

Over the life of the plan, improve the floristic composition of approximately 500 acres of seeded grasslands (native and non-native cool and warm season grasses) to attain high diversity restored mesic and wet-mesic prairie. Improved sites should exhibit at least 30 species of native tallgrass prairie vegetation within ten years.

Strategies

- Use tallgrass prairie vegetation information from surveys conducted by Pemble (1995), Refuge remnant prairie inventories (see Objective 2-2) if applicable, and local knowledge to develop target mesic or wet-mesic prairie species lists.
- Verify locations and acres of seeded grasslands from Refuge Uplands Inventory (see Objective 1-1), restoration needs, and prioritization among District restorations.
- Assign prairie type (mesic or wet-mesic) according to the historic distribution of vegetation communities (table 3-1).
- Acquire appropriate local ecotype seed. Seed each area using the technique best suited for the situation.
- Record restoration information in RLGIS.

Rationale

According to Refuge documents, upland restoration from 1992–1999 consisted mainly of drill-seeding native and non-native grasses into the previously-cropped fields. Over 800 acres were seeded only to grass. This was primarily due to original guidance outlined in the Hamden Slough NWR Concept Plan (FWS, 1992), which advised seeding Refuge uplands to cool and warm season grasses. Planting fields to

strictly grass provides, for the most part, adequate nesting habitat for waterfowl. At the time, little scientifically-sound information was available on the benefits of forbs to grassland bird species, small mammals, and invertebrates. In addition, the expense of forb seed was high, given the limited budget of a small Refuge.

As time and knowledge progressed, areas were planted to local ecotype (locally native) seed containing a diverse mix of both forb and grass species. However, due to broadleaf weed control, some non-target forb species were removed via chemical use and/or intensive mowing. In order for grasslands to provide benefits for all prairie-obligate wildlife, especially grassland-nesting birds such as bobolinks and grasshopper sparrows, they should contain a high diversity of native grasses and forbs that afford the necessary structure and a sustainable food source.

Sites will be selected for diversification based on upland inventory data (see Objective 1-5) and prioritized among the WMD's Annual Work Plans. Generally, low diversity grasslands will be improved first. Another factor affecting selection and priority will be amount of non-native/invasive species present. Fields will be planted using a variety of methods, including over seeding post-burn, chemically treating, conversion using farming, and more as identified in the step-down Habitat Management Plan. Methods and timing will depend on seed availability, weather, resources, and other priorities within the District.

Objective 1-8: Conversion of Food Plots to Tallgrass Prairie

Convert 50 acres of food plots (corn and soybeans) to native tallgrass prairie vegetation within the first three years of CCP approval.

Strategies

- Continue farming food plots until resources become available (e.g., prairie seed). Ensure the field is planted to soybeans the year prior to the planned restoration.
- Use species lists developed from historic vegetation communities and remnant prairie inventories. Verify prairie type.
- Acquire appropriate local ecotype seed. Seed each area using the technique best suited for the situation.
- Record restoration information in RLGIS.

Rationale

Two issues identified during the establishment phase of Hamden Slough NWR were loss of farming income in areas planned for habitat restoration and wildlife depredation on adjacent private cropland (FWS, 1988). To alleviate this, the Refuge agreed to maintain 500 acres of conservation farming (i.e., cover crop and row crop) within the core of Hamden Slough NWR. Originally, conservation farming provided waterfowl nesting habitat in the spring, while "lure crops" attracted waterfowl to Refuge fields instead of nearby private croplands. Twenty-two years later, Refuge cooperators farm 50 acres using conventional methods for growing row crops, with no associated benefits to nesting waterfowl. Refuge cooperators are currently farming two small plots near the headquarters for conversion to tallgrass prairie vegetation.

Since Refuge establishment, there has been little documented information on the level of damage by waterfowl on neighboring crops. Also, there is no evidence waterfowl are using Refuge food plots as an alternative food source. A program to alleviate potential damage to private croplands is available to private landowners. The Service administers and the Minnesota Department of Natural Resources (DNR) issues depredation permits for lethal and non-lethal control of Canada geese to protect personal property (i.e., crops). Today, there are no reasons to maintain the food plots. They are providing no critical habitat for Refuge focal species or other resources of concern. In fact, the food plots are fragmenting upland nesting habitat on the south end. Fragmentation of grassland habitat has been associated with declines in locally breeding grassland birds (Herkert, 1994). In addition, a portion of one field is planted on "highly erodible soils," which are vulnerable to wind and water erosion that could potentially cause sediments to

flow into the shallow lakes and marshes below. Restoration of these areas to diverse native tallgrass prairie vegetation will create a contiguous piece of uplands and wetlands totaling over 800 acres.

Objective 1-9: Conversion of Cropland to Tallgrass Prairie

Convert all existing and newly acquired cropland to native tallgrass prairie vegetation—primarily mesic and wet-mesic prairie—within five years of acquisition.

Strategies

- Prepare seedbed by farming as soon as a cooperators can be found. Ensure the field is planted to soybeans the year prior to the planned restoration.
- Use species lists developed from historic vegetation communities and remnant prairie inventories.
- Acquire local ecotype seed from mesic or wet-mesic prairie species. Seed each area using the technique best suited for the situation.
- Record restoration information in RLGIS.

Rationale

The loss of available grassland habitat may be influencing regional declines in grassland bird populations in the Midwest (Herkert et al., 1996). Over 99 percent of Minnesota's tallgrass prairie has been lost to agriculture or development (Minnesota County Biological Survey, 2010) and seven out of 13 of the state's breeding grassland bird species have experienced significant declines between 1966 and 2010 (Sauer et al., 2011). Within two miles of Hamden Slough NWR, approximately 25,000 acres of land are cropped, making up 60 percent or more of the land base. In support of the Biological Integrity, Diversity, and Environmental Health policy, we should, to the best of our ability and in concert with Refuge purposes and the Service mission, restore habitats to their historic condition and mimic natural processes. Restored tallgrass prairie benefits bobolinks, savanna sparrows, and grasshopper sparrows, three of Minnesota's grassland birds in decline today. Tallgrass prairie restoration is a priority for Hamden Slough NWR.

Acquired land will be converted from row crops to a diverse mix of local ecotype tallgrass prairie vegetation following recent Regional guidance. This guidance states that genetically modified organisms can be used for restoration purposes but for no more than five years. Typically, the seedbed is prepared by farming the area with Roundup Ready® corn and soybeans in alternate years; ensuring the final crop year prior to restoration is planted in soybeans. Using Roundup Ready® crops safeguards the fields from significant broadleaf weed infestation with minimal chemical carryover, resulting in successful prairie vegetation establishment. Fields will be planted within five years of acquisition based on seed availability, resources, weather, and other factors.

Objective 1-10: Habitat Structure

Manage all Refuge lands using prescribed burning, grazing, haying, and tree removal, alone or in combination. Managed lands should provide open vistas and mixed structures to benefit the full range of Refuge grassland focal species.

Strategies

- Utilize prescribed burning as a management tool to set back encroaching young trees and shrubs, provide structural differences in vegetation, and promote vegetative diversity.
- Initiate a grazing program on the Refuge to promote forb species diversity and a mosaic of vegetation heights.
- Continue to use haying, as appropriate, to create specific vegetation heights.
- Use removal techniques to rid Refuge uplands of trees established outside of their historical occurrence.

Rationale

Fire and grazing, along with a highly variable climate, shaped and maintained the pre-settlement tallgrass prairie. Frequent fires set back encroaching woody vegetation. Bison trampled young woody seedlings while grazing on tender grass shoots of newly burned areas allowing forb species to flourish. This interaction between fire and grazing created a shifting mosaic of microhabitats for grassland birds and other wildlife, prairie invertebrates, and prairie vegetation.

Grassland-dependent birds adapted to the microhabitats resulting from frequent disturbance in the tallgrass prairies. Grassland-dependent birds require open vistas devoid of trees and tall shrubs for nesting and rearing of young. Trees are hostile habitat on prairies, hosting cowbird parasites as well as providing perch and den sites for avian and mammalian predators. In the annotated bibliography “The effects of woody vegetation on grassland birds”, Bakker (2003) compiled and summarized relationships between grassland birds and woody vegetation from 81 scientific papers. Savanna sparrows had the most consistently negative association with woody vegetation followed closely by the grasshopper sparrow (Bakker, 2003). Grassland birds also prefer a range of vegetation structures. For example, the marbled godwit and upland sandpiper prefer grasslands with shorter, patchier structure while the sedge wren and bobolink prefer taller, dense stands of tallgrass vegetation.

Currently, the uplands of Hamden Slough NWR are managed primarily using prescribed fire on a five-year rotation, when possible, as are the rest of the WPAs within the complex. Annual haying of a portion of the Hamden Lake bottom provides lek habitat for the greater prairie-chicken, but the routine has not changed for many years. Cattle grazing was employed early on, but was phased out as cattle operations became harder to find, and fire became more prominent. Without frequent and varied disturbance, restored prairie vegetation becomes vulnerable to tree invasion, accumulates heavy litter layers, and develops into stands dominated by grasses with little other structure.

The new approach to Refuge upland management will emulate effects of historic fire and grazing regimes using a combination of management tools. Management of Refuge uplands in concert with the surrounding WPAs will achieve habitat requirements for a range of Refuge grassland focal species. Additional benefits to breeding ducks may also result when associated pothole wetlands receive the applied management. The step-down Habitat Management Plan will contain details on use, location, and timing of management tools.

Watershed

Objective 1-11 Watershed Sustainability

Over the course of the CCP, work with partners to focus efforts at the watershed level to reduce storm runoff, sedimentation, and other nonpoint source pollution and their potential impacts to Refuge water quality and quantity.

Strategies

- Identify areas of highest concern for contributing sediment, nutrients, and surface water runoff into the Refuge; prioritize PFW Agreements; help implement Best Management Practices; and prioritize land acquisition where appropriate, using newly acquired GIS runoff analyses.
- Pursue implementation of a recommended three-year water quality/quantity monitoring program on Refuge wetlands and ditches. See Hamden Slough NWR Contaminants Assessment Program (CAP) (Brozowski, 2010) and Water Resources Inventory and Assessment (WRIA) (Newman and Eash, 2011) for more details.
- Increase communication with partners (Minnesota DNR, BRRWD, Red River Basin Commission, etc.) to acquire additional watershed quality information.

Rationale

The Hamden Slough watershed once was covered with small, isolated pothole wetlands and larger shallow wetlands and lakes. Water was carried overland from the south and east by many small streams

and captured in the wetlands. The system as a whole was isolated except in wet years when larger basins apparently were interconnected. Today, the Hamden Slough watershed is a flow-through system, with water carried by multiple surface ditches, including the Ditch 15 system. Subsurface tile drainage also is becoming more prevalent in the area. Many of the ecosystem benefits afforded by wetlands and associated uplands have been lost with the advent of agricultural drainage.

Based on information gathered for the Refuge CAP and WRIA, nonpoint source runoff from neighboring agricultural lands appears to be the primary threat to water quality on the Refuge. Because of surrounding land use and drainage practices, as well as the Hamden Slough NWR's location at the base of these lands, it is likely that elevated concentrations of nutrients, bacteria, and sediment are transported into Refuge habitats during storm runoff events (Newman and Eash, 2011). Excessive nutrient and sediment loads can affect recruitment, growth, productivity, and viability of numerous wetland plants and animals (Environmental Protection Agency [EPA], 2002). The main carrier of these pollutants is the Ditch 15 system, which connects neighboring uplands and wetlands to the Refuge and then to the Buffalo River.

The Buffalo River is on the 2008 303(d) list of impaired waters both above and below the confluence with Ditch 15 for bacteria (*E. coli*) and turbidity (Minnesota Pollution Control Agency [MPCA], 2008). In addition, many water bodies adjacent to the Refuge also have impaired status due to elevated nutrient and mercury concentrations (Newman and Eash, 2011). Water monitoring sites about 4.5 miles downstream of the Refuge show that levels of *E. coli* and phosphorous are above levels proposed by the EPA and MPCA, respectively. Although waterways within the Hamden Slough watershed have not been assessed for inclusion in the list of impaired waters, MPCA has established a Total Monitoring Daily Load monitoring location near the confluence of the Buffalo River.

The Service needs to be aware of impairments within the watershed, as they could be indicators of water quality threats to the Refuge and potential conditions of Refuge lands. The Service's Partners for Fish and Wildlife Program will work with partners to implement conservation practices (e.g., planting buffer strips, restoring pothole wetland hydrology) on private lands within the watershed to reduce potential threats to Refuge resources. Restoration of sustainable plant communities and ecological processes (e.g., groundwater recharge) on the Refuge will require restoration of more natural patterns of waterflow into, through, and out of the area (Heitmeyer, 2012).

Migratory Bird Populations

Objective 1-12: Upland Nesting Duck Pairs

Increase breeding duck pair density from 374 to 530 within the Refuge acquisition boundary by 2028.

Strategies

- Acquire land within the Refuge acquisition boundary.
- Restore wetlands on all Refuge lands.
- Work with partners and private landowners within the acquisition boundary to restore wetlands.
- Improve wetland condition making them more attractive to breeding pairs.
- Monitor breeding pairs as outlined in Refuge Inventory and Monitoring Plan.

Rationale

Hamden Slough NWR has historical importance to wetland-dependent birds, especially waterfowl, due to its abundance and variety of wetland types. In 1989, after many efforts to preserve the area, the Refuge was established for waterfowl production, particularly ducks. Over the years, wetland restoration has been a priority of the Refuge. However, over 2,700 acres within the Refuge acquisition boundary remain in private ownership, contributing to the numerous drained wetlands and shallow lakes. It is well-documented that the availability of wetlands drives the number of breeding ducks (Kantrud and Stewart, 1977). Currently, restored/existing wetlands within the acquisition boundary can support an estimated 374 breeding pairs (FWS R3 Habitat and Population Evaluation Team [HAPET], 2009). Wetland restoration

within the acquisition boundary and follow-up management of all wetlands is critical for the Refuge to reach its full potential as a breeding place for waterfowl.

The Service will acquire land within the acquisition boundary from willing sellers and restore all wetlands within the acquired tracts (see Objective 1-2). In addition, the Service will work with partners and private landowners to restore wetlands within the boundary on lands remaining in private ownership. Once restored, the focus will be improving the quality of wetland habitat, especially the distribution of emergent vegetation, making all wetlands more attractive to pairs (Weller and Spatcher, 1965; Murkin et al., 1982). Indirect manipulation of wetland vegetation will occur using grazing, prescribed burning, or haying on associated uplands (see Objective 1-10). The acquisition of remaining land to complete the Refuge, but more importantly the restoration of all remaining wetlands within the acquisition boundary along with habitat improvements, will sustain an estimated 530 breeding pairs annually. Implementing these strategies will also benefit many other wetland-dependent wildlife species.

Objective 1-13: Upland Nesting Duck Recruitment

Over the life of the plan, increase the estimated median recruitment rate of ducks on Hamden Slough NWR from 0.46 to 0.55.

Strategies

- Acquire land within the Refuge acquisition boundary.
- Restore uplands to high quality native tallgrass prairie vegetation.
- Convert Refuge food plots to high quality native tallgrass prairie vegetation.
- Work with partners and private landowners to establish permanent grass cover adjacent to the Refuge.
- Manage Refuge uplands to provide a variety of vegetation structures and open vistas.
- Explore predator control options (e.g., trapping or exclosures).

Rationale

Wetlands drive breeding waterfowl pairs, while available grassland habitat is critical for duck nest success. Nesting habitat can range from native prairies and planted grasslands to old fields and road ditches. However, hens face challenges as many factors (e.g., climate, predation) play into nest success. Edge is probably the greatest indirect detriment to hen nest success. Edge is typically associated with predator lanes in the form of a drainage ditch, field edge, shelterbelt and more. Further, trees also provide perches for avian predators. Providing quality habitat gives the hen a better chance to be successful and recruit ducks into the population. Research has shown that contiguous patches of permanent grassland with the least amount of edge possible is needed for a better chance of a successful nest (Higgins, 1977; Duebbert et al., 1981; Sovada et al., 2000). Positive relationships between habitat patch size and duck nest success have been found (Greenwood et al., 1995; Sovada et al., 2000). Sovada et al. (2000) found smaller patches (less than 105 hectares) had lower brood daily survival rates and higher incidences of red fox compared to larger patches (greater than 105 hectares). This likely was related to the proximity of edge, used as a predator lane, to the duck nest.

Permanent grass cover within two miles of the Refuge is limited. Roughly 25,000 acres are farmed compared to 6,000 acres of permanent grass on the Refuge and nearby WPAs. Contiguous patches of grassland also are limited within the acquisition boundary. A large portion of the Refuge interior is still in private ownership and farmed, although some is left idle and/or hayed. In existing grass cover, edge is predominant in the form of the surface drainage ditches, shelterbelts, roadways, and field edges. Very little suitable upland nesting habitat is available for waterfowl.

The Service will acquire land within the acquisition boundary from willing sellers and restore all uplands within the acquired tracts (see Objective 1-9). In addition, the Service will work with partners and private landowners to establish permanent grass cover within the acquisition boundary on lands remaining in

private ownership. Once planted and restored, the focus will be improving the quality of upland habitat to make the area more suitable for nesting. Tree removal and direct management of upland vegetation will be implemented using haying, grazing, and prescribed fire to provide different vegetation structures preferred by a variety of upland-nesting ducks (see Objective 1-10).

Objective 1-14: Bobolink Breeding Pairs

Increase breeding pairs of bobolinks on managed Refuge uplands (not including drained Hamden Lake) from 37 to 54 over the life of the plan.

Strategies

- Convert 50 acres of Refuge food plots to diverse tallgrass prairie vegetation.
- Diversify 500 acres of Refuge grasslands to diverse tallgrass prairie vegetation.
- Consider minor Refuge boundary adjustments to enhance management and reduce habitat fragmentation.
- Develop Inventory and Monitoring Plan. Outline protocol to monitor breeding grassland birds on the Refuge, including Bobolink.

Rationale

Bobolinks are one of many breeding grassland birds found in Minnesota that are on the decline (Sauer et al., 2011). This is likely due to many factors, one of which is loss or fragmentation of tallgrass prairie nesting habitat. Tree invasion could also be a factor affecting use of existing grassland patches by bobolinks. Bobolinks prefer moderate to tall, dense vegetation with less than five percent woody vegetation and a grassland patch size of 25 to 250 acres with forbs or shrubs for singing perches (Sample and Mossman, 1997).

Based on point count surveys conducted between 1994 and 1996, bobolinks were the most numerous breeding grassland bird species on Hamden Slough NWR. An average of 50 birds was recorded during the three-year survey period. No detailed information is available on point locations, habitat types, or specific methodology. Point counts also were conducted in 2006, but the data were never analyzed and information on methodology could not be found. Using the grassland bird thunderstorm model developed by the FWS Region 3 HAPET office (2009), 1,480 acres of Hamden Slough grasslands (**not** including the drained Hamden Lake) currently can support 37 pairs of bobolinks (one pair per 40 acres). Refuge grasslands range from diverse tallgrass prairie to rank stands of primarily grass (500 acres). Although not numerous, scattered trees are still found in some areas. On the south unit, uplands are fragmented by food plots (50 acres) and the east boundary contains two private exclusions (15 acres) dominated by trees. In all, up to 565 acres could be improved for breeding bobolinks.

Improving floristic quality of grasslands (see Objective 1-7), removing single/tree groves (see Objective 1-10), converting food plots (see Objective 1-8), and possible minor expansion of the Refuge boundary, especially on the south unit, will provide more habitat of higher quality for bobolinks. It is reasonable to predict the newly-improved 565 acres of land could support two pairs per 40 acres or an estimated 28 pairs of bobolinks. The remaining 980 acres of uplands would still support one pair per 40 acres or 25 pairs of bobolinks. Implementation of the strategies above will result in 53 bobolink breeding pairs using the restored prairies of Hamden Slough NWR. Implementing these strategies will also benefit many other prairie-obligate wildlife species.

People

Goal: The Service will engage the public, build relationships, and encourage awareness of a landscape in balance. The Refuge will provide compatible wildlife-dependent recreation that connects people to the land and demonstrates the societal benefits of a restored prairie-wetland system.

Objective 2-1: Welcome and orient visitors

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

Strategies

- Regularly 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 well-maintained and meet Service standards.
- Provide kiosks at key locations that welcome and orient visitors to the Refuge.
- Provide and maintain publications that are clear and accurate and meet Service publication standards. Develop a general Refuge information brochure.
- Ensure that all facilities are accessible according to standards of the Americans with Disabilities Act.
- Determine the annual number of visitors to the Refuge. Develop and implement a survey of overall visitor satisfaction if funding is available.

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 (605 FW 1). The ease with which the public can understand where they can go, what they can do, and how to safely and ethically engage in wildlife-related activities increases visitor satisfaction and creates a positive impression of the Service and an identification with the mission and goals of the agency.

Estimates of Refuge visitation are based on periodic vehicle counts by Refuge staff during times of expected use (e.g., hunting or interpretive program). 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 be obtained within the constraints of limited Refuge resources. The number of people contacted at both on- and off-Refuge events will be recorded.

Objective 2-2: Hunting

Continue to provide the public with quality muzzleloader deer hunting opportunities. Continue to support and encourage youth waterfowl hunting on the Refuge.

Strategies

- Determine number of muzzleloader deer hunters that use the Refuge and their satisfaction with the quality of the hunt.
- Modify and clarify hunt boundaries for consistency, minimizing conflicts between user groups.
- Explore potential modifications to the existing muzzleloader hunt within the state framework.
- Develop an updated hunting regulations leaflet.
- Work with the Minnesota DNR to incorporate the Refuge into current state white-tailed deer surveys.
- Continue to work with partners to host the one-day youth waterfowl hunt.
- Provide adequate law enforcement for visitor safety and resource protection through routine patrols and continued cooperation with the Minnesota DNR and partnerships with other refuges.

Rationale

Hunting is one of six wildlife-dependent recreational uses that receives priority consideration in Refuge planning and management under the Improvement Act. The Service recognizes hunting as a traditional outdoor pastime deeply rooted in our American heritage. Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs. Hunting programs help promote understanding and appreciation of natural resources and their management on all lands and waters in the National Wildlife Refuge System (NWRS, Refuge System). Surveys have shown that the number of adults participating in hunting programs has decreased in recent years. More concerning is the decreased number of youth engaged in the sport of hunting, especially waterfowl hunting. The State of Minnesota offers a special waterfowl season for youth—a one-day event of traditional waterfowl hunting in which only youth can participate. Service staff recognizes the importance of youth waterfowl hunting and encourages youth to participate in the sport on Hamden Slough NWR, including the mentored hunt hosted by Ducks Unlimited (see Hunting and Fishing in chapter 3). An estimated 20 youth waterfowl hunters use the Refuge annually.

It is estimated that the Refuge hosts fewer than 400 deer hunting visits each year. There may be opportunities to improve the muzzleloader deer hunting program by redefining the hunting areas, clarifying boundaries, and redesigning hunt brochures. By doing this, the number of hunters on the Refuge is expected to remain constant but provide for improved quality opportunities and maintain healthy wildlife populations. Changes would primarily aim to decrease conflicts between muzzleloader deer hunting and other priority public uses. Additional changes could be made based on comments received by visitors, hunters, and landowners via a satisfaction survey. A Refuge hunt plan has been written and allows for muzzleloader deer hunting and the youth waterfowl hunt.

Objective 2-3: Wildlife Observation and Photography

Within five years of plan approval, increase the number and quality of opportunities for wildlife observation and photography.

Strategies

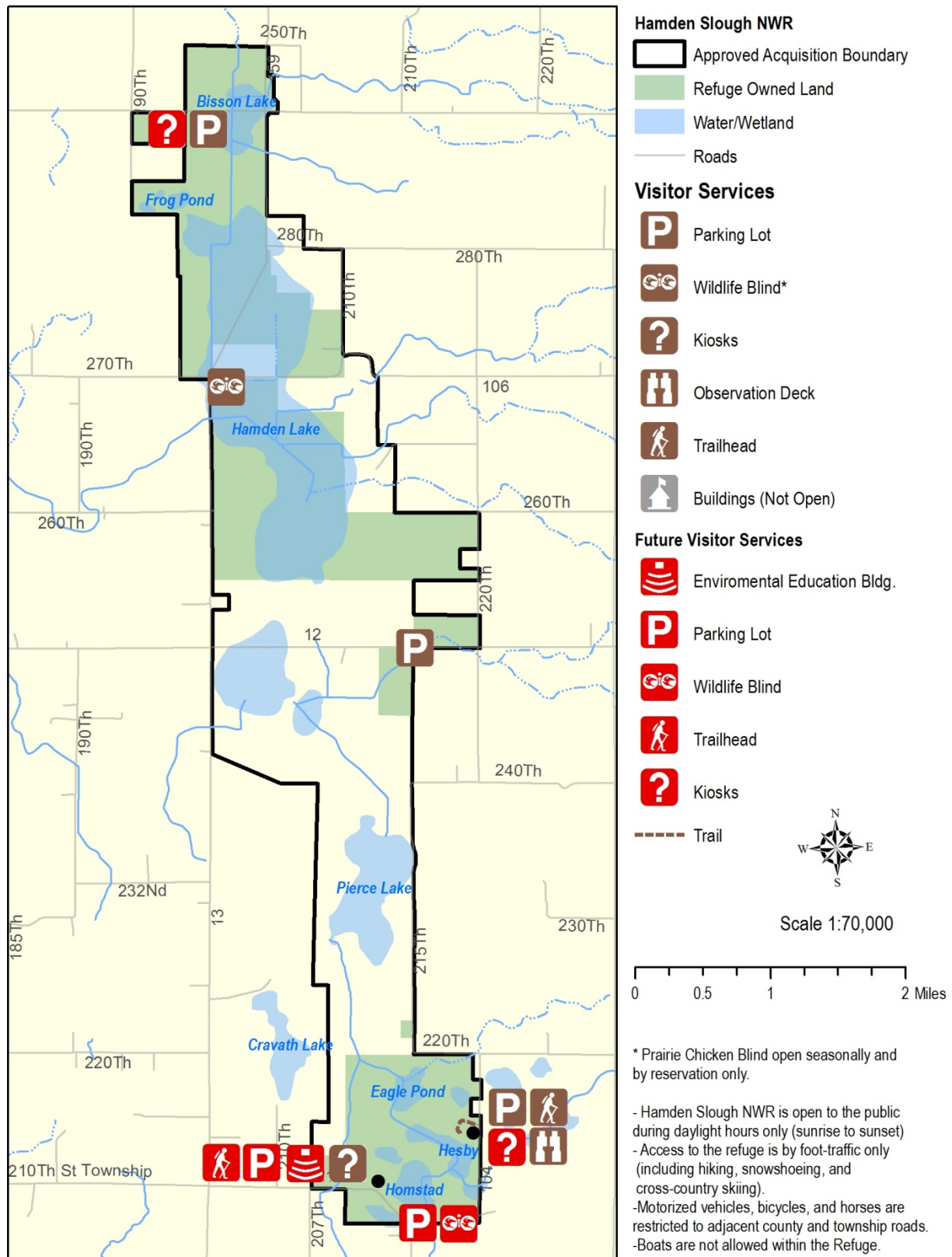
- Identify and improve locations for vehicle pull-offs that will offer additional opportunities for wildlife observation and photography.
- Identify an area suitable for a seasonal observation/photo blind on the south side of Homstad Lake.
- Explore the option of constructing an observation deck or photo blind at Bisson Lake.
- Maintain the seasonal observation/photo blind at the prairie-chicken lek.
- Maintain the trail and observation platform at Hesby Lake.

Rationale

Hamden Slough NWR is a long, linear Refuge with limited contiguous grassland acres for nesting. Wildlife observation and photography are priority wildlife-dependent recreation activities listed in the Improvement Act. They are important and valuable activities that promote understanding and appreciation of natural resources and their management. Proper management of these uses provides invaluable opportunities for interaction between people and the natural environment with little or no detrimental effects to wildlife or vegetation.

To encourage visitation to Hamden Slough NWR throughout the year, additional public use facilities should be added and improvements to existing facilities should be made (figure 4-1). By expending this effort, visitors will be more engaged in wildlife observation and photography at Hamden Slough NWR. They may stay longer and enjoy their visit more. Longer visits may lead to a greater appreciation of Refuge grassland and wetland habitats for wildlife.

Figure 4-1: Future Visitor Facilities



Objective 2-4: Environmental Education

Within three years of plan approval, provide environmental education programming to no fewer than 50 students per year. Within ten years, develop a focused education partnership with at least one local school.

Strategies

- Encourage teachers throughout the area to bring their classes to the Refuge.
- Develop focused education partnerships with local school districts.
- Expand the current prairie-chicken curriculum to include other seasons, habitat types, and wildlife species.
- Adapt existing Refuge System curricula (e.g., Rhythms of the Refuge) to Hamden Slough NWR.
- Hire a park ranger or visitor services specialist.

Rationale

Incorporating environmental education into the school curricula is an important way to influence the future well-being of the Refuge. Only through understanding and appreciation will people be moved to personal and collective action to ensure a healthy Refuge for the future. Environmental education is important in forming general conservation attitudes and responsible conduct on the Refuge.

Developing an effective environmental education program is a very high priority for Hamden Slough NWR. In the past, the Refuge has offered limited environmental education opportunities by responding to special requests. This objective aims to move the Refuge's environmental education program toward more action. This more active approach will depend on additional staff and resources devoted to visitor services. Visitor services staff at Tamarac NWR may be able to provide occasional assistance.

Because the Refuge has a limited history of offering environmental education and little participation data, the beginning objective has been set at 50 K–12 students in Becker and Clay Counties. Over the course of the next 15 years, the number of participants will increase as the program develops. Educators from throughout the local area will be encouraged to come out to the Refuge with their students for independent visits. Efforts of Refuge staff will focus initially on developing a close working partnership with the Lake Park-Audubon School District, which is nearest to the Refuge. Through this partnership, students will gain experience on a regular basis, allowing an understanding of Hamden Slough NWR and the importance of prairie-wetland habitats.

Objective 2-5: Interpretation

Within 10 years, improve opportunities for self-guided interpretation of Refuge wildlife and habitats.

Strategies

- Construct an interpretive loop trail that travels from the environmental education building through important prairie and wetland sites.
- Explore the feasibility of developing a wildlife drive on existing county and township roads.
- Install kiosks at the Hesby Lake overlook and the Bisson Lake parking area to interpret prairie-wetland ecology.
- Develop interpretive panels for the interior and exterior of the environmental education building.
- Update the Refuge bird list.

Rationale

With increased visitation comes an opportunity to interpret Refuge resources and educate a diverse group of visitors about conservation. While many people may visit the Refuge, they may not be aware of the wildlife and resources they are viewing from their vehicles or on foot. Constructing interpretive trails

and panels will help orient visitors and interpret the Refuge resources. Visitors will spend more time learning about the Refuge and its purpose from the additional opportunities provided. If people stay longer on Hamden Slough NWR, it may lead to a greater appreciation of the value and need for the conservation of important Refuge habitats for wildlife.

Objective 2-6: Outreach

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

Strategies

- Develop a message that relays the important role Hamden Slough 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.
- Maintain regular contact with community leaders and organizations through presentations and events.
- Hold annual special events on the Refuge in conjunction with other local, regional, or national celebrations.

Rationale

It is important to Hamden Slough NWR that people, organizations, and agencies in the area know about the Refuge and support it as a valuable part of the community. Continued support is essential for the success of the Refuge and its long-term viability. Building support for land and water conservation among Refuge neighbors is essential to protect natural resources over the long-term.

Effective outreach depends on open and continuing communication and collaboration between the Refuge and its many publics. Outreach can foster a sense of ownership in the greater community and contribute to achievement of Hamden Slough NWR purposes and the Refuge System mission.

Objective 2-7: Volunteer Programs and Community Partnerships

Over the life of the plan, work with local communities and Friends of Detroit Lakes WMD to generate support for the Refuge that results in at least 100 volunteer hours annually.

Strategies

- Recruit, orient, and train additional volunteers to assist with a variety of projects including visitor services programs, habitat restoration, biological programs, and maintenance tasks.
- Seek additional, mutually beneficial partnership opportunities with local communities.

Rationale

The Service recognizes the value of time and expertise contributed by individuals and groups. Volunteers help the Service achieve agency goals. Developing a 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, and contribution to, Service programs and operations. Whether through volunteers, support groups, or other important partnerships in the community, Refuge staff seeks to make Hamden Slough NWR an integral part of the community.

Objective 2-8: American Indian Cultural Practices

Maintain and enhance Refuge partnerships with American Indian tribes.

Strategies

- Continue to provide current opportunities for American Indian traditional uses on Refuge lands located within the White Earth Reservation.
- Increase communication and coordination with Tamarac NWR and the local White Earth Band of Ojibwe.

Rationale

The Refuge is rich in both historic and pre-historic American Indian cultural traditions. Both the Dakota (Sioux) and Ojibwe (Chippewa) Indians used the resources of the wetlands and surrounding lands during historic times. Today, members of the White Earth Band of Ojibwe use the portion of the Refuge that lies within the White Earth Reservation—more specifically, the Refuge lands within Riceville Township—for hunting waterfowl and whitetail deer. Tamarac NWR has a well-established working relationship with the tribe and will assist with coordination on issues relevant to Hamden Slough NWR.

Chapter 5: Plan Implementation

In this appendix:

- [5.1 Introduction](#)
- [5.2 Funding](#)
- [5.3 Staffing](#)
- [5.4 Partnership Opportunities](#)
- [5.5 Step-Down Management Plans](#)
- [5.6 Monitoring and Evaluation](#)
- [5.7 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

This CCP outlines an ambitious course of action for the future management of Hamden Slough National Wildlife Refuge (NWR, Refuge). The ability to enhance wildlife habitats and to develop and maintain quality public use facilities will require a significant commitment of staff and funding from the Service. The Refuge will continually need appropriate operational and maintenance funding to implement the objectives of this plan. The highest priority Hamden Slough NWR projects as chosen by Refuge staff are:

- Full restoration of Pierce Lake.
- Full restoration of Bisson Lake, including raising/relocating Becker County Highway 14.
- Full restoration of Hamden Lake, including raising existing county and township roads.
- Implementation of a water monitoring plan as identified in the Water Resources Inventory and Assessment.

5.3 Staffing

Currently, Hamden Slough NWR has no full-time employees. The Refuge is managed by the staff of Detroit Lakes Wetland Management District (WMD, District). Table 5-1 lists current District staff. At least one additional position (visitor services specialist) will be needed for full implementation of this CCP. However, future funding is uncertain and new staff positions cannot be guaranteed.

Table 5-1: Current Detroit Lakes WMD staffing

Category	Number of Positions
Management	3
Biological	1
Visitor Services	0
Administrative	2
Maintenance	2
Fire Management	5
Law Enforcement	1

5.4 Partnership Opportunities

Partnerships are an essential element for the successful accomplishment of goals, objectives, and strategies at Hamden Slough 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:

- Red River Basin Commission
- Buffalo-Red River Watershed District
- Minnesota Department of Natural Resources
- Natural Resources Conservation Service, U.S. Department of Agriculture
- Friends of Detroit Lakes WMD
- Becker County
- Ducks Unlimited
- Pheasants Forever
- Lessard-Sams Outdoor Heritage Council
- Minnesota Prairie Chicken Society
- Safari Club International of Minnesota
- Izaak Walton League, Prairie Woods Chapter
- Detroit Lakes Area Birding Club

5.5 Step-Down Management Plans

The CCP for Hamden Slough NWR is intended to be a broad umbrella plan that: 1) outlines general concepts and objectives for habitat, wildlife, visitor services, cultural resources, and partnerships; and 2) guides Refuge management for the next 15 years. Step-down management plans provide greater detail for carrying out specific actions authorized by this CCP. Table 5-2 below presents step-down management plans that are anticipated to be needed, along with their current status and next revision date. Some of these plans logically suggest an integrated approach and, where appropriate, may be combined into a single integrated step-down management plan.

Table 5-2: Step-down Management Plans

Step-down Plan	Existing Plan Year Approved	New or Revised Plan
Habitat Management	N/A	2014
Inventory and Monitoring	N/A	2014

5.6 Monitoring and Evaluation

The direction set forth in this CCP and specifically-identified strategies and projects will be monitored throughout the life of the plan. Many actions inherent in the plan are new directions and monitoring will

help understand the effects of the actions on habitat, wildlife, and public use patterns. In addition, the Refuge and its watershed will certainly change, and likely in ways unforeseen. Land use changes, invasive species, floods and droughts, disease outbreaks, and climate may alter expected outcomes. Monitoring will be critical to detecting and reacting to such change.

5.7 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 document minor plan modifications when monitoring and evaluation 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. A major plan review and re-write will occur after 15 years.

Appendix A: Environmental Assessment

In this appendix:

- [A.1 Purpose and Need](#)
- [A.2 Description of Alternatives](#)
- [A.3 Affected Environment](#)
- [A.4 Environmental Consequences](#)

Finding of No Significant Impact

Environmental Assessment and Comprehensive Conservation Plan for the Hamden Slough National Wildlife Refuge, Minnesota

An Environmental Assessment (EA) has been prepared to identify management strategies to meet the conservation goals of Hamden Slough National Wildlife Refuge (NWR). The EA examined the environmental consequences that each management alternative could have on the quality of the physical, biological, and human environment, as required by the National Environmental Policy Act of 1969 (NEPA). The EA evaluated three alternatives for the future management of Hamden Slough NWR.

The alternative selected for implementation on the refuge is *Alternative C*. This preferred alternative focuses on increasing the quantity and quality of habitat for waterfowl and grassland birds. Acquisition and full restoration of Pierce Lake is emphasized. The hydrologic regime will better emulate natural seasonal and long-term variability. More diverse, sustainable wetland and prairie vegetation will be restored. The preferred alternative also includes opportunities for refuge visitors to enjoy hunting, wildlife observation and photography, environmental education, and interpretation. A high priority will be placed on expanding environmental education opportunities in partnership with local schools and community groups.

For reasons presented above and below, and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative C as the management alternative for Hamden Slough NWR is not a major federal action which would significantly affect the quality of the human environment, within the meaning of Section 102 (2)(c) of the National Environmental Policy Act of 1969.

Additional Reasons:

- Future management actions will have a neutral or positive impact on the local economy.
- This action will not have an adverse impact on threatened or endangered species.

Supporting References:

- Environmental Assessment
- Comprehensive Conservation Plan


Regional Director

10/9/12
Date

A.1 Purpose and Need for Proposed Action

A.1.1 Purpose

The purpose of this Environmental Assessment (EA) is to adopt and implement a Comprehensive Conservation Plan (CCP) for Hamden Slough 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 Refuge System, and adheres to Service policies and mandates.

Refuge purposes are derived from the legislative authority used to acquire specific refuge lands and are, along with Refuge System goals, the basis on which primary management activities are determined.

Purposes for Hamden Slough NWR:

" . . . conservation, management, and . . . restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans . . . " 16 U.S.C. § 668dd(a)(2) (*National Wildlife Refuge System Administration Act*)

" . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (*Migratory Bird Conservation Act*)

" . . . as Waterfowl Production Areas subject to " . . . all the provisions of such Act [Migratory Bird Conservation Act] ...except the inviolate sanctuary provisions . . . " 16 U.S.C. § 718(c) (*Migratory Bird Hunting and Conservation Stamp Tax*)

The mission of the National Wildlife Refuge set forth in the Refuge Improvement Act of 1997 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."

Appendix E of the CCP contains a list of key laws, orders and regulations that provide a framework for the proposed action.

A.1.2 Need for Action

This EA addresses the need to adopt a 15-year management plan for Hamden Slough NWR in order 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 CCP is needed because adequate, long-term management direction does not currently exist for the Refuge. A 1991 Concept Management Plan provided initial guidance for Refuge development and management. Updated guidance now is needed that makes use of lessons learned since then. In addition, the landscape has undergone changes that affect the Refuge, new threats to wildlife and habitat are emerging, new laws and policies are in place, and new scientific information is available.

The plan is needed to help achieve Refuge goals for wildlife, habitat, and people:

Goal 1: Wildlife and Habitat – Habitats on Hamden Slough NWR will be restored, protected, and actively managed to provide a diversity of native wetland and grassland habitats. These efforts will be further leveraged by partnerships and conservation actions outside the Refuge, resulting in a resilient and

balanced landscape, meeting the needs of migratory birds, threatened and endangered species, and other wildlife in an uncertain future.

Goal 2: People – The Service will engage the public, build relationships, and encourage awareness of a landscape in balance. The Refuge will provide compatible wildlife-dependent recreation that connects people to the land and demonstrates the societal benefits of a restored prairie-wetland system.

Significant issues that need to be addressed are summarized in section A.1.3 below. More detail about these issues can be found in chapter 2 of the CCP.

A.1.3 Scoping of the Issues

Internal scoping began in August 2010 when Service planning staff and Hamden Slough NWR staff 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 Regional Office staff at Fort Snelling, MN, in March 2011 to get input on issues from regional supervisors, biologists, planners, and other program specialists.

Public scoping began in October 2010 when Refuge staff hosted an open house event in Detroit Lakes, MN, to inform the public of the planning process and to solicit their input on issues of concern. About 12 people attended. In addition, a news release was distributed to area media, informational posters were displayed in local communities, and postcards soliciting comments were sent to several hundred names on the Refuge mailing list.

In December 2010, the Refuge convened a team of resource professionals to share their perspectives on the biological and visitor services programs at Hamden Slough NWR. Participants included partner agencies, researchers, educators, and Refuge volunteers. Purposes of the workshop were to define significant issues and identify potential options for addressing them; share knowledge, ideas, and perspectives to ensure that best available information is considered; and begin to develop a shared vision for the future of the Refuge and the ecosystem.

In June 2011, the Refuge Manager met with both the Red River Basin Commission and the Buffalo-Red River Watershed District to provide information and solicit input on the Hamden Slough CCP. In July 2011, the Refuge Manager mailed letters to all landowners within the approved boundary inviting them to meet one-on-one to discuss their thoughts on the future direction of the Refuge. Meetings were completed by early August.

A.1.4 Hamden Slough NWR Issues, Concerns, and Opportunities

This section summarizes the major issues that were identified and analyzed as part of the CCP process. The issues were critical in framing the objectives for the various alternatives considered and formed the basis for evaluating environmental effects. More detailed explanation of the issues can be found in chapter 2 of the CCP.

Wetlands

Prairie pothole wetlands

About 85 percent of Minnesota's prairie pothole wetlands have been drained and the trend continues today as subsurface tile drainage systems improve. The exact number of pothole wetlands on the Refuge is not known, although more than 200 have undergone at least partial restoration. Individual wetlands have not been inventoried as to size, watershed, or hydrologic regime. Monitoring of the physical and biological condition of restored wetlands has been minimal.

Managed wetlands

Natural water level cycles that historically maintained long-term wetland and wildlife productivity were heavily altered by drainage ditches and subsurface tiles in the early 20th century. Wetlands that

historically captured and held water were converted to a flow-through system. Some water level control now is possible on several of these larger wetlands, although water management capability is limited.

These wetlands are managed primarily to provide habitat for migrating spring shorebirds and breeding waterfowl. Water levels also may be manipulated for fall shorebirds, overwintering resident wildlife, protection of roads, control of invasives, or to alleviate downstream flooding. The Refuge does not have an integrated wetland management plan. Invasive hybrid cattails are difficult to control. Invasive fish, especially fathead minnows, compete with wetland wildlife for food.

Relict glacial lake restoration

Two of the largest relict glacial lakes—Pierce Lake and Hamden Lake—are still drained. All of Pierce Lake and some of Hamden Lake remain as private inholdings within the approved Refuge boundary. Restoration of Pierce Lake must be completed first in order to restore Hamden Lake.

Uplands

Tallgrass prairie restoration

Many restored prairies on the Refuge have fairly low diversity of native plant species. Some sites are dominated by non-native cool season grasses. Non-native parsnip, spurge, knapweed, crown vetch, and tansy have been found on the Refuge; all are aggressive invaders. Fire and grazing regimes that historically sustained prairie diversity have been disrupted. Data on current condition of Refuge prairie restorations is limited.

Grassland-dependent bird populations have declined from historic levels far more than any other group of birds due to habitat loss and fragmentation. Grassland birds show a variety of habitat preferences based on vegetation height, cover density, grass/forb ratio, soil moisture, litter depth, woody vegetation, and plant species composition. It is important to maintain a mosaic of grassland habitats to meet the varying needs of grassland bird species of concern.

Tallgrass prairie remnants

Some unbroken tallgrass prairie exists on the Refuge in small fragmented remnants. The location, size, and current status of most remnants are not well-documented, but most are thought to be in a degraded condition as evidenced by low native species diversity, and some could be lost to invasive and/or woody vegetation if not given management attention soon. These tallgrass prairie remnants are irreplaceable. Some may contain rare plant species that could provide a local seed source for upland restoration and diversification projects.

Management tools

About 50 acres are farmed as wildlife food plots to mitigate crop depredation on neighboring lands, but little information is available on depredation levels or use of the food plots by target species. The cropped areas increase habitat fragmentation and do not provide critical habitat for Refuge resources of concern. Erosion from the fields may be increasing sedimentation in the wetlands below. All farming must be compliant with new regional policy that limits use of genetically-modified, Glyphosate-tolerant corn and soybeans.

Rotational grazing by cattle was used as a management tool in the early years of the Refuge to emulate the historic disturbance effects of bison and elk but was phased out as other management techniques became available. Reinstating a grazing program could increase prairie diversity and heterogeneity, improve wildlife habitat, provide economic benefit to local landowners, and generate additional support for the Refuge in the local community.

Watershed

Historically, the matrix of prairie vegetation interspersed with wetlands in the Hamden Slough watershed slowed surface water runoff, allowing soil infiltration and recharge of groundwater aquifers. This prairie wetland ecosystem provided habitat for wildlife, maintained water quality, and helped to mediate downstream flooding in the Buffalo River. Now, however, the watershed is dominated by row crop production. Prairie vegetation has been removed. Ditches and subsurface tile lines have accelerated

water drainage and dried up wetlands. It is likely that elevated concentrations of contaminants are being transported onto the Refuge (Newman and Eash, 2011). Ongoing climate change could further exacerbate these issues. Restoration of sustainable plant communities, wildlife habitat, and ecological processes (such as flood storage and groundwater recharge) on the Refuge will require restoration of more natural patterns of water flow into, through, and out of the area (Heitmeyer, 2012).

People

Hunting

A late-winter deer muzzleloader season and a one-day youth waterfowl hunt are available on the Refuge. During the scoping period for this CCP, some members of the public expressed concerns about the safety of the muzzleloader hunt and the pressure on the deer herd. Some would like to see the entire hunting program eliminated to provide a sanctuary for wildlife. Others, however, were in support of continuing the muzzleloader deer hunt. Comments on the youth waterfowl hunt were generally supportive.

Wildlife observation and photography

Current opportunities include roadside viewing, one wetland overlook, one hiking trail, and a seasonal observation blind. Demand for additional visitor access outside these areas is low, but disturbance could become an issue if opportunities and/or demand increase. Clear definition is needed of where these uses should be allowed and with what stipulations. We want to encourage visitor connections to the Refuge while minimizing wildlife and habitat disturbance.

Environmental education and interpretation

Environmental education and interpretive activities and materials on the Refuge are limited due to lack of dedicated staff. Few outdoor opportunities for school groups are available in the area. Development of a strong environmental education program is a high priority for the Refuge as resources become available.

Outreach and community partnerships

Communication and partnerships increase public support and make the Refuge a valuable part of the community. Current methods include news releases, media interviews, and group presentations. Partnership with the volunteer group "Friends of the Detroit Lakes Wetland Management District" increases awareness of both the District and the Refuge. Additional outreach and partnership efforts are desirable, but priorities must be set to make best use of limited resources and to generate the most benefits for the Refuge and the local area.

A.1.5 Decision Framework

This EA describes three 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.

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 planning team has recommended Alternative C to the Regional Director. The Draft CCP was developed for implementation based on this recommendation.

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.

A.2 Description of Alternatives

A.2.1 Alternatives Development

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve Refuge purposes, the vision and goals identified in the CCP, and the mission and goals of the National Wildlife Refuge System (NWRS, Refuge System) and the Service. Alternatives are formulated to address the significant issues, concerns, and opportunities identified by the Service and by the public during the scoping period.

The three alternatives identified and evaluated represent different approaches to protecting, restoring, and managing Refuge wildlife, plants, habitats, and other resources as well as compatible wildlife-dependent recreation. The planning team assessed the existing biological conditions and external relationships affecting the Refuge. This information contributed to the development of Refuge goals and, in turn, helped to formulate the alternatives.

A.2.2 Elements Common to All Alternatives

Although the alternatives differ in many ways, there are similarities as well. These common features are listed below to reduce the length and redundancy of the individual alternative descriptions.

- The Service would ensure that Refuge management complies with all federal laws and regulations that provide direction for managing units of the Refuge System.
- No adjacent landowners would be adversely impacted by any action taken by the Service without a mutual agreement and adequate compensation.
- All alternatives would provide equal protection and management of cultural resources.

A.2.3 Description of Alternatives

Alternative A: Current Management (No Action)

This alternative reflects the current management direction of Hamden Slough NWR. It provides the baseline against which to compare other alternatives. It is also a requirement of NEPA that a no-action alternative is 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:

- Quality and quantity of migratory bird habitat would remain about the same.
- Wetland water management would focus on drawdowns for migrating spring shorebirds and flooding for breeding waterfowl. Target water levels would be determined on a year-by-year basis for each wetland.
- Remaining drained prairie pothole wetlands (about 40) would be restored.
- Prairie restoration would continue on newly-acquired agricultural sites.
- The primary upland management tool would be prescribed fire in the spring. Limited haying and tree removal would continue.
- Farming of wildlife food plots (about 50 acres) would continue, but use of genetically modified crops would not be allowed on Refuge food plots in compliance with current FWS Region 3 policy.
- Land acquisition from willing sellers would continue within the approved Refuge boundary.

- Conservation partnerships with other agencies, landowners, and organizations would remain at the current level.
- Outreach, community partnerships, and priority public uses that are compatible and wildlife-dependent would continue at present levels.

Alternative B: Wetland Focus

This alternative would focus on increasing the quantity and quality of habitat for waterfowl. Acquisition and full restoration of Pierce Lake would be emphasized over the next 15 years. The hydrologic regime would better emulate natural seasonal and long-term variability. More diverse, sustainable wetland vegetation patterns would be restored. This alternative would build upon the wetland and waterfowl focus developed when the Refuge was first established.

These are key elements of Alternative B:

- Land acquisition from willing sellers would continue, with Pierce Lake as the highest priority.
- Further restoration of managed wetlands would occur where appropriate and feasible. An integrated wetland management plan would be developed.
- The natural hydrology of all prairie pothole wetlands would be restored and maintained. A baseline inventory of each site would guide management decisions.
- Construct nesting islands and over-water nesting structures to provide additional waterfowl nesting habitat.
- Planting of native prairie vegetation would continue on newly-acquired agricultural sites.
- Fire, grazing, haying, and tree removal would be used to manage uplands for nesting waterfowl.
- Farming of wildlife food plots would continue, but with alternative crops and locations to maximize benefits to waterfowl.
- Conservation partnerships would focus on increasing soil and water retention and restoring natural waterflow corridors in the Hamden watershed.
- The deer hunt would be eliminated; the waterfowl hunt would continue. Other visitor services programs would expand as resources allow.

Alternative C: Wetland and Prairie Focus (Preferred Alternative)

This alternative would focus on increasing the quantity and quality of habitat for waterfowl and grassland birds. Acquisition and full restoration of Pierce Lake would be emphasized over the next 15 years. The hydrologic regime would better emulate natural seasonal and long-term variability. More diverse, sustainable wetland and prairie vegetation patterns would be restored. This alternative would expand the wetland and waterfowl focus of Alternative B to include an additional focus on tallgrass prairie and grassland birds. A detailed description of objectives and actions included in this preferred alternative is found in chapter 4 of the CCP.

These are key elements of Alternative B:

- Land acquisition from willing sellers would continue, with Pierce Lake as the highest priority.
- Further restoration of managed wetlands would occur where appropriate and feasible. An integrated wetland management plan would be developed.
- The natural hydrology of all prairie pothole wetlands would be restored and maintained. A baseline inventory of each site would guide management decisions.

- Emphasis on restoration and management of diverse tallgrass prairie would increase. Plant diversity would include a mix of native grasses, sedges, and forbs tailored to the specific characteristics of each site. A baseline inventory of each site would guide management decisions.
- Fire, grazing, haying, and tree removal would be used in combination to create the varied habitat structure needed by grassland birds and upland-nesting waterfowl.
- Wildlife food plots would be converted to appropriate native vegetation.
- Conservation partnerships would focus on increasing soil and water retention and restoring natural waterflow corridors in the Hamden watershed.

Deer and waterfowl hunt programs would continue. Expansion of environmental education opportunities would be a high priority. Other visitor services programs would increase as staff availability increases, and core themes, key audiences, and measures of success would be developed.

Table A-1 (below) shows a summary of actions by alternative

Table A-1: Summary of Actions by Alternative

Issue/Topic	Alternative A (No Action) Current management	Alternative B Wetland Focus	Alternative C (Preferred Alternative) Wetland and Prairie Focus
WILDLIFE AND HABITAT			
Wetlands	<p>Manage water levels in Bisson and the Big Six wetlands primarily by drawing down in spring/fall and flooding in summer.</p> <p>Continue to restore drained pothole wetlands.</p> <p>Continue working toward restoration of Pierce and Hamden lakes.</p>	<p>Manage water levels to better emulate natural seasonal and long-term variability.</p> <p>Restore all wetlands; ensure that each restoration is consistent with wetland type.</p> <p>Restore Pierce Lake; continue working toward restoration of Hamden Lake.</p> <p>Construct nesting islands and overwater nesting structures to provide additional waterfowl nesting habitat.</p>	<p>Manage water levels to better emulate natural seasonal and long-term variability.</p> <p>Restore all wetlands; ensure that each restoration is consistent with wetland type.</p> <p>Restore Pierce Lake; continue working toward restoration of Hamden Lake.</p>
Prairies	<p>Convert cropland native prairie vegetation.</p> <p>Manage restored prairie to reduce plant litter and invasive species, and to promote native prairie vegetation.</p>	<p>Convert cropland to native prairie vegetation.</p> <p>Manage prairies to provide waterfowl nesting cover.</p>	<p>Convert cropland to native prairie vegetation; improve floral composition of seeded grasslands; use seed mixtures tailored to the hydrogeomorphic setting of each site.</p> <p>Manage prairies to provide diverse habitat structure needed by grassland birds and upland-nesting waterfowl.</p>
Management tools			
Farming	<p>Continue cooperative farming of wildlife food plots (50 acres) without use of genetically-modified seed.</p> <p>Use short-term farming (up to five years on newly-acquired tracts) to prepare seedbeds on prairie restoration sites.</p>	<p>Continue cooperative farming of wildlife food plots, but switch to alternate crops and locations to increase waterfowl benefits.</p> <p>Use short-term farming to prepare seedbeds on prairie restoration sites.</p>	<p>Convert wildlife food plots to appropriate native prairie vegetation, primarily mesic and wet-mesic prairie.</p> <p>Use short-term farming to prepare seedbeds on prairie restoration sites.</p>
Fire, Haying, Grazing, Tree Removal	<p>Prescribed fire in spring is primary tool for upland habitat management.</p> <p>Hay 100 acres of Hamden lakebed annually.</p> <p>No grazing.</p> <p>Remove trees as needed to improve habitat for nesting grassland birds.</p>	<p>Integrated use of fire, haying, grazing, and tree removal as needed to increase habitat benefits for priority wetland wildlife.</p>	<p>Integrated use of fire, grazing, haying, and tree removal as needed to increase habitat benefits for priority wetland and prairie wildlife.</p>
Watershed sustainability	<p>Work with partners to improve watershed condition as opportunities become available.</p> <p>Continue to purchase land from willing sellers within the approved Refuge boundary.</p>	<p>Work with partners to increase soil and water retention within the watershed and to restore natural waterflow corridors.</p> <p>Continue to purchase land from willing sellers within the approved Refuge boundary, with Pierce Lake as the highest priority.</p>	Same as Alternative B.

Issue/Topic	Alternative A (No Action) Current management	Alternative B Wetland Focus	Alternative C (Preferred Alternative) Wetland and Prairie Focus
PEOPLE			
Welcome and orient visitors	Continue to provide current leaflets, directional signs, kiosk, and website.	Evaluate effectiveness and completeness of information provided for visitors. Update regularly.	Same as Alternative B.
Hunting	Continue muzzleloader deer and youth waterfowl hunts.	Eliminate muzzleloader deer hunt. Continue youth waterfowl hunt. Coordinate with tribe to evaluate use of Refuge lands by tribal members; seek opportunities to enhance the partnership.	Continue muzzleloader deer hunt; consider modifications to increase quality. Continue youth waterfowl hunt. Coordinate with tribe to evaluate use of Refuge lands by tribal members; seek opportunities to enhance the partnership.
Wildlife observation and photography	Maintain existing roads, trails, parking areas, overlooks, and viewing blind. Refuge is open from sunrise to sunset.	Enhance opportunities in balance with concerns about visitor safety and wildlife/habitat disturbance.	Same as Alternative B.
Environmental education and interpretation	Work with local schools and organizations by request when staff is available. Provide Prairie Trunk, prairie curriculum, and shelter for use by educators. Continue Prairie Fun Day, mentored waterfowl hunt, and Detroit Lakes Bird Festival events. Continue webcam development. Maintain interpretive panels.	Continue current environmental education programs. Continue current interpretive events. Expand opportunities for self-guided interpretation.	Expand environmental education opportunities in partnership with local schools and community groups. Continue current interpretive events. Expand opportunities for self-guided interpretation.
Outreach	Continue current level of outreach to off-site audiences including community group presentations by request, news releases for special events, and participation in local community events.	Continue current outreach activities. Expand when resources allow, defining key audiences, core themes, and measures of success to be incorporated into all visitor services activities.	Same as Alternative B.
Volunteers and community partnerships	Continue current level of volunteer support from Friends of Detroit Lakes Wetland Management District.	Develop and expand partnerships with local communities and volunteers.	Same as Alternative B.

A.3 Affected Environment

This section contains a brief overview of the affected environment of Hamden Slough NWR. Additional detail is contained in chapter 3 of the CCP.

Hamden Slough NWR was authorized by the Migratory Bird Conservation Commission in 1989 to restore 5,944 acres of prairie and wetland habitat in west-central Minnesota for migratory waterfowl. About 3,200 acres have been acquired and restored so far, and the location is recognized once again as an outstanding place to see migratory birds.

A.3.1 Physical Environment

Geology and Topography

The Des Moines Lobe, the most recent advance of the Wisconsin Glacier, left the bulk of surficial deposits in this portion of Becker County. The Wadena Lobe formed the Alexandria Moraine, a large

glacial outwash slope that lies on the extreme eastern boundary of the Refuge. Therefore, the surficial geomorphology of the northern half of the Refuge is dominated by ground moraine, while the southern half of the Refuge is dominated by terminal moraine.

The northern portion of the Refuge, dominated by ground moraine and flatter northern till plain surfaces, contains the historic Hamden Lake. A higher density of larger pothole wetlands and shallow lakes are found in the southern portion of the Refuge due to the greater changes in topography. The Refuge lies within the lowest elevation within its watershed, which provides excellent wetland conditions, even in drier periods.

Hydrology

Hamden Slough NWR is located within the greater Red River Basin. Water flows primarily northward through the Refuge and then west into the Buffalo River. The Buffalo empties into the Red River, which flows north into Hudson Bay in Canada. The smaller Hamden Slough watershed is approximately 31,200 acres (about 4.5 percent of the Buffalo River watershed). There is considerable surface-groundwater interaction, a key component of the water supply and function of Refuge wetlands.

Historically, water draining into the Refuge area was captured and held in several larger wetland basins. Local surface and groundwater runoff was held in several hundred small isolated wetland depressions. Collectively, these wetlands helped recharge regional groundwater and mediate downstream discharge and flooding in the Buffalo and Red Rivers (Heitmeyer, 2011). Extensive drainage of wetlands in the Hamden Slough area began with construction of Ditch 15 and its laterals in the early 20th century and has continued with ongoing installation of subsurface drainage tiles. Today, this inter-connected system transports water out of the Hamden Slough watershed to increase agricultural productivity. Water quality is compromised by sediment, nutrients, and other contaminants. The system is highly susceptible to flash flooding during high precipitation events (Newman and Eash, 2010).

More than 200 drained wetlands on the Refuge have been at least partially restored with ditch fills, sediment removal, and/or water control structures. However, the largest shallow lakes within the Refuge boundary—Hamden and Pierce—are still drained and remain in private ownership.

Soils

Refuge soils were formed in glacial outwash sediments or in glacial drift overlying outwash. Silty clay loam and muck types are generally dominant. Glacio-lacustrine depressions, pothole depressions, drainages, and uplands each contain distinct soil series. Much of the ground moraine on the northern part of Hamden Slough NWR is poorly drained, while slope soils in the southern terminal moraine are moderately drained to well-drained.

Climate

The climate of the Hamden Slough region is classified as continental cold temperate with warm, moderately humid summers and cold dry winters. Mean monthly temperatures range from about 18 °F in January to about 75 °F in July. The annual growing season ranges from 145 to 175 days. Average annual precipitation is 25 inches, with a strong seasonal pattern typically increasing in April and reaching a peak in June, followed by a gradual decline to low levels in winter. Long-term climate and local precipitation data suggest an approximate 10 to 12 year pattern of alternating wet and dry periods. In general, precipitation and streamflow data indicate markedly increased amounts over the past 20 years (Heitmeyer, 2012).

Wetlands are very susceptible to climate change because of their shallow depths and high evapotranspiration rates. In nearly all climate simulation models, mean temperatures in the Northern Great Plains could increase between 6.5 °F and 11.0 °F over the next 100 years. Without a substantial increase in precipitation to counteract increased temperature, severe impacts such as decreased water inputs, decreased storage capacity, change in hydroperiod, and increased frequency of drought will occur (North American Bird Conservation Initiative [NABCI], 2010). Climate records indicate that the strong east-west precipitation gradient across the Prairie Pothole Region (PPR) steepened during the 20th century, with weather stations in the west becoming drier and stations in the east becoming wetter. The

greatest drying occurred in the Canadian provinces. Climate simulations for the PPR show that a 3.6 °F increase in temperature would cause many highly productive wetlands to go dry, especially in the Dakotas and Saskatchewan (NABCI, 2010), likely causing eastward shifts in the breeding range of waterfowl (Johnson et al., 2010).

A.3.2 Vegetation and Wildlife

Historic conditions

Historical accounts from the settlement of Hamden Township in the 1870s describe “The grass in some places was two and a half feet high, the rolling prairie was dotted with lakes and groves here and there. (Wilcox, 1907)” More specifically, the area encompassed by Hamden Slough NWR, as depicted on the original General Land Office map, was an open prairie with abundant wetlands and lakes including a large “impassable marsh” named Hamden Lake.

Bison grazed the prairie. Other mammals in the area likely included elk, moose, deer, coyote, jackrabbit, and the occasional pronghorn antelope. But it was the abundance of birds that defined Hamden. W.A. Wilkin, one of the first settlers of Hamden Township states, “Game was very plentiful, especially ducks, geese and prairie-chickens. It was no trouble to keep our families in meat, as all we had to do was to look out on the lake in the morning and see where the ducks were . . . and with a double-barreled shotgun, we could usually kill enough to last the whole day. (Wilcox, 1907)” Other birds of interest recorded include whooping cranes, common moorhens, Eskimo curlews, and passenger pigeons.

Current conditions

Vegetation in temporary wetlands typically includes emergent annuals adapted to constant water fluctuations such as beggarticks, smartweeds, wild millet, ragweed, and cocklebur. Vegetation commonly found in seasonal wetlands includes some grasses, bulrush species, sedges, spikerushes, arrowhead, and some cattail. Semi-permanent wetlands usually have a combination of robust emergent vegetation such as cattails and bulrushes, along with submerged vegetation such as coontail, watermilfoil, and pondweeds. Many Refuge wetlands have too much or too little emergent vegetation. Hybrid cattail, an invasive emergent, is very aggressive and forms dense stands when conditions are right. Most vegetation management on the Refuge is to reduce stands of hybrid cattail.

More than 1,500 acres of former crop fields have been planted to native grasses and forbs. Early restorations included a mix of warm and cool season grasses, sometimes including non-native species. Over time, diversity of seed mixes has increased. More forbs are included and only seed from the local area is used. Invasive plants are probably the biggest threat to Refuge uplands. Of greatest concern are crown vetch, wild parsnip, and common tansy. All are prolific seeders, have a long-lasting seed bank, and are easily moved around by mowing.

Over 200 species of birds have been recorded on the Refuge. Every wetland niche—from dense cattail to seasonal emergent vegetation to mudflats to open water—is used by wetland birds. Migrating shorebirds include Hudsonian godwits; white-rumped, western, and pectoral sandpipers; short-billed dowitchers; and semi-palmated plovers. Marbled godwit, greater yellowlegs, and killdeer breed on the Refuge. Waterfowl are seen in large numbers during migration and may include lesser scaup, American wigeon, and northern pintail. Breeding waterfowl include Canada goose, trumpeter swan, blue-winged teal, mallard, and canvasback, among others. Other waterbird species include American white pelican, pied-billed grebe, Virginia rail, Franklin’s gull, black tern, and American bittern.

Grassland birds have responded to the restoration of upland habitat. Species documented on Hamden Slough include, but are not limited to, bobolink; clay-colored, grasshopper, and field sparrows; western meadowlarks; and northern harriers. Species that frequent margins between grassland and wetland include common yellowthroat, LeConte’s sparrow, sedge wren, and savanna sparrow, among others. Upland sandpiper and greater prairie-chicken are attracted to the mowed portion of the drained Hamden Lake.

Mammals on the Refuge include white-tailed deer, coyote, badger, raccoon, striped skunk, mink, and muskrat. Document amphibians and reptiles include eastern garter and smooth green snakes; tiger salamander; plains leopard, wood, and tree frogs; northern spring peeper; common snapping and western painted turtle; and the 12-lined skink.

A.3.3 Public Use

Hunting and Fishing

Muzzleloader hunting for deer and a youth waterfowl hunt are available on the Refuge. There are no fishable waters.

Wildlife Observation and Photography

The roadways crisscrossing the Refuge fragment habitat, but also provide convenient opportunities for wildlife observation. In addition, a pullover is available at Bisson Lake, the Hesby trail and overlook offers a short accessible walk through restored prairie ending at Hesby wetland, and a prairie-chicken observation blind is located on the drained Hamden lakebed.

Environmental Education and Interpretation

Currently, the Refuge does not have a formal environmental education program due to lack of trained, available staff. On request, District staff or volunteers may work with educators to present programs at local schools. An environmental education shelter recently was constructed at the old headquarters area. A prairie curriculum, Prairie Trunk with teaching aids, and a live prairie-chicken webcam are available for use by educators. Interpretive materials and programs are minimal due to lack of staff. Materials include a bird list, informational leaflet, kiosk, and two interpretive panels. Programs include an annual Prairie Fun Day and an interpretive program held in conjunction with the mentored youth waterfowl hunt.

Socioeconomics

Hamden Slough NWR is located in Becker County in west central Minnesota, about forty miles east of the North Dakota border. The population of Becker County was 32,504 in the 2010 census (U.S. Census Bureau, 2012). The Refuge lies seven miles northwest of Detroit Lakes, MN (county seat, population 8,570) and one mile from Audubon, MN (population 520). Becker County has a total area of 1,315 square miles (841,600 acres).

Median household income in Becker County is just over \$46,000; about 11% of the population has income below the poverty line. The five-year estimate (2006–2010) of unemployment is 5.3 percent (U.S. Census Bureau, 2012). About 75 percent of workers are private wage and salary earners, another 14 percent work for the government, and 11 percent are self-employed.

In 2007, Becker County had 1,202 farms totaling nearly 400,000 acres. Total market value of products sold was \$150 million, about evenly divided between crops and livestock/poultry. Net income averaged \$40,137 per farm. Sixty percent of operators had a primary occupation other than farming (U.S. Department of Agriculture, 2007).

In 2009, the tourism industry generated about \$62.6 million in gross sales in Becker County and supported 1,310 jobs, contributing \$4 million in sales tax to the state economy (Explore Minnesota Tourism, 2011). The region offers water-based recreation, cultural attractions, and multiple festivals and special events.

A.3.4 Archeological and Cultural Values

The Cheyenne were the first known historic Native American group to live in the upper reaches of the Red River Valley. They were decimated by smallpox during the early 1780s, leaving the area open for the Ojibwe who became the dominant people in the region until the mid-1800s. The first land cession by the southern Ojibwe was made in 1837. Multiple treaties with the Ojibwe, Dakota, and Winnebago tribes soon opened up central Minnesota to logging and settlement. Construction of the Northern Pacific Railway

through the Hamden Slough region in the late 1800s stimulated tremendous population growth. By 1923, Becker County had a population of nearly 23,000 people.

The Indian Springs site is the only known prehistoric site within the authorized Refuge boundary. It was discovered during a 1997 cultural resources survey (Ward et al.). Three working basalt tools were found, but a period of occupation could not be pinpointed. The survey also located 12 historic farmsteads or other historic sites within the authorized Refuge boundary.

A.4 Environmental Consequences

A.4.1 Effects Common to All Alternatives

Air Quality

None of the management alternatives would have appreciable, long-term impacts on ambient air quality conditions in the area. Habitat management involving prescribed fire would occur under each alternative, but prescribed fire would be used only under ideal weather conditions. Approved smoke management practices developed by state and federal land management agencies would be implemented in all burning events. Nevertheless, under each alternative there would be some potential for temporary air quality impacts from smoke in areas near the Refuge.

Actions to manage smoke include altering ignition techniques and sequence, halting ignition, suppressing the fire, use of local law enforcement as traffic control, and roadway signs. Burning will be done only on days that the smoke will not be blown across nearby communities and/or Refuge neighbors or when the wind is sufficient as not to cause heavy concentrations. The Annual Prescribed Fire Plan for each unit will have specific mitigation measures to deal with unexpected smoke management problems. Refuge staff will work with neighboring agencies and in consultation with Minnesota air quality personnel to address smoke issues that require additional mitigation.

Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their program, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment and to provide minority and low-income communities with access to public information and participation in matters relating to human health or the environment.

None of the alternatives described in this EA will disproportionately place any adverse environmental, economic, social, or health impacts 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 prairie pothole ecosystem in Minnesota have been identified that may need to be considered and addressed in the future. For example:

- If climate conditions continue to be warmer and wetter in the Hamden Slough area, more water may enter the Refuge, resulting in decreased water quality and increased sedimentation in wetland habitats. Downstream flooding and nutrient loading could be exacerbated unless regional land use changes and water discharge/runoff could be mediated.
- More frequent drought conditions in the western portion of the PPR could shift waterfowl use eastward, making habitat restoration in the eastern portion of the PPR (including Hamden Slough NWR) even more important for waterfowl populations.
- Many plant and animal communities may change as species' ranges shift due to changes in climate, with less-adaptable species becoming threatened by the changing conditions and more-tolerant species moving in to take their place. Invasive non-native species often are tolerant to changing conditions and may out-compete native plants for resources.

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 grasslands 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.

Prescribed burning releases carbon dioxide directly to the atmosphere from plants consumed during combustion. However, new vegetation quickly replaces the burned vegetation and, over multiple years of burns, an increasing root network develops below the soil surface in prairies, effectively capturing large quantities of carbon. No net decrease in the amount of carbon sequestered on the Refuge will occur due to prescribed burning. Restoration of uplands and wetlands 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. Grasses and forbs characteristic of the Refuge ecosystem are effective at capturing and storing carbon both above and below the ground.

A.4.2 Summary of Effects by Alternative

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

Habitat

All alternatives would have a positive net effect on quantity and quality of wetland and prairie habitats, although acreage, plant diversity, and quality of wildlife habitat achieved over the next 15 years would vary by alternative. Alternatives B and C would provide the most diverse and highest quality wetland habitat. Alternative C also would provide the highest quality prairie habitat and the greatest increase in overall biological integrity, diversity, and environmental health of the Refuge.

Wetland

Alternative A

Under Alternative A, wetland acreage would increase slowly as the Service continued to acquire and restore lands within the Refuge boundary. Overall plant diversity would remain stable as existing restoration and management programs continued. Invasive hybrid cattail would continue to dominate many wetlands. Overall habitat quality for waterfowl and other wetland wildlife would not change.

Alternatives B and C

Under Alternatives B and C, wetland acreage would increase significantly due to full restoration of Pierce Lake over the next 15 years. Diversity, composition, distribution, and regeneration of native vegetation communities would improve due to a wetland management approach that emulated historic seasonal and long-term water level variations and ensured restoration of each wetland according to its historic type. Efforts to reduce invasive cattails would be more successful. Quality of habitat for waterfowl and other wetland-dependent wildlife would improve along with these improvements in wetland vegetation. Increased physical and biological integrity would improve wetland sustainability and resilience to stressors such as drought, invasive species, and climate change.

Prairie

Alternative A

Under Alternative A, prairie acreage would increase slowly as the current rate of land acquisition continued. Plant diversity would remain mostly stable; newly acquired agricultural lands would continue to be seeded with a variety of native prairie plants, but species composition on existing restorations would not be improved. Overall quality of habitat for grassland birds and nesting waterfowl would remain largely stable as current management programs continued.

Alternative B

Under Alternative B, prairie acreage could increase more than under Alternative A due to the high priority placed on acquisition and restoration of the Pierce Lake area. Prairie plant diversity would remain mostly stable. Newly acquired agricultural lands would continue to be planted with a mix of grasses, sedges, and forbs. Species composition on existing restorations would not be improved. Approximately 850 acres of existing restorations were planted with grasses only, and approximately 550 acres were planted with a mix of grasses, sedges, and forbs.

Quality of habitat for grassland birds and nesting waterfowl would increase due to integrated use of fire, haying, and grazing to provide appropriate structural diversity, which also could benefit many other wildlife species. Wildlife food plots would continue to be farmed; new locations coupled with the use of alternative crops such as alfalfa, wheat, and oats would attract more waterfowl.

Alternative C

Under Alternative C, prairie acreage could increase more than under Alternative A due to the high priority placed on acquisition and restoration of the Pierce Lake area and conversion of all farmed food plots to native prairie vegetation.

Diversity of plant species and habitat structure would both increase significantly compared to Alternatives A and B. Newly acquired agricultural land would continue to be planted to diverse prairie, and floral composition of about 500 acres of existing restored grassland would be enhanced to include many species of forbs and sedges. Seed mixes would be tailored to the specific condition of each site. Enhanced plant diversity would also result in improved habitat structure for wildlife. Integrated use of fire,

grazing, and haying would further improve wildlife habitat structure and would maintain plant and animal diversity over the long term. Increased biological integrity would result in improved overall health of the prairie ecosystem and its resilience to stressors such as drought, invasive species, and climate change.

Watershed

All alternatives would reduce erosion and improve water quality in the Hamden Slough watershed by converting crop fields to native prairie and encouraging adoption of additional conservation measures on privately owned agricultural land. Alternatives B and C include more focused attention on areas of greatest concern within the Hamden watershed, so greater reduction in erosion and sediment and more natural waterflow patterns would be expected under these two alternatives than under Alternative A, with increased benefits to Refuge wetlands, water quality, and downstream flood reduction.

Wildlife

Migratory birds and other wildlife of the prairie pothole ecosystem would benefit from all three alternatives, although the magnitude of benefit for Refuge priority species would vary. Alternative C provides the greatest overall benefits to priority wildlife species due to increased quality of both wetland and prairie habitats.

Waterfowl

Under Alternative A, waterfowl numbers would remain stable or show a small increase. Quality of habitat would not change much, but amount of habitat could increase as land acquisition and restoration continue.

Under Alternatives B and C, significant increases in waterfowl numbers during breeding and migration would be expected as wetland habitat improves due to improved hydrology and diversity of vegetation and a large increase in acreage when Pierce Lake is restored. Upland nesting habitat also would improve compared to Alternative A due to greater emphasis on managing to provide mixed vegetation structure for a wide variety of upland nesting ducks.

Under Alternative B, islands and overwater nesting structures would also be constructed in the restored wetlands to provide additional waterfowl nesting sites. These features would benefit generalist species, primarily mallards and Canada geese that readily utilize both nesting islands and structures. Benefits to upland-nesting ducks with more specific requirements, such as blue-winged teal and northern pintail, would be minimal. Both species are declining in Minnesota while mallards and Canada geese are increasing (Sauer, 2011). Construction of nesting islands is extremely expensive, and therefore, locations must be planned in order to maximize use, while minimizing predation and deterioration (Shaffer et al., 1999). In addition, annual maintenance of both features requires significant staff time. With limited resources available, the addition of overwater nesting structures and islands must be carefully considered.

Grassland Birds

Under Alternative A, grassland bird populations would remain stable or increase slightly. Quality of habitat would not change much, but amount of habitat could increase as land acquisition and restoration continued.

Grassland bird populations are more likely to increase under Alternative B than under Alternative A, because the increased emphasis on fire, grazing, and haying that would provide mixed vegetation structure for upland nesting waterfowl also would provide improved structural diversity needed by priority grassland bird species.

Grassland bird populations would benefit most under Alternative C because of the increase in prairie habitat diversity compared to Alternatives A and B. Each grassland bird species has unique habitat requirements. For example, sedge wrens prefer tall dense vegetation, western meadowlarks like moderate-to-tall patchy vegetation, and upland sandpipers do well in shorter vegetation, while preferred habitat of greater prairie-chickens varies by season. Improved floral composition of restored prairies

under Alternative C would increase the structural diversity needed by priority grassland birds beyond what could be accomplished solely with fire, grazing, and haying in a prairie with few plant species.

Greater prairie-chickens currently utilize a mowed lek area within the drained Hamden lakebed. When Hamden Lake is fully restored, the lek will likely be under water. However, the lek is merely a breeding ground used to attract a mate, and prairie-chickens will readily mobilize to a more suitable area if conditions are not right. No nesting habitat will be lost with the restoration of Hamden Lake, thus no detrimental effects on prairie-chicken numbers will occur. In fact, additional nesting habitat will be added under Alternative C as food plots are restored to tallgrass prairie vegetation and more upland acres are acquired.

Other Wildlife

Wetland birds—including priority species such as sedge wren, marbled godwit, black tern, Le Conte's sparrow, and migratory shorebirds—would benefit most under Alternatives B and C due to increased quantity and quality of wetland and wet prairie habitat. Ultimately, when Hamden Lake is restored, much of what is now attractive habitat to marbled godwits could potentially be under water, depending on climate conditions at a given time. However, with increased restoration of wet meadow and temporary wetland habitats on the Refuge under Alternatives B and C, there will be quality habitat available to meet the needs of marbled godwits and other wetland wildlife.

Butterflies and other prairie insects would benefit most under Alternative C due to increased diversity of tallgrass prairie plants. Higher diversity plant communities have more species of insects than do lower-quality sites. Prairie insects are major contributors to many ecosystem functions including soil formation and aeration, plant decomposition, and seed distribution. In addition, more than half of all flowering plants require insects for pollination (Helzer, 2010),

Alternative C would provide the most benefit to many reptiles, amphibians, and small mammals. The more-diverse plant community would provide microhabitats needed by many animals for cover, nesting, and thermal regulation. The high diversity of plants and insects would provide stable, balanced food sources.

People

Under Alternative A, wildlife-dependent recreation opportunities, visitor numbers, and economic effects of the Refuge on the local community would remain largely stable.

Under Alternative B, some wildlife-dependent recreation opportunities would be reduced (deer hunting eliminated), while others would increase (wildlife viewing sites, self-guided interpretation) or remain stable. Each change would directly affect the people who participate in that activity, but overall quality of opportunities would increase, as would visitor numbers. County property tax revenues would decline as land acquisition continues, although at least some of that reduction would be mitigated by Refuge Revenue Sharing payments. The local economy would benefit from cooperative grazing, haying, and farming activities on Refuge lands.

Under Alternative C, some wildlife-dependent recreation opportunities would be stable (hunting) and others would increase (environmental education, wildlife viewing sites, self-guided interpretation). Each change would directly affect the people who participate in that activity, but overall quality of opportunities would increase, as would visitor numbers. Local schools would benefit from increased access to environmental education programs. County property tax revenues would decline as land acquisition continues, although at least some of that reduction would be mitigated by Refuge Revenue Sharing payments. The local economy would benefit from cooperative grazing, haying, and short-term farming activities on Refuge lands.

Table A-2: Summary of Impacts by Alternative

Issues	Alternative A (No Action) Current Direction	Alternative B Wetland Focus	Alternative C (Preferred) Wetland and Prairie Focus
HABITAT AND WILDLIFE			
<i>Wetland</i>	Small increase in acreage. Stable plant diversity. Stable wetland wildlife habitat.	Significant increase in acreage. Increased plant diversity. More diverse wetland wildlife habitat.	Significant increase in acreage. Increased plant diversity. More diverse wetland wildlife habitat.
<i>Prairie</i>	Stable or small increase in acreage. Stable plant diversity. Stable habitat structure.	Some increase in acreage. Stable plant diversity. Some increase in structural habitat diversity.	Some increase in acreage. Increased plant diversity Significant increase in structural habitat diversity.
<i>Water quantity and quality</i>	Little or no change.	Improved.	Improved.
<i>Waterfowl populations</i>	Stable or small increase.	Significant increase.	Significant increase.
<i>Grassland bird populations</i>	Stable or small increase.	Some increase.	Significant increase.
PEOPLE			
<i>Hunting</i>	Stable opportunities. No program changes.	Reduced opportunities (deer hunt eliminated; waterfowl hunt continued).	Stable opportunities. Potential increases in quality.
<i>Wildlife observation opportunities</i>	Stable.	Some increases.	Some increases.
<i>Quality of environmental education and interpretation</i>	Small increase.	Increase in self-guided interpretation.	Significant increase in environmental education. Increase in self-guided interpretation.
<i>Quality of signs, brochures, website</i>	Small increase. Occasional improvements.	Increased.	Increased.
<i>Public awareness and support</i>	Stable.	Increased.	Increased.

Appendix B: Species of Concern

In this appendix:

[Priority Species of Concern for Hamden Slough NWR](#)
[Comprehensive List of Species of Concern for Hamden Slough NWR](#)

Priority Species of Concern for Hamden Slough NWR

Focal Species	Habitat Type	Habitat Structure	Life History Requirement	Other Benefiting Species
Greater Prairie-Chicken Upland Sandpiper Marbled Godwit	Mesic Prairie	Short, open vegetation	Breeding Foraging Foraging, Breeding	Short-eared Owl, Western Meadowlark
Upland Sandpiper Greater Prairie-Chicken Western Meadowlark Blue-winged Teal		Moderate to tall vegetation, patchy	Full Season Nesting and Brood Rearing Full Season Nesting	Northern Harrier, Upland Sandpiper, Grasshopper Sparrow, Savannah Sparrow
Mallard Northern Harrier Bobolink		Moderate to tall, dense vegetation	Nesting Full Season Full Season	Common Yellowthroat, Sedge Wren, Le Conte's Sparrow
Marbled Godwit Greater Prairie-Chicken Le Conte's Sparrow	Wet Prairie	Disturbed prairie (hay or grazing), areas with low or patchy vegetation	Foraging, Breeding Breeding Full Season	Hudsonian Godwit, Blue-winged Teal, Wilson's Phalarope, Western Meadowlark Nelson's (Sharp-tailed) Sparrow, Savannah Sparrow
Mallard Northern Harrier Sedge Wren Le Conte's Sparrow		Tall, dense vegetation	Nesting Full Season Full Season Full Season	Sandhill Crane, Bobolink, Common Yellowthroat, American Bittern, Nelson's (Sharp-tailed) Sparrow
Marbled Godwit Migratory Shorebirds	Wetland Natural Depression (divided by zone)	Shallow water, short/sparse to open shoreline, low/disturbed vegetation	Foraging	Migratory Shorebirds, American bittern, Loafing Waterfowl
Mallard Black Tern Le Conte's Sparrow		Hemi-marsh, interspersed vegetation and shallow open water, peripheral vegetation	Full Season Full Season Full Season	Waterfowl, Sora, American Bittern, Black-crowned Night Heron, Nelson's (Sharp-tailed) Sparrow
Northern Harrier Sedge Wren Greater Prairie-Chicken		Tall, dense vegetation	Full Season Full Season Wintering	Red-winged Blackbird, Yellow-headed Blackbird, Sora, American Bittern, Common Yellowthroat, Marsh Wren
Canvasback Lesser Scaup Black Tern Sedge Wren	Managed Impoundments	Varying degrees of vegetation and open water	Breeding, Molting/Migration Molting/Migration Full Season Full Season	Waterfowl, Migratory Shorebirds, Blackbirds, Sora, American Bittern, Bald Eagle, Marsh Wren

Comprehensive List of Species of Concern for Hamden Slough NWR

Hamden Slough NWR Comprehensive List of Bird Species of Concern			USFWS BCC 2008		U.S. Shorebird Con. Plan	PPJV		PPP LLC 2009	PIF Priority Spp. 1998	Audubon Watch list 2007		NA Waterbird Plan- NPPP	R3 RCP 2002	State-End, Thr, SpC	MN SGCN
Common Name	Scientific Name	Refuge Purpose	BCR-11	FWS-R3		PPJV	R3			Red	Yellow				
Loons															
Common Loon	<i>Gavia immer</i>												Rare / declining		X
Grebes															
Pied-billed Grebe*	<i>Podilymbus podiceps</i>			X		X		X	X						
Horned Grebe	<i>Podiceps auritus</i>		X	X		X						High Concern		Thr	X
Red-necked Grebe*	<i>Podiceps grisegena</i>														X
Eared Grebe	<i>Podiceps nigricollis</i>											Moderate Concern			X
Pelicans															
American White Pelican	<i>Pelecanus erythrorhynchos</i>											Moderate Concern		SpC	X
Herons/Bitterns															
American Bittern*	<i>Botaurus lentiginosus</i>		X	X		X			X			High Concern	Rare / declining		X
Least Bittern	<i>Ixobrychus exilis</i>		X	X			X					Very High Concern	Rare / declining		X
Great Blue Heron	<i>Ardea herodias</i>											Moderate Concern			
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>											Moderate Concern	Rare / declining		X
Ducks, Geese, Swans															
Canada Goose*	<i>Branta canadensis</i>	X													
Trumpeter Swan*	<i>Cygnus buccinator</i>	X				X			X		X		Rare / declining?	Thr	X
Wood Duck	<i>Aix sponsa</i>	X					X		X						
Gadwall	<i>Anas strepera</i>	X				X									
American Wigeon	<i>Anas americana</i>	X				X									
Mallard*	<i>Anas platyrhynchos</i>	X				X		X							
Blue-winged Teal*	<i>Anas discors</i>	X				X									
Northern Shoveler	<i>Anas clypeata</i>	X				X									
Northern Pintail	<i>Anas acuta</i>	X				X							Rare / declining		X
Green-winged Teal	<i>Anas crecca</i>	X													
Canvasback*	<i>Aythya valisineria</i>	X				X							?????		
Redhead*	<i>Aythya americana</i>	X				X									
Ring-necked Duck*	<i>Aythya collaris</i>	X				X									
Greater Scaup	<i>Aythya marila</i>	X													
Lesser Scaup	<i>Aythya affinis</i>	X				X							Rare / declining		
Bufflehead	<i>Bucephala albeola</i>	X													

Hamden Slough NWR Comprehensive List of Bird Species of Concern			USFWS BCC 2008		U.S. Shorebird Con. Plan	PPJV		PPP LLC 2009	PIF Priority Spp. 1998	Audubon Watch list 2007		NA Waterbird Plan- NPPP	R3 RCP 2002	State-End, Thr, SpC	MN SGCN
Common Name	Scientific Name	Refuge Purpose	BCR-11	FWS-R3		N Plains-Prairie Parklands	PPJV			R3	Red				
Common Goldeneye	<i>Bucephala clangula</i>	X													
Hooded Merganser	<i>Lophodytes cucullatus</i>	X							X						
Common Merganser	<i>Mergus merganser</i>	X													
Red-breasted Merganser	<i>Mergus serrator</i>	X													
Ruddy Duck*	<i>Oxyura jamaicensis</i>	X													
Hawks & Eagles															
Bald Eagle	<i>Haliaeetus leucocephalus</i>		X	X					X				????		X
Northern Harrier*	<i>Circus cyaneus</i>					X		X					Rare / declining		X
Northern Goshawk	<i>Accipiter gentilis</i>												Rare / declining		X
Red-shouldered Hawk	<i>Buteo lineatus</i>												Rare / declining	SpC	X
Falcons															
Peregrine Falcon	<i>Falco peregrinus</i>		X	X									Rare / declining	Thr	X
Upland Game Birds															
Greater Prairie-Chicken	<i>Tympanuchus cupido</i>					X			X	X				SpC	X
Rails & Coots															
Yellow Rail	<i>Coturnicops noveboracensis</i>		X	X		X		X	X	X		High Concern	Rare / declining	SpC	X
Virginia Rail	<i>Rallus limicola</i>								X			Moderate Concern			X
Sora*	<i>Porzana carolina</i>					X			X						
American Coot*	<i>Fulica americana</i>						X								
Cranes															
Sandhill Crane	<i>Grus canadensis</i>						X								
Shorebirds															
Black-bellied Plover	<i>Pluvialis squatarola</i>				Moderate										
American Golden Plover	<i>Pluvialis dominica</i>				High-migrant habitat						X				X
Semipalmated Plover	<i>Charadrius semipalmatus</i>				Moderate-migrant habitat										
Killdeer*	<i>Charadrius vociferus</i>				Moderate										
American Avocet	<i>Recurvirostra americana</i>				High-Spp Concern										X
Lesser Yellowlegs	<i>Tringa flavipes</i>				Moderate-migrant habitat										
Greater Yellowlegs*	<i>Tringa melanoleuca</i>				Moderate								Rare / declining		X
Solitary Sandpiper	<i>Tringa solitaria</i>		X	X	Moderate										
Willet	<i>Tringa semipalmata</i>				Moderate										

Hamden Slough NWR Comprehensive List of Bird Species of Concern			USFWS BCC 2008		U.S. Shorebird Con. Plan	PPJV		PPP LLC 2009	PIF Priority Spp. 1998	Audubon Watch list 2007		NA Waterbird Plan- NPPP	R3 RCP 2002	State-End, Thr, SpC	MN SGCN
Common Name	Scientific Name	Refuge Purpose	BCR-11	FWS-R3	N Plains-Prairie Parklands	PPJV	R3			Red	Yellow				
Spotted Sandpiper	<i>Actitis macularius</i>				Moderate										
Upland Sandpiper	<i>Bartramia longicauda</i>		X	X	High-Spp Concern, breed	X							Rare / declining		X
Whimbrel	<i>Numenius phaeopus</i>			X	High								Rare / declining		X
Hudsonian Godwit	<i>Limosa haemastica</i>		X	X	High-Spp Concern	X					X		Rare / declining		X
Marbled Godwit*	<i>Limosa fedoa</i>		X	X	High-Spp Concern	X		X	X		X		Rare / declining	SpC	X
Ruddy Turnstone	<i>Arenaria interpres</i>				High										X
Red Knot	<i>Calidris canutus</i>			X	Low-UnC in region						X				
Sanderling	<i>Calidris alba</i>				Low-UnC in region						X				
Semipalmated Sandpiper	<i>Calidris pusilla</i>				High-migrant habitat		X				X				X
Least Sandpiper	<i>Calidris minutilla</i>				Moderate										
White-rumped Sandpiper	<i>Calidris fuscicollis</i>				High-migrant habitat		X				X				X
Baird's Sandpiper	<i>Calidris bairdii</i>				Moderate-migrant habitat										
Pectoral Sandpiper	<i>Calidris melanotos</i>				Moderate-migrant habitat										
Dunlin	<i>Calidris alpina</i>				High-migrant habitat		X								X
Stilt Sandpiper	<i>Calidris himantopus</i>				Moderate-migrant habitat						X		Rare / declining		
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>		X	X	High					X			Rare / declining		X
Short-billed Dowitcher	<i>Limnodromus griseus</i>		X	X	Moderate								Rare / declining		X
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>				Moderate-migrant habitat										
Common Snipe*	<i>Gallinago gallinago</i>				Moderate-migrant habitat				X						
American Woodcock	<i>Scolopax minor</i>						X						Rare / declining		X
Wilson's Phalarope	<i>Phalaropus tricolor</i>				High-Spp Concern	X		X	X				Rare / declining	Thr	X
Gulls/Terns															
Franklin's Gull	<i>Leucophaeus pipixcan</i>					X			X			High Concern		SpC	X
Caspian Tern	<i>Hydroprogne caspia</i>											Moderate Concern			
Common Tern	<i>Sterna hirundo</i>			X								Moderate Concern	Rare / declining	Thr	X
Forster's Tern	<i>Sterna forsteri</i>												Rare / declining	SpC	X
Black Tern*	<i>Chlidonias niger</i>		X	X		X			X			High Concern	Rare / declining		X
Doves															

Hamden Slough NWR Comprehensive List of Bird Species of Concern				USFWS BCC 2008		U.S. Shorebird Con. Plan		PPJV		PPP LLC 2009		PIF Priority Spp. 1998		Audubon Watch list 2007		NA Waterbird Plan- NPPP		R3 RCP 2002		State-End, Thr, SpC		MN SGCN	
Common Name	Scientific Name	Refuge Purpose	BCR-11	FWS-R3	N Plains-Prairie Parklands	PPJV	R3					Red	Yellow										
Mourning Dove*	<i>Zenaida macroura</i>						X																
Cuckoos/Roadrunners																							
Black-billed Cuckoo*	<i>Coccyzus erythrophthalmus</i>		X	X			X			X									Rare / declining			X	
Owls																							
Long-eared Owl	<i>Asio otus</i>																		Rare / declining				
Short-eared Owl	<i>Asio flammeus</i>		X	X		X							X						Rare / declining	SpC		X	
Nighthawks/Nightjars																							
Common Nighthawk	<i>Chordeiles minor</i>																					X	
Whip-poor-will	<i>Caprimulgus vociferus</i>			X															Rare / declining				
Woodpeckers																							
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>		X	X			X			X									Rare / declining				
Yellow-bellied Sapsucker*	<i>Sphyrapicus varius</i>																					X	
Northern Flicker*	<i>Colaptes auratus</i>									X									Rare / declining				
Flycatchers																							
Eastern Wood-pewee	<i>Contopus virens</i>																					X	
Least Flycatcher	<i>Empidonax minimus</i>																					X	
Swallows																							
Northern Rough-winged Swallow*	<i>Stelgidopteryx serripennis</i>																					X	
Wrens																							
House Wren*	<i>Troglodytes aedon</i>									X													
Sedge Wren*	<i>Cistothorus platensis</i>					X			X	X									Rare / declining			X	
Marsh Wren*	<i>Cistothorus palustris</i>					X			X													X	
Warblers																							
Golden-winged Warbler	<i>Vermivora chrysoptera</i>			X								X							Rare / declining			X	
Cape May Warbler	<i>Setophaga tigrina</i>																		Rare / declining			X	
Bay-breasted Warbler	<i>Setophaga castanea</i>												X									X	
Ovenbird	<i>Seiurus aurocapilla</i>																					X	
Connecticut Warbler	<i>Oporornis agilis</i>																		Rare / declining			X	
Canada Warbler	<i>Cardellina canadensis</i>			X									X						Rare / declining			X	
Sparrows/Grosbeaks																							
Clay-colored Sparrow*	<i>Spizella pallida</i>						X			X													

Hamden Slough NWR Comprehensive List of Bird Species of Concern			USFWS BCC 2008		U.S. Shorebird Con. Plan	PPJV		PPP LLC 2009	PIF Priority Spp. 1998	Audubon Watch list 2007		NA Waterbird Plan- NPPP	R3 RCP 2002	State-End, Thr, SpC	MN SGCN
Common Name	Scientific Name	Refuge Purpose	BCR-11	FWS-R3		PPJV	R3			Red	Yellow				
Field Sparrow	<i>Spizella pusilla</i>												Rare / declining		X
Vesper Sparrow	<i>Poocetes gramineus</i>					X			X						
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		X			X			X				Rare / declining		X
Henslow's Sparrow	<i>Ammodramus henslowii</i>			X		X		X		X			Rare / declining	End	X
Le Conte's Sparrow	<i>Ammodramus leconteii</i>					X					X		Rare / declining		X
Nelson's (Sharp-tailed) Sparrow	<i>Ammodramus nelsoni</i>		X	X		X			X		X		Rare / declining	SpC	X
Swamp Sparrow	<i>Melospiza georgiana</i>														X
White-throated Sparrow	<i>Zonotrichia albicollis</i>														X
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>														X
Dickcissel	<i>Spiza americana</i>		X	X		X			X				Rare / declining		X
Blackbirds/Orioles															
Bobolink*	<i>Dolichonyx orizivorus</i>					X			X				Rare / declining		X
Eastern Meadowlark	<i>Sturnella magna</i>												Rare / declining		X
Western Meadowlark*	<i>Sturnella neglecta</i>					X							Rare / declining		
Rusty Blackbird	<i>Euphagus carolinus</i>			X											X
Orchard Oriole	<i>Icterus spurius</i>												Rare / declining		

*asterisk indicates documented nesting on the Refuge

Appendix C: Species Lists

In this appendix:

[Hamden Slough NWR Birds](#)
[Hamden Slough NWR Mammals](#)
[Hamden Slough NWR Plants](#)

Hamden Slough NWR Birds

Species and Abundance		Spring	Summer	Fall	Winter
Loons					
Common Loon	<i>Gavia immer</i>	o	r	r	
Grebes					
Pied-billed Grebe*	<i>Podilymbus podiceps</i>	c	c	c	
Horned Grebe	<i>Podiceps auritus</i>	r		r	
Red-necked Grebe*	<i>Podiceps grisegena</i>	r	r		
Eared Grebe	<i>Podiceps nigricollis</i>	r		r	
Pelicans					
American White Pelican	<i>Pelecanus erythrorhynchos</i>	o	o	o	
Cormorants					
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	c	o	o	
Hérons and Bitterns					
American Bittern*	<i>Botaurus lentiginosus</i>	u	u	u	
Least Bittern	<i>Ixobrychus exilis</i>	r	r	r	
Great Blue Heron	<i>Ardea herodias</i>	c	c	c	
Great Egret	<i>Ardea alba</i>	o	o	o	
Cattle Egret	<i>Bubulcus ibis</i>	r		r	
Green Heron*	<i>Butorides virescens</i>	u	u	u	
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	r		r	
Vultures					
Turkey Vulture	<i>Cathartes aura</i>	o	r	o	
Ducks, Geese, and Swans					
Greater White-fronted Goose	<i>Anser albifrons</i>	r		r	
Snow Goose	<i>Chen caerulescens</i>	o		o	
Ross's Goose	<i>Chen rossii</i>	r		r	
Canada Goose*	<i>Branta canadensis</i>	a	c	a	r
Trumpeter Swan*	<i>Cygnus buccinator</i>	o	o	o	
Tundra Swan	<i>Cygnus columbianus</i>	o	o	o	
Wood Duck	<i>Aix sponsa</i>	a	c	a	
Gadwall	<i>Anas strepera</i>	c	r	u	
American Wigeon	<i>Anas americana</i>	u	u	u	
American Black Duck	<i>Anas rubripes</i>	r	r	r	
Mallard*	<i>Anas platyrhynchos</i>	a	u	a	
Blue-winged Teal*	<i>Anas discors</i>	c	c	c	
Northern Shoveler	<i>Anas clypeata</i>	c	o	c	
Northern Pintail	<i>Anas acuta</i>	c	o	o	

Species and Abundance		Spring	Summer	Fall	Winter
Green-winged Teal	<i>Anas crecca</i>	u		u	
Canvasback*	<i>Aythya valisineria</i>	c	u	c	
Redhead*	<i>Aythya americana</i>	c	u	c	
Ring-necked Duck*	<i>Aythya collaris</i>	c	o	c	
Greater Scaup	<i>Aythya marila</i>	r		r	
Lesser Scaup	<i>Aythya affinis</i>	c	r	c	
Bufflehead	<i>Bucephala albeola</i>	c	r	u	
Common Goldeneye	<i>Bucephala clangula</i>	c	r	u	
Hooded Merganser	<i>Lophodytes cucullatus</i>	u	r	u	
Common Merganser	<i>Mergus merganser</i>	r	r	r	
Red-breasted Merganser	<i>Mergus serrator</i>	r	r	r	
Ruddy Duck*	<i>Oxyura jamaicensis</i>	u	r	u	
Hawks and Eagles					
Osprey	<i>Pandion haliaetus</i>	r	r	r	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	c	u	c	r
Northern Harrier*	<i>Circus cyaneus</i>	c	c	c	
Sharp-shinned Hawk	<i>Accipiter striatus</i>	u	r	u	
Cooper's Hawk	<i>Accipiter cooperii</i>	u	u	u	
Northern Goshawk	<i>Accipiter gentilis</i>	r		r	
Red-shouldered Hawk	<i>Buteo lineatus</i>	u	r	u	
Broad-winged Hawk	<i>Buteo platypterus</i>	u	r	u	
Red-tailed Hawk*	<i>Buteo jamaicensis</i>	c	c	c	u
Rough-legged Hawk	<i>Buteo lagopus</i>	o		r	r
Golden Eagle	<i>Aquila chrysaetos</i>	r		r	r
Falcons					
American Kestrel*	<i>Falco sparverius</i>	c	c	c	
Merlin	<i>Falco columbarius</i>	r		r	
Peregrine Falcon	<i>Falco peregrinus</i>	o	o	o	
Prairie Falcon	<i>Falco mexicanus</i>	r		r	
Upland Game Birds					
Gray Partridge	<i>Perdix perdix</i>	o	o	o	o
Ring-necked Pheasant	<i>Phasianus colchicus</i>	o	o	o	o
Greater Prairie-Chicken	<i>Tympanuchus cupido</i>	o	r	r	r
Wild Turkey*	<i>Meleagris gallopavo</i>	r	r	r	r
Rails and Coots					
Yellow Rail	<i>Coturnicops noveboracensis</i>	r	r	r	
Virginia Rail	<i>Rallus limicola</i>	c	c	c	
Sora*	<i>Porzana carolina</i>	c	c	c	
American Coot*	<i>Fulica americana</i>	a	c	a	
Cranes					
Sandhill Crane	<i>Grus canadensis</i>	r	r	r	
Shorebirds					
Black-bellied Plover	<i>Pluvialis squatarola</i>	o	o	o	
American Golden Plover	<i>Pluvialis dominica</i>	o		o	
Semipalmated Plover	<i>Charadrius semipalmatus</i>	o	o	o	

Species and Abundance		Spring	Summer	Fall	Winter
Killdeer*	<i>Charadrius vociferus</i>	c	c	c	
American Avocet	<i>Recurvirostra americana</i>	u	r	u	
Lesser Yellowlegs	<i>Tringa flavipes</i>	c	o	o	
Greater Yellowlegs*	<i>Tringa melanoleuca</i>	c	o	o	
Solitary Sandpiper	<i>Tringa solitaria</i>	u	o	u	
Willet	<i>Tringa semipalmata</i>	u	r	u	
Spotted Sandpiper	<i>Actitis macularius</i>	u	u	u	
Upland Sandpiper	<i>Bartramia longicauda</i>	r	r	r	
Whimbrel	<i>Numenius phaeopus</i>	r	r	r	
Hudsonian Godwit	<i>Limosa haemastica</i>	r		r	
Marbled Godwit*	<i>Limosa fedoa</i>	u	u	u	
Ruddy Turnstone	<i>Arenaria interpres</i>	r		r	
Red Knot	<i>Calidris canutus</i>	o	o	o	
Sanderling	<i>Calidris alba</i>	o	o	o	
Semipalmated Sandpiper	<i>Calidris pusilla</i>	o	o	o	
Least Sandpiper	<i>Calidris minutilla</i>	o	o	o	
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	o	o	o	
Baird's Sandpiper	<i>Calidris bairdii</i>	o	o	o	
Pectoral Sandpiper	<i>Calidris melanotos</i>	o	o	o	
Dunlin	<i>Calidris alpina</i>	o	o	o	
Stilt Sandpiper	<i>Calidris himantopus</i>	o	o	o	
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	o	o	o	
Short-billed Dowitcher	<i>Limnodromus griseus</i>	o	o	o	
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	r		r	
Comon Snipe*	<i>Gallinago gallinago</i>	c	o	c	
American Woodcock	<i>Scolopax minor</i>	o		o	
Wilson's Phalarope	<i>Phalaropus tricolor</i>	c	o	o	
Red-necked Phalarope	<i>Phalaropus lobatus</i>	o	o	o	
Gulls and Terns					
Franklin's Gull	<i>Leucophaeus pipixcan</i>	c		c	
Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>	u		u	
Ring-billed Gull	<i>Larus delawarensis</i>	o	o	o	
Herring Gull	<i>Larus argentatus</i>	r	r	r	
Caspian Tern	<i>Hydroprogne caspia</i>	r		r	
Common Tern	<i>Sterna hirundo</i>	u	r	u	
Forster's Tern	<i>Sterna forsteri</i>	u	r	u	
Black Tern*	<i>Chlidonias niger</i>	c	u	c	
Doves					
Rock Pigeon	<i>Columba livia</i>	c	c	c	c
Mourning Dove*	<i>Zenaida macroura</i>	c	c	c	
Cuckoos and Roadrunners					
Black-billed Cuckoo*	<i>Coccyzus erythrophthalmus</i>	r	r		
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	r	r		
Owls					

Species and Abundance		Spring	Summer	Fall	Winter
Eastern Screech-Owl	<i>Megascops asio</i>	r	r	r	
Great Horned Owl*	<i>Bubo virginianus</i>	u	u	u	u
Snowy Owl	<i>Bubo scandiacus</i>	r			o
Long-eared Owl	<i>Asio otus</i>	r		r	
Short-eared Owl	<i>Asio flammeus</i>	r		r	
Nighthawks and Nightjars					
Common Nighthawk	<i>Chordeiles minor</i>	u	r	u	
Whip-poor-will	<i>Caprimulgus vociferus</i>	r	r	r	
Swifts					
Chimney Swift*	<i>Chaetura pelagica</i>	o	r	o	
Hummingbirds					
Ruby-throated Hummingbird*	<i>Archilochus colubris</i>	u	u	u	
Kingfishers					
Belted Kingfisher*	<i>Megaceryle alcyon</i>	o	o	o	
Woodpeckers					
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	r	u		
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	o	o	o	
Yellow-bellied Sapsucker*	<i>Sphyrapicus varius</i>	u	u	u	
Downy Woodpecker*	<i>Picoides pubescens</i>	u	u	u	u
Hairy Woodpecker*	<i>Picoides villosus</i>	u	u	u	u
Northern Flicker*	<i>Colaptes auratus</i>	c	u	c	
Pileated Woodpecker*	<i>Dryocopus pileatus</i>	r	r	r	r
Flycatchers					
Eastern Wood-pewee	<i>Contopus virens</i>	r			
Least Flycatcher	<i>Empidonax minimus</i>	o	o	o	
Eastern Phoebe*	<i>Sayornis phoebe</i>	u	u	u	
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	r	r	r	
Western Kingbird	<i>Tyrannus verticalis</i>	r	r	r	
Eastern Kingbird*	<i>Tyrannus tyrannus</i>	o	c	o	
Shrikes					
Northern Shrike	<i>Lanius excubitor</i>	r		r	r
Vireos					
Yellow-throated Vireo*	<i>Vireo flavifrons</i>	u	r	r	
Blue-headed (Solitary) Vireo	<i>Vireo solitarius</i>	r	r	r	
Warbling Vireo*	<i>Vireo gilvus</i>	u	r	r	
Philadelphia Vireo	<i>Vireo philadelphicus</i>	r	r	r	
Red-eyed Vireo*	<i>Vireo olivaceus</i>	u	r	r	
Jays, Magpies, Crows					
Blue Jay*	<i>Cyanocitta cristata</i>	c	c	u	c
Black-billed Magpie	<i>Pica hudsonia</i>	r		r	r
American Crow*	<i>Corvus brachyrhynchos</i>	a	c	a	o
Common Raven	<i>Corvus corax</i>	r		r	r
Larks					
Horned Lark	<i>Eremophila alpestris</i>	a	u	c	o
Swallows					

Species and Abundance		Spring	Summer	Fall	Winter
Purple Martin	<i>Progne subis</i>	o	o	o	
Tree Swallow*	<i>Tachycineta bicolor</i>	a	c	a	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	c	o	c	
Bank Swallow	<i>Riparia riparia</i>	c	o	c	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	u	u	u	
Barn Swallow*	<i>Hirundo rustica</i>	a	c	a	
Chickadees and Titmice					
Black-capped Chickadee*	<i>Poecile atricapillus</i>	c	u	c	a
Nuthatches					
Red-breasted Nuthatch*	<i>Sitta canadensis</i>	r	r	r	r
White-breasted Nuthatch*	<i>Sitta carolinensis</i>	c	u	c	c
Creepers					
Brown Creeper	<i>Certhia americana</i>	r	r	r	r
Wrens					
House Wren*	<i>Troglodytes aedon</i>	o	o	o	
Sedge Wren*	<i>Cistothorus platensis</i>	c	c	u	
Marsh Wren*	<i>Cistothorus palustris</i>	c	c	u	
Kinglets, Bluebirds, Thrushes					
Golden-crowned Kinglet	<i>Regulus satrapa</i>	r		r	r
Ruby-crowned Kinglet	<i>Regulus calendula</i>	r		r	
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>	r		r	
Eastern Bluebird*	<i>Sialia sialis</i>	c	c	c	
Townsend's Solitaire	<i>Myadestes townsendi</i>			r	r
Veery	<i>Catharus fuscescens</i>	r		r	
Gray-cheeked Thrush	<i>Catharus minimus</i>	r		r	
Swainson's Thrush	<i>Catharus ustulatus</i>	r		r	
Hermit Thrush	<i>Catharus guttatus</i>	r		r	
American Robin*	<i>Turdus migratorius</i>	a	a	u	r
Mimics					
Gray Catbird*	<i>Dumetella carolinensis</i>	u	u	u	
Northern Mockingbird	<i>Mimus polyglottos</i>	r	r	r	
Brown Thrasher*	<i>Toxostoma rufum</i>	u	u	u	
Starlings					
European Starling	<i>Sturnus vulgaris</i>	o	o	o	o
Pipits					
American Pipit	<i>Anthus rubescens</i>	r		r	
Waxwings					
Bohemian Waxwing	<i>Bombycilla garrulus</i>	r			r
Cedar Waxwing	<i>Bombycilla cedrorum</i>	r	r	r	r
Warblers					
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	r		r	
Tennessee Warbler	<i>Oreothlypis peregrina</i>	o	r	r	
Orange-crowned Warbler	<i>Oreothlypis celata</i>	u		o	
Nashville Warbler	<i>Oreothlypis ruficapilla</i>	o	r	o	
Northern Parula	<i>Setophaga americana</i>	r		r	

Species and Abundance		Spring	Summer	Fall	Winter
Yellow Warbler*	<i>Setophaga petechia</i>	c	c	c	
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	r	r	r	
Magnolia Warbler	<i>Setophaga magnolia</i>	r		r	
Cape May Warbler	<i>Setophaga tigrina</i>	r		r	
Yellow-rumped Warbler	<i>Setophaga coronata</i>	u		u	
Black-throated Green Warbler	<i>Setophaga virens</i>	r		r	
Blackburnian Warbler	<i>Setophaga fusca</i>	r		r	
Pine Warbler	<i>Setophaga pinus</i>	o		o	
Palm Warbler	<i>Setophaga palmarum</i>	u		u	
Bay-breasted Warbler	<i>Setophaga castanea</i>	r		r	
Blackpoll Warbler	<i>Setophaga striata</i>	r		r	
Black-and-white Warbler	<i>Mniotilta varia</i>	o	r	o	
American Redstart	<i>Setophaga ruticilla</i>	o	r	o	
Ovenbird	<i>Seiurus aurocapilla</i>	o	r	r	
Northern Waterthrush	<i>Parkesia noveboracensis</i>	r		r	
Connecticut Warbler	<i>Oporornis agilis</i>	r		r	
Mourning Warbler	<i>Geothlypis philadelphia</i>	r		r	
Common Yellowthroat*	<i>Geothlypis trichas</i>	c	c	c	
Wilson's Warbler	<i>Cardellina pusilla</i>	o	r	o	
Canada Warbler	<i>Cardellina canadensis</i>	r	r	r	
Tanagers					
Scarlet Tanager	<i>Piranga olivacea</i>	o	r	o	
Sparrows, Buntings, Grosbeaks					
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	u			
American Tree Sparrow	<i>Spizella arborea</i>	u		u	
Chipping Sparrow*	<i>Spizella passerina</i>	c	c	c	
Clay-colored Sparrow*	<i>Spizella pallida</i>	c	c	c	
Field Sparrow	<i>Spizella pusilla</i>	r	r	r	
Vesper Sparrow	<i>Pooecetes gramineus</i>	c	c	c	
Lark Sparrow*	<i>Chondestes grammacus</i>	o	o	o	
Savannah Sparrow*	<i>Passerculus sandwichensis</i>	u	u	u	
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	u	u	o	
Henslow's Sparrow	<i>Ammodramus henslowii</i>	r	r	r	
Le Conte's Sparrow	<i>Ammodramus leconteii</i>	u	u	u	
Nelson's (Sharp-tailed) Sparrow	<i>Ammodramus nelsoni</i>	o	r	o	
Fox Sparrow	<i>Passerella iliaca</i>	o		o	
Song Sparrow*	<i>Melospiza melodia</i>	c	c	c	
Lincoln's Sparrow	<i>Melospiza lincolni</i>	o	r	o	
Swamp Sparrow	<i>Melospiza georgiana</i>	o	o	o	
White-throated Sparrow	<i>Zonotrichia albicollis</i>	u		u	
Harris's Sparrow	<i>Zonotrichia querula</i>	o		o	
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	o		o	
Dark-eyed Junco	<i>Junco hyemalis</i>	c		c	u
Lapland Longspur	<i>Calcarius lapponicus</i>	r		o	r
Snow Bunting	<i>Plectrophenax nivalis</i>	u		u	c

Species and Abundance		Spring	Summer	Fall	Winter
Northern Cardinal	<i>Cardinalis cardinalis</i>	r	r	r	r
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	o	o	o	
Indigo Bunting*	<i>Passerina cyanea</i>	u	u	u	
Dickcissel	<i>Spiza americana</i>	r	r	r	
Blackbirds and Orioles					
Bobolink*	<i>Dolichonyx orizivorus</i>	c	a	c	
Red-winged Blackbird*	<i>Agelaius phoeniceus</i>	a	a	a	r
Eastern Meadowlark	<i>Sturnella magna</i>	r	r	r	
Western Meadowlark*	<i>Sturnella neglecta</i>	c	c	c	
Yellow-headed Blackbird*	<i>Xanthocephalus xanthocephalus</i>	u	c	u	
Rusty Blackbird	<i>Euphagus carolinus</i>	u	r	a	r
Brewer's Blackbird*	<i>Euphagus cyanocephalus</i>	u	r	u	
Common Grackle	<i>Quiscalus quiscula</i>	c	c	a	r
Brown-headed Cowbird*	<i>Molothrus ater</i>	c	c	c	r
Orchard Oriole	<i>Icterus spurius</i>	r	r	r	
Baltimore Oriole*	<i>Icterus galbula</i>	c	u	u	
Finches					
Pine Grosbeak	<i>Pinicola enucleator</i>	r		r	
Purple Finch	<i>Carpodacus purpureus</i>	u	u	o	o
House Finch*	<i>Carpodacus mexicanus</i>	u	u	o	o
Common Redpoll	<i>Acanthis flammea</i>	r			r
Hoary Redpoll	<i>Acanthis hornemanni</i>				r
Pine Sisken	<i>Spinus pinus</i>	u	u	o	u
American Goldfinch*	<i>Spinus tristis</i>	u	u	u	u
Evening Grosbeak	<i>Coccothraustes vespertinus</i>				r
Old World Sparrows					
House Sparrow	<i>Passer domesticus</i>	o	o	o	o
Accidental/Casual Species					
Black Scoter	<i>Melanitta americana</i>				
Cinnamon Teal	<i>Anas cyanoptera</i>				
Surf Scoter	<i>Melanitta perspicillata</i>				
Swainson's Hawk	<i>Buteo swainsoni</i>				
White-winged Scoter	<i>Melanitta fusca</i>				
Piping Plover	<i>Charadrius melodus</i>				

a=abundant, c=common, u=uncommon, o=occasional, r=rare

*asterisk indicates documented nesting on the Refuge

Hamden Slough NWR Mammals

Common Name	Scientific Name	Common Name	Scientific Name
Masked Shrew*	<i>Sorex cinereus</i>	Northern Grasshopper Mouse*	<i>Onychomys leucogaster</i>
Northern Water Shrew	<i>Sorex palustris</i>	Meadow Vole	<i>Microtus pennsylvanicus</i>
Pigmy Shrew*	<i>Microsorex hoyi</i>	Prairie Vole*	<i>Microtus ochrogaster</i>
Short-tailed Shrew*	<i>Blarina brevicauda</i>	Muskrat	<i>Ondatra zibethicus</i>
Star-nosed Moles	<i>Condylura cristata</i>	House Mouse	<i>Mus musculus (exotic)</i>
Little Brown Bat	<i>Myotis lucifugus</i>	Meadow Jumping Mouse	<i>Zapus hudsonius</i>
Big Brown Bat	<i>Eptesicus fuscus</i>	Woodland Jumping Mouse*	<i>Napaeozapus insignis</i>
Eastern Cottontail	<i>Sylvilagus floridanus</i>	Coyote	<i>Canus latrans</i>
White-tailed Jackrabbit	<i>Lepus townsendii</i>	Red Fox	<i>Vulpes vulpes</i>
Eastern Chipmunk	<i>Tamias striatus</i>	Raccoon	<i>Procyon lotor</i>
Woodchuck	<i>Marmota monax</i>	Fisher *	<i>Martes pennanti</i>
Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	Short-tailed Weasel	<i>Mustela erminea</i>
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>	Least Weasel *	<i>Mustela nivalis</i>
Fox Squirrel	<i>Sciurus niger</i>	Long-tailed Weasel	<i>Mustela frenata</i>
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	Mink	<i>Mustela vison</i>
Plains Pocket Gopher	<i>Geomys bursarius</i>	Badger	<i>Taxidea taxus</i>
Plains Pocket Mouse*	<i>Perognathus flavescens</i>	Stripped Skunk	<i>Mephitis mephitis</i>
Beaver	<i>Castor canadensis</i>	River Otter	<i>Lutra canadensis</i>
Western Harvest Mouse*	<i>Reithrodontomys megalotis</i>	Bobcat *	<i>Lynx rufus</i>
Prairie Deer Mouse*	<i>Peromyscus maniculatus</i>	White-tailed Deer	<i>Odocoileus virginianus</i>
White-footed Mouse	<i>Peromyscus leucopus</i>	Moose	<i>Alces alces</i>

* Asterisk indicates likely present, but undocumented

Hamden Slough NWR Plants

Common name	Scientific name	Common name	Scientific name
Grasses			
Red top	<i>Agrostis alba</i>	Switchgrass	<i>Panicum virgatum</i>
Quackgrass	<i>Agropyron repens</i>	Reed canary grass	<i>Phalaris arundinacea</i>
Big bluestem	<i>Andropogon gerardii</i>	Timothy	<i>Phleum pratense</i>
Side-oats grama	<i>Bouteloua curtipendula</i>	Common Reed Grass	<i>Phragmites australis</i>
Smooth brome grass	<i>Bromus inermis</i>	Kentucky bluegrass	<i>Poa pratensis</i>
Bluejoint	<i>Calamagrostis canadensis</i>	Little bluestem	<i>Schizachyrium scoparium</i>
Northern reedgrass	<i>Calamagrostis stricta inexpansa</i>	Indiangrass	<i>Sorghastrum nutans</i>
Canada wild rye	<i>Elymus canadensis</i>	Prairie cordgrass	<i>Spartina pectinata</i>
Foxtail barley	<i>Hordeum jubatum</i>	Prairie dropseed	<i>Sporobolus heterolepis</i>
Junegrass	<i>Koeleria macrantha</i>	Porcupine grass	<i>Stipa spartea</i>
Mat muhly	<i>Muhlenbergia richardsonii</i>		
Aquatic Monocots			
Slough Sedge	<i>Carex atherodes</i>	Hardstem bulrush	<i>Scirpus acutus</i>
Coontail	<i>Ceratophyllum demersum</i>	Three-square bulrush	<i>Scirpus americanus</i>
Rush spp.	<i>Juncus spp.</i>	Softstem bulrush	<i>Scirpus validus</i>
Duckweed spp.	<i>Lemna spp.</i>	Burreed	<i>Sparganium spp.</i>
Milfoil spp.	<i>Myriophyllum spp.</i>	Narrow-leaved cattail	<i>Typha angustifolia</i>
Pondweeds	<i>Potamogeton spp.</i>	Hybrid cattail	<i>Typha x glauca</i>
Aquatic buttercup	<i>Ranunculus spp.</i>	Greater bladderwort	<i>Utricularia vulgaris var. americana</i>
Arrowhead/Duck potato	<i>Sagittaria latifolia</i>	Wild celery	<i>Vallisneria spp.</i>
Trees and Shrubs			
Box elder	<i>Acer negundo</i>	Chokecherry	<i>Prunus virginiana</i>
Saskatoon Serviceberry (Juneberry)	<i>Amelanchier alnifolia</i>	Bur Oak	<i>Quercus macrocarpa</i>
Lead plant	<i>Amorpha canescens</i>	Currant	<i>Ribes americanum</i>
False indigo	<i>Amorpha fruticosa</i>	Wild rose	<i>Rosa spp.</i>
Red-osier dogwood	<i>Cornus stolonifera</i>	Common red raspberry	<i>Rubus idaeus var. strigosus spp.</i>
Green ash	<i>Fraxinus pennsylvanica</i>	Peach-leaved willow	<i>Salix amygdaloides</i>
Cottonwood	<i>Populus deltoids</i>	Sandbar willow	<i>Salix exigua</i>
Trembling aspen	<i>Populus tremuloides</i>	Black willow	<i>Salix nigra</i>
Wild plum	<i>Prunus americana</i>	Western snowberry	<i>Symphoricarpos occidentalis</i>
Broadleaf Plants			
Yarrow	<i>Achillea millefolium</i>	Stiff goldenrod	<i>Oligoneuron rigidum</i>
Prairie onion	<i>Allium stellatum</i>	False gromwell	<i>Onosmodium molle</i>
Common ragweed	<i>Ambrosia artemisiifolia</i>	Wood-sorrel	<i>Oxalis spp.</i>
Meadow anemone	<i>Anemone canadensis</i>	Common parsnip	<i>Pastinaca sativa</i>
Thimbleweed	<i>Anemone cylindrica</i>	Swamp lousewort	<i>Pedicularis lanceolata</i>
Columbine	<i>Aquilegia canadensis</i>	Wood betony	<i>Pedicularis Canadensis</i>
Wormwood	<i>Artemisia campestris</i>	Silverleaf scurf-pea	<i>Pedimelum argophyllum</i>
White sage	<i>Artemisia ludoviciana</i>	Downy Phlox	<i>Phlox pilosa</i>
Common milkweed	<i>Asclepias syriaca</i>	Smartweed	<i>Polygonum spp.</i>
Green milkweed	<i>Asclepias hirtella</i>	Purslane	<i>Portulaca spp.</i>
Beggarticks	<i>Bidens cernua</i>	Silverweed	<i>Potentilla anserina</i>
Mustard	<i>Brassica nigra</i>	Tall cinquefoil	<i>Potentilla arguta</i>
Marsh marigold	<i>Caltha palustris</i>	(Virginia) Mountain Mint	<i>Pycnanthemum virginianum</i>
Plumeless thistle	<i>Carduus acanthoides</i>	Buttercup	<i>Ranunculus spp.</i>
Water hemlock	<i>Cicuta maculata</i>	Gray-headed coneflower	<i>Ratibida pinnata</i>
Canada thistle	<i>Cirsium arvense</i>	Black-eyed Susan	<i>Rudbeckia hirta</i>
Native thistle spp.	<i>Cirsium spp.</i>	Curly dock	<i>Rumex crispus</i>

Common name	Scientific name	Common name	Scientific name
Field bindweed	<i>Convolvulus arvensis</i>	Crown vetch	<i>Securigera varia</i>
Golden corydalis	<i>Corydalis aurea</i>	Golden ragwort	<i>Senecio aureus</i>
White lady's slipper	<i>Cypripedium candidum</i>	Black nightshade	<i>Solanum nigrum</i>
White prairie clover	<i>Dalea candida</i>	Canada goldenrod	<i>Solidago canadensis</i>
Purple prairie clover	<i>Dalea purpureum</i>	Oldfield goldenrod	<i>Solidago nemoralis</i>
Smooth horsetail	<i>Equisetum laevigatum</i>	Showy goldenrod	<i>Solidago speciosa</i>
Daisy fleabane	<i>Erigeron strigosus</i>	Perennial sow-thistle	<i>Sonchus arvensis</i>
Spotted joe pye weed	<i>Eupatorium maculatum</i>	Prairie blue-eyed grass	<i>Sisyrinchium campestre</i>
Common/Tall boneset	<i>Eupatorium perfoliatum/altissimum</i>	Heath aster	<i>Symphyotrichum ericoides</i>
Leafy spurge	<i>Euphorbia esula</i>	White panicle aster	<i>Symphyotrichum lanceolatum</i>
Plains grass-leaved goldenrod	<i>Euthamia gymnospermoides</i>	Aromatic aster	<i>Symphyotrichum oblongifolium</i>
Wild licorice	<i>Glycyrrhiza lepidota</i>	Silky aster	<i>Symphyotrichum pratense</i>
Yellow star grass	<i>Hypoxis hirsuta</i>	Purplestem aster	<i>Symphyotrichum puniceum</i>
Wild lettuce	<i>Lactuca canadensis</i>	Common tansy	<i>Tanacetum vulgare</i>
Vetchling spp., beach pea spp.	<i>Lathyrus spp.</i>	(Purple) Meadow rue	<i>Thalictrum dasycarpum</i>
Rough blazing star	<i>Liatris aspera</i>	Meadow goat's beard	<i>Tragopogon dubius</i>
Hoary puccoon	<i>Lithospermum canescens</i>	Red clover	<i>Trifolium pratense</i>
Pale spiked lobelia	<i>Lobelia spicata</i>	Stinging nettle	<i>Urtica dioica</i>
Purple loosestrife	<i>Lythrum salicaria</i>	Star-flowered Solomon's seal	<i>Vagnera stellata</i>
Black medic	<i>Medicago lupulina</i>	Mullein	<i>Verbascum spp.</i>
Alfalfa	<i>Medicago sativa</i>	Blue vervain	<i>Verbena hastata</i>
Yellow sweet-clover	<i>Melilotus officinalis</i>	Hoary vervain	<i>Verbena stricta</i>
White sweet-clover	<i>Melilotus alba</i>	Bird's foot violet	<i>Viola pedata</i>
Wild mint	<i>Mentha arvensis</i>	Downy yellow violet	<i>Viola pubescens</i>
Wild bergamot	<i>Monarda fistulosa</i>	White camass	<i>Zigadenus elegans</i>
Evening primrose	<i>Oenothera biennis</i>	Golden Alexander	<i>Zizia aurea</i>
Mosses			
Clubmoss spp.	<i>Lycopodium spp.</i>		

Appendix D: Glossary

Adaptation: Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.

Adaptive Management: The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels (FWS, 602 FW1 1.6).

Alternatives: Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the National Wildlife Refuge System mission, and resolving issues (FWS, 602 FW1 1.6).

Appropriate Use: A proposed or existing use on a refuge that meets at least one of the following four conditions (FWS, 603 FW1 1.6):

- The use is a wildlife-dependent recreational use as identified in the Fish and Wildlife Improvement Act of 1978.
- The use contributes to fulfilling the refuge purpose(s), the National Wildlife Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the National Wildlife Refuge System Improvement Act of 1997 was signed into law.
- The use involves the take of fish and wildlife under state regulations.
- The use has been found to be appropriate as specified in section 1.11.

Approved Acquisition Boundary: A project boundary that the Director of the U.S. Fish and Wildlife Service approves upon completion of the planning and environmental compliance process. An approved acquisition boundary only designates those lands that the Service has authority to acquire and/or manage through various agreements. Approval of an acquisition boundary does not grant the Service jurisdiction or control over lands within the boundary, and it does not make lands within the refuge boundary part of the National Wildlife Refuge System. Lands do not become part of the Refuge System until they are purchased or are placed under an agreement that provides for management as part of the refuge system.

Biological Control: The use of organisms or viruses to control weeds or other pests.

Biological Diversity: The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur (FWS, 602 FW1 1.6).

Biological Integrity: Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities (FWS, 602 FW1 1.6).

Candidate Species: Plants and animals for which the U.S. Fish and Wildlife Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Carbon Sequestration: The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen, and store the carbon. Fossil fuels were at one time biomass and continue to store the carbon until burned.

Climate Change: Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from: 1) natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; 2) natural processes within the climate system (e.g., changes in ocean circulation); 3) human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification, etc.).

Code of Federal Regulations (CFR): The codification of the general and permanent rules published in the *Federal Register* by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to federal regulation. The 50 subject matter titles contain one or more individual volumes, which are updated once each calendar year, on a staggered basis.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge (FWS, 603 FW 2 2.6).

Compatibility Determination (CD): A written determination signed and dated by the Refuge Manager and the U.S. Fish and Wildlife Service Regional Chief signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. The director of the Service makes this delegation through the Regional Director (FWS, 603 FW 2 2.6).

Comprehensive Conservation Plan (CCP): A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the National Wildlife Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (FWS, 602 FW1 1.6).

Cultural Resource Inventory: A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register of Historic Places follows the criteria found in 36 CFR 60.4.

Cultural Resources: "Those parts of the physical environment—natural and built—that have cultural value to some kind of sociocultural group . . . [and] those non-material human social institutions" Cultural resources include historic sites, archeological sites and associated artifacts, sacred sites, traditional cultural properties, cultural items (human remains, funerary objects, sacred objects, and objects of cultural patrimony), and buildings and structures.

Easement: A privilege or right that is held by one person or other entity in land owned by another.

Ecological Integrity: The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions (FWS, 602 FW1 1.6).

Ecosystem: A biological community together with its environment, functioning as a unit. For administrative purposes, 53 ecosystems covering the United States and its possessions have been designated. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary (FWS, 602 FW1 1.6).

Effects (Impacts): Effects include:

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
- Cumulative effects, which result from past, present, and reasonably foreseeable future actions that, collectively, become significant over time.

Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects even if, on balance, the agency believes the effect will be beneficial (40 CFR 1508.8).

Endangered Species: Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the *Federal Register*.

Endangered Species Act (ESA): Through federal action and by encouraging the establishment of state programs, the Endangered Species Act of 1973 provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The Act authorizes the determination and listing of species as endangered and threatened; prohibits unauthorized taking, possession, sale, and transport of endangered species; provides authority to acquire land for the conservation of listed species, using land and water conservation funds; authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for endangered and threatened wildlife and plants; authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the Act or any regulation issued thereunder.

Section 7 of the Endangered Species Act requires federal agencies to insure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

Environmental Action Statement (EAS): The decision document for an environmental assessment for the U.S. Fish and Wildlife Service. The EAS will consist of a one-page document indicating the proposal, the Service decision, references to supporting documents (if any), and a signature block. The purposes of the EAS are to establish a process for internal review of National Environmental Policy Act-related decision documents and to provide an appropriate administrative record of NEPA-related decisions at all management levels of the Service (FWS, 550 FW3 3.3 C).

Environmental Analysis: The process associated with preparing documents such as environmental assessments and environmental impact statements and the decision whether to prepare an environmental impact statement. It is an analysis of alternative actions and their predictable short-term and long-term effects, which include physical, biological, economic, and social factors and their interactions.

Environmental Assessment (EA): A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.

Environmental Consequences: The scientific and analytic basis for the comparison of alternatives. The environmental impacts of the alternatives including the proposed action, any adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources that would be involved in the proposal should it be implemented (40 CFR 1502.16).

Environmental Health: Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment (FWS, 602 FW1 1.6).

Environmental Impact Statement (EIS): A detailed written statement, required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Environmental Justice: The fair treatment and meaningful involvement of all people in the development, implementation, and enforcement of environmental laws regardless of race, color, national origin, or income.

Finding of No Significant Impact (FONSI): A document prepared in compliance with the National Environmental Policy Act and supported by an environmental assessment that briefly presents why a federal action will have no significant effects on the human environment and for which an Environmental Impact Statement will not be prepared (40 CFR 1508.13).

Goal: A descriptive, open-ended, and often broad statement of desired future conditions that conveys purposes but does not define measurable units (FWS, 602 FW1 1.6).

Greenhouse Gas (GHG): Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O₃), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Habitat: The physical and biological resources required by an organism for its survival and reproduction; these requirements are species-specific. Food and cover are major components of habitat and must extend beyond the requirements of the individual to include a sufficient area capable of supporting a viable population.

Incompatible: Any use (recreational or nonrecreational) of a refuge that, in the sound professional judgment of the Director of the U.S. Fish and Wildlife Service, will materially interfere with or detract from the fulfillment of the mission of the National Wildlife Refuge System or the purposes of the refuge. Incompatible uses are not allowed to occur on Service areas.

Indicator: In effects analysis, a way for measuring effects from management alternatives on a particular resource or issue.

Interjurisdictional Fish: Fish that occur in waters under the jurisdiction of one or more states, for which there is an interstate fishery management plan or which migrates between the waters under the jurisdiction of two or more states bordering on the Great Lakes.

Invasive Species: Invasive species are organisms that are introduced into a non-native ecosystem and that cause, or are likely to cause, harm to the economy, environment, or human health.

Inventory: Accepted biological methods to determine the presence, relative abundance, and/or distribution of species (FWS, 702 FW2 2.6).

Issue: Any unsettled matter that requires a management decision—that is, a U.S. Fish and Wildlife Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (FWS, 602 FW1 1.6).

Major Federal Action: Includes action with effects that may be major and that are potentially subject to federal control and responsibility. “Major” reinforces but does not have a meaning independent of significantly. “Actions” include new and continuing activities. Federal actions include adoption of official policy, formal plans, programs, and approval of specific projects (40 CFR 1508.18).

Migratory Birds: Birds that follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

Monitoring: Accepted biological methods to determine the status and/or demographics of species over time (FWS, 702 FW2 2.6).

National Environmental Policy Act (NEPA): This act, promulgated in 1969, requires all federal agencies to disclose the environmental effects of their actions, incorporate environmental information, and use 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 (40 CFR 1500). The law also established the Council on Environmental Quality to implement the law and to monitor compliance with the law.

National Wilderness Preservation System: A network of federally owned areas designated by Congress as wilderness and managed by one of four federal agencies: the U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, or the U.S. Forest Service. Includes over 600 areas and more than 105 million acres. The National Wildlife Refuge System includes over 20 million acres of wilderness on more than 60 refuges (FWS, 610 FW1 1.9).

National Wildlife Refuge (NWR, Refuge): A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include Coordination Areas. A complete listing of all units of the Refuge System is located in the current Report of Lands Under Control of the U.S. Fish and Wildlife Service (FWS, 602 FW1 1.6).

National Wildlife Refuge System (NWRS, Refuge System): All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife, and plant resources.

National Wildlife Refuge System Improvement Act of 1997 (Improvement Act): Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System. Clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); establishes a formal process for determining compatibility; establishes the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

Native Species: A species, subspecies, or distinct population that occurs within its natural range or natural zone of potential dispersal (i.e., the geographic area the species occupies naturally or would occupy in the absence of direct or indirect human activity or an environmental catastrophe).

No-Action Alternative: In the context of a Comprehensive Conservation Plan, this refers to the current management direction. With this alternative, no change from current CCP would be implemented.

Non-native Species: A species, subspecies, or distinct population that has been introduced by humans (intentionally or unintentionally) outside its natural range or natural zone of potential dispersal.

Objective: A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Objectives are to be attainable, time-specific, and measurable (FWS, 602 FW1 1.6).

Planning Area: The area upon which the planning effort will focus. A planning area may include lands outside existing planning unit boundaries currently studied for inclusion in the National Wildlife Refuge System and/or partnership planning efforts. It also may include watersheds or ecosystems outside of our jurisdiction that affect the planning unit. At a minimum, the planning area includes all lands within the authorized boundary of the refuge (FWS, 602 FW1 1.6).

Planning Team: A planning team is interdisciplinary in membership and function. A team generally consist of a Planning Team Leader, Refuge Manager, staff biologists, a state natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, recreation specialist). Other federal and Tribal natural resource agencies may also be asked to provide team members, as appropriate. The planning team prepares the Comprehensive Conservation Plan and appropriate National Environmental Policy Act documentation (FWS, 602 FW1 1.6).

Prescribed Burning: Controlled application of fire to the landscape that allows the fire to be confined to a predetermined area while producing the intensity of heat and rate of spread required to achieve planned management objectives.

Preferred Alternative: A proposed action in the National Environmental Policy Act document for the Comprehensive Conservation Plan identifying the alternative that the U.S. Fish and Wildlife Service believes best achieves planning unit purposes, vision, and goals; helps fulfill the National Wildlife Refuge System mission; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; addresses the significant issues and mandates; and is consistent with principles of sound fish and wildlife management.

Priority Public Uses: Six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority and are found to be compatible with the refuge purposes. This includes hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

Proposed Action: In the context of a Comprehensive Conservation Plan, this is the same as the Preferred Alternative.

Public Involvement: A process that offers affected and interested individuals and organizations opportunities to become informed about, and to express their opinions on, U.S. Fish and Wildlife Service actions and policies. In the process, these public views are studied thoroughly and are thoughtfully considered in shaping decisions for refuge management.

Purposes of the Refuge: The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (FWS, 602 FW1 1.6).

Record of Decision (ROD): A concise public record of a decision prepared by the federal agency, pursuant to National Environmental Policy Act, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement whether all practical means to avoid or minimize environmental harm from the alternative selected have

been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

Resident Species: A nonmigratory species inhabiting a given locality throughout the year. Examples include white-tailed deer, muskrat, raccoon, mink, and fox.

Scoping: A process for determining the scope of issues to be addressed by a Comprehensive Conservation Plan and for identifying the significant issues. Involved in the scoping process are federal, state, and local agencies; private organizations; and individuals.

Shorebird: Long-legged birds, also known as waders, belonging to the order Charadriiformes that use shallow wetlands and mud flats for foraging and nesting.

Significant Issue: A significant issue is typically: within Service jurisdiction, suggests different actions or alternatives, and will influence the decision (FWS, 602 FW3 3.4 3b).

Species: A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Sound Professional Judgment: A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the National Wildlife Refuge System Administration Act and other applicable laws.

Stakeholder: A person or group who has an interest in activities within the Planning Area.

Step-down Management Plan: A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting Comprehensive Conservation Plan goals and objectives (FWS, 602 FW1 1.6).

Strategy: A specific action, tool or technique, or combination of actions, tools, and techniques used to meet unit objectives (FWS, 602 FW 1.6).

Threatened Species: Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the Endangered Species Act of 1973 and published in the *Federal Register*.

Vision Statement: A concise statement of what the planning unit should be or hope to do, based primarily upon the National Wildlife Refuge System mission, specific refuge purposes, and other mandates. The vision statement for the refuge should be tied to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (FWS, 602 FW1 1.6).

Waterfowl: A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Waterfowl Production Area (WPA): Prairie wetlands with associated uplands managed to provide nesting areas for waterfowl and owned in fee title by the U.S. Fish and Wildlife Service. These lands are purchased from willing sellers with funds from Federal Duck Stamp sales. They are open to public hunting, fishing, and trapping according to state and federal regulations.

Watershed: The entire land area that collects and drains water into a river/stream or river/stream system.

Wetland: A wetland is land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this classification a wetland must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes; 2) the substrate is predominantly undrained hydric soil; and

3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al., 1979).

Wetland Management District (WMD): An area covering several counties that acquires (with Federal Duck Stamp funds), restores, and manages prairie wetland habitat critical to waterfowl and other wetland birds.

Wildlife-Dependent Recreational Use: A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. These are the six priority public uses of the National Wildlife Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. These other uses will also be considered in the preparation of refuge Comprehensive Conservation Plans; however, the six priority public uses always will take precedence (FWS, 602 FW1 1.6).

Wildlife Diversity: A measure of the number of wildlife species in an area and their relative abundance.

Waterbirds: This general category includes all birds that inhabit lakes, marshes, streams and other wetlands at some point during the year. The group includes all waterfowl, such as ducks, geese, and swans and other birds such as loons, rails, cranes, herons, egrets, ibis, cormorants, pelicans, shorebirds, and passerines that nest and rely on wetland vegetation.

Appendix E: 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

Establishes as policy of the United States the protection and preservation for American Indians of their inherent right to freedom to believe, express, and practice their traditional religions. The Act 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

Prohibits discrimination of individuals based on disability. It requires that public transportation services be accessible to individuals with disabilities and prohibits discrimination in employment of qualified individuals with disabilities. It requires the Equal Employment Opportunity Commission to issue regulations relating to discrimination of disabled individuals, and requires the National Council on Disability to conduct a study of areas designated as wilderness to determine the effect of the designation on the ability of individuals to enjoy such areas. The ADA Amendments Act of 2008 restored the intent and protections of the original act.

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. The Act requires that a permit be obtained for examination of ruins, excavation of archaeological sites, and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army; and provides penalties for violations.

Archaeological Resources Protection Act of 1979

Largely supplanted the resource protection provisions of the Antiquities Act for archaeological items. This Act established detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from federal or Indian lands. It also established civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from federal or Indian land in violation of any provision of federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any state or local law. This act also required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the Nation.

Archeological and Historic Preservation Act of 1960, as amended

This act carries out the policy established by the Historic Sites, Buildings and Antiquities Act of 1935 (known as the Historic Sites Act). It directs federal agencies to notify the Secretary of the Interior whenever they find a federal or federally assisted, licensed, or permitted project may cause loss or destruction of significant scientific, prehistoric, or archaeological data. The Act authorizes use of appropriated, donated, and/or transferred funds for the recovery, protection, and preservation of such data.

Archeological and Historic Preservation Act of 1974

Directs the preservation of historic and archaeological data in federal construction projects.

Architectural Barriers Act of 1969

Ensures that certain buildings financed or leased by federal agencies are constructed (or renovated) so that they will be accessible to the physically handicapped.

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. The Act and its amendments charge federal land managers with direct responsibility 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

Authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. Requires the Secretary of the Interior to establish a National Wetlands Priority Conservation Plan, requires the states to include wetlands in their comprehensive outdoor recreation plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It established entrance fees at national wildlife refuges. It also extended the Wetlands Loan Act authorization through 1988 and required the Secretary to report to Congress on wetlands loss. In addition, it directed 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 Conterminous United States, 1950s to 1970s." This act also increased the price of duck stamps.

Endangered Species Act of 1973, as amended

Directs federal agencies to take actions that would further the purposes of the Act and to ensure that actions they carry out, authorize, or fund do not jeopardize endangered species or their critical habitat. The Act also provides authority for land acquisition. Conservation of threatened and endangered species has become a major objective of both land acquisition and refuge management programs.

Endangered Species Conservation Act of 1969

This act expanded the provisions of the Endangered Species Preservation Act of 1966 to include the listing of species in danger world-wide and added mollusks and crustaceans to the animals that could be listed.

Endangered Species Preservation Act of 1966

This act was the predecessor to the Endangered Species Act of 1973 and directed the Secretary of the Interior to produce a list of native U.S. vertebrate species in danger of extinction for the limited protection of those animals.

Environmental Education Act of 1990

Established 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)

Established 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)

Seeks to foster intergovernmental partnerships by requiring federal agencies to use the state process to determine and address concerns of state and local elected officials with proposed federal assistance and development programs.

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994)

Mandates that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. This order also creates an Interagency Working Group on Environmental Justice to provide guidance to federal agencies in overcoming these issues.

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)

Recommended 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. Of particular importance to Comprehensive Conservation Plans is the National Vegetation Classification System (NVCS), which is the adopted standard for vegetation mapping. Using NVCS facilitates the compilation of regional and national summaries, which, in turn, can provide an ecosystem context for individual refuges.

Executive Order 12962: Recreational Fisheries (1995)

Directs federal agencies to improve the quantity, function, sustainable productivity, and distribution of United States aquatic resources for increased 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 a conservation mission for the National Wildlife Refuge System, six compatible wildlife-dependent recreational activities, and four guiding principles for management of the Refuge System. Directs the Secretary of the Interior to undertake several actions in support of management and public use and to ensure the maintenance of the biological integrity and environmental health of the Refuge System. It also provides for the identification of existing wildlife-dependent uses that will continue to occur as lands are added to the Refuge System.

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)

Established the American Heritage Rivers initiative for the purpose of natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The Act 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 to prevent introductions, to control invasive species, and to promote public education on invasive species and the means to address them. This EO replaces and rescinds EO 11987: Exotic Organisms (1977).

Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds (2001)

Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation (2007)

Directs federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of 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 conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.

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, nonduplicative 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. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other federal agencies before approving any program or project requiring the use of land under their jurisdiction.

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. It is financed by 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

Established requirements for the 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 in caves on federal lands.

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. The recreation fee program is a program by which 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

The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other federal, state, and local agencies; farmers associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each federal land-managing agency, including the U.S. Fish and Wildlife Service, to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the states, including integrated management systems to control undesirable plants.

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

This Act and its amendments have as their objectives the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters and, therefore, regulates the discharge of pollutants into waters of the United States. The act protects fish and wildlife, establishes operation permits for all major sources of water pollution, limits the discharge of pollutants or toxins into water, and makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit is obtained under the Clean Water Act. Section 404 charges the U.S. Army Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands. The "Clean Water Act" became the common name with amendments in 1977.

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. The Act also authorizes the use of federal water project funds for land acquisition in order to establish refuges for migratory waterfowl when recommended by the Secretary of the Interior, and authorizes the Secretary to provide facilities for outdoor recreation and fish and wildlife at all reservoirs under his control, except those within national wildlife refuges.

Fish and Wildlife Act of 1956, as frequently amended

Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also with a direction to administer the Act with regard to the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. The 1998 amendments to the Act

modified the powers of the Secretary of the Interior in regard to volunteer service, community partnerships, and education programs.

Fish and Wildlife Conservation Act of 1980, as amended

Requires the Service to monitor non-gamebird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act.

Fish and Wildlife Coordination Act of 1934

Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the U.S. Fish and Wildlife Service and the state fish and wildlife agencies where 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. This act also authorized use of surplus federal property for wildlife conservation purposes and authorized 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, and the Fish and Wildlife Act of 1956. It authorizes the Secretary of the Interior to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

Food Security Act of 1985 (Farm Bill), as amended

Known as the Farm Bill, this act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farm program subsidies. The Act also established the Wetlands Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.

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, declared it a national policy to preserve historic sites and objects of national significance, including those located on refuges. It provided procedures for designation, acquisition, administration, and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this Act.

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. The Act prohibits interstate and international transport and commerce of fish, wildlife, or plants taken in violation of domestic or foreign laws. It regulates the introduction to the United States of foreign species into new locations.

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

Establishes a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. Authorizes the Secretary of the Interior to cooperate with local authorities in wildlife conservation and to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges. The Act provides for cooperation with states in enforcement. It establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Commission for migratory birds. This act includes acquisition authority for purchase or rental of a partial interest in land or waters and requires the Secretary of the Interior to consult with the appropriate units of local government and with the governor of the state concerned, or the appropriate state agency, before recommending an area for purchase or rental. This provision was subsequently amended in 1983, 1984, and 1986 to require that either the governor or the state agency approve each proposed acquisition. The role of the Commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.

Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) of 1934

Known as the Duck Stamp Act, this act requires every waterfowl hunter 16 years of age or older to carry a stamp, and earmarks proceeds of Duck Stamps 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

Implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, the Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export, or import any migratory bird, part, nest, egg, or product.

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 engage citizens of the United States in full and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law established the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on federal or tribal lands.

National Environmental Policy Act of 1969 (NEPA), as amended

This act and the implementing regulations developed by the Council on Environmental Quality (40 CFR 1500–1508) require federal agencies to integrate the National Environmental Policy Act (NEPA) process

with other planning at the earliest possible time to provide a systematic interdisciplinary approach to decision making; to identify and analyze the environmental effects of their actions; to describe appropriate alternatives to the proposed actions; and to involve the affected state and federal agencies, tribal governments, and public in the planning and decision making process. This act requires the disclosure of the environmental impacts of any major federal action significantly affecting the quality of the human environment.

National Historic Preservation Act of 1966

Repeatedly amended, the Act provides for preservation of significant historical features (buildings, objects, and sites) through a grant-in-aid program to the states. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468–468d). The Act established an Advisory Council on Historic Preservation, which was made a permanent independent agency in 1976 (90 Stat. 1319). That Act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register. Section 110 requires federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; section 101 requires federal agencies consider Indian tribal values in historic preservation programs and requires each federal agency to establish a program leading to inventory of all historic properties on its land.

National Trails System Act of 1968

Established the National Trails System to protect the recreational, scenic, and historic values of some important trails. National Recreation Trails may be established by the Secretaries of the Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s) and other land managing agencies, if any. National scenic and national historic trails may only be designated by an Act of Congress. Several national trails cross units of the National Wildlife Refuge System.

National Wildlife Refuge System Administration Act of 1966 (amended by the National Wildlife Refuge System Improvement Act of 1997)

This act consolidates the authorities relating to the various categories of lands for the conservation of fish and wildlife administered by the Secretary of the Interior through the U.S Fish and Wildlife Service by designating all such areas part of a single National Wildlife Refuge System. Areas include wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas. The law also prohibits knowingly disturbing any area within the system or the take of Refuge System wildlife without a permit. The Act 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 Centennial Act of 2000

Establishes a commission to promote awareness by the public to develop a long-term plan to meet priority needs of the National Wildlife Refuge System, require an annual report on the needs, and improve public use programs and facilities.

National Wildlife Refuge System Improvement Act of 1997

This act, which amends the National Wildlife Refuge System Administration Act of 1966, serves as the "organic act" for the National Wildlife Refuge System. The Act states first and foremost that the mission of the National Wildlife Refuge System is focused singularly on wildlife conservation. It establishes a unifying mission for the Refuge System, reinforces the importance of refuge purposes to guide management direction, articulates a process for determining compatible uses of refuges, identifies six priority wildlife-dependent recreation uses (hunting, fishing, wildlife observation, photography, environmental education and interpretation), and adds a requirement for preparing comprehensive conservation plans through a public planning process. The Act requires the Secretary of the Interior 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 encourage the use of volunteers to help in the management of refuges within the National Wildlife Refuge System; facilitates partnerships between the Refuge

System and nonfederal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

National Wildlife Refuge Volunteer Improvement Act of 2010

Maintains the current funding authorization level for the U.S. Fish and Wildlife Service's volunteer and community partnerships programs that are vital to national wildlife refuges but makes a number of important amendments. The law amends the National Wildlife Refuge Volunteer and Community Partnership Enhancement Act of 1998 to direct the Service to carry out a National Volunteer Coordination Program within the National Wildlife Refuge System. It also requires the Director of the Service to publish a national strategy for the coordination and utilization of volunteers within the Refuge System and provide at least one regional 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. This act 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 and the Tripartite Agreement on wetlands between the United States, Canada, and Mexico. North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. 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

Established 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. The funding formula is no more than 1/3 federal funds, at least 1/3 foundation funds, and at least 1/3 state funds.

Refuge Recreation Act of 1962, as amended

Requires that any recreational use on areas of the National Wildlife Refuge System be "compatible" with the primary purpose(s) for which the area was acquired or established. This Act also 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 in lieu of taxes, using revenues derived from the sale of products from refuges. A major revision in 1964 requires all revenues received from refuge products be distributed to counties for public schools and roads (this stipulation later removed). Another revision in 1974 requires that any remaining funds be transferred to the Migratory Bird Conservation Fund for land acquisition. A 1978 amendment stated payments to counties were established as:

- on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land, and on land withdrawn from the public domain, 25 percent of net receipts and basic payments.

This amendment also required counties to pass payments along to other units of local government within the county that suffer losses in revenues due to the establishment of U.S. Fish and Wildlife Service areas.

Rehabilitation Act of 1973, as amended

Prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance.

Rivers and Harbors Appropriations Act of 1899, as amended

Requires the authorization by the Chief of Engineers prior to any work in, on, over, or under navigable waters of the United States. The Fish and Wildlife Coordination Act provides authority for the U.S. Fish and Wildlife Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the COE. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.

Secretarial Order 3289 Amendment 1: Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources (2010)

Secretarial Order 3285, issued in March of 2009, made production and transmission of renewable energy on public lands a priority for the Department of the Interior. This Secretarial Order, 3289A1, issued in February of 2010 establishes a Department-wide approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and on the land, water, ocean, fish and wildlife, and cultural resources that the Department manages.

Sikes Act of 1960, as amended

Provides for the cooperation by the U.S. 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 United States. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction and requires federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.

Surface Mining Control and Reclamation Act of 1977

Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating 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 the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred without reimbursement to the Secretary of the Interior if the land has particular value for migratory birds or to a state agency for other wildlife conservation purposes.

Transportation Equity Act for the 21st Century of 1998

Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations, and bicycle/pedestrian facilities.

Treasury and General Government Appropriations Act of 2000

In December 2002, Congress required federal agencies to publish their own guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information that they disseminate to the public (44 U.S.C. 3502). The amended language is included in section 515(a). The Office of Budget and Management directed agencies to develop their own guidelines to address the requirements of the law. The Department of the Interior instructed bureaus to prepare separate guidelines on how they would apply the Act. The U.S. Fish and Wildlife Service has developed "Information Quality Guidelines" to address the law.

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 U.S. Fish and Wildlife Service. The Act requires that any purchase offer be no less than the fair market value of the property.

Water Resources Planning Act of 1965

Established the Water Resources Council to be composed of Cabinet representatives, including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational, and fish and wildlife needs. The Act also established 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

Established 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. Section 5(d)(1) requires that in all planning by federal agencies for the use and development of water and related land resources, consideration be given to potential wild, scenic, and recreation rivers. Rivers are added to the national system based on their free-flowing character and their outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural, ecological, or other values. Rivers in the system are managed to maintain and protect these outstandingly remarkable values for present and future generations.

Wilderness Act of 1964

Defined the Wilderness resource and established the National Wilderness Preservation System. It directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System. This act also prescribes the management of new inclusions as wilderness.

Youth Conservation Corps Act of 1970

Established a permanent Youth Conservation Corps program within the Departments of the Interior and Agriculture. Within the U.S. Fish and Wildlife Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

Appendix F: Literature Cited

- Anderson, R. C. 2006. "Evolution and origin of the central grassland of North America: Climate, fire, and mammalian grazers." *Journal of the Torrey Botanical Society* 133(4): pp. 626–647.
- Anteau, M. J. 2011. "Do interactions of land use and climate affect productivity of waterbirds and prairie-pothole wetlands?" *Wetlands* 32: pp. 1–9.
- Bakker, K. K. 2003. The effect of woody vegetation on grassland nesting birds: An annotated bibliography. *Proceedings of the South Dakota Academy of Science* 82: pp. 119–141. *Updated January 2008
- Biondini, M. E., A. A. Steuter, R. G. Hamilton. 1999. "Bison use of fire-managed remnant prairies." *Journal of Range Management* 52(5): pp. 454–461.
- Briggs, J. M., A. K. Knapp, J. M. Blair, J. L. Heisler, G. A. Hoch, M. S. Lett, J. K. McCarron. 2005. "An ecosystem in transition: Causes and consequences of the conversion of mesic grassland to shrubland." *BioScience* 55(3): pp. 243–254.
- Brozowski, J. 2010. "Hamden Slough National Wildlife Refuge, Contaminants Assessment Process (CAP)." Twin Cities Ecological Services Field Office, U.S. Fish and Wildlife Service, Bloomington, MN: p. 32.
- Christensen, K. A. 1998. "Soil Survey of Becker County, Minnesota: Part 1." United States Department of Agriculture, Natural Resources Conservation Service. U.S. Gov't Printing Off: p. 184.
- Collins, S. L. and L. L. Wallace, editors. 1990. "Fire in North American tallgrass prairies." University of Oklahoma Press, Norman, Oklahoma, USA.
- Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. "Classification of wetlands and deepwater habitats of the United States." U.S. Fish and Wildlife Service, FWS/OBS-79/31. Washington, DC.
- Dickmann, D. I. and Cleland, D. T. 2002. "Fire return intervals and fire cycles for historic fire regimes in the Great Lakes Region: A synthesis of the literature, *DRAFT*." Great Lakes Ecological Assessment: p. 21.
- Duebbert, H. F., E. T. Jacobson, K. F. Higgins, and E. B. Podoll. 1981. "Establishment of seeded grasslands for wildlife habitat in the Prairie Pothole Region." U.S. Fish and Wildlife Service, Special Scientific Report, Wildlife No. 234. Jamestown, ND: Northern Prairie Wildlife Research Center; <http://www.npwrc.usgs.gov/resource/tools/grasland/contents.htm> (Version 16Jul97).
- Explore Minnesota Tourism. 2011. "Tourism and Minnesota's economic recovery." State of Minnesota. Accessed 21 May 2012 at: <http://www.exploreminnesota.com>.
- Hartnett, D. C., K. R. Hickman, L. E. Fischer Walter. 1996. "Effects of bison grazing, fire, and topography on floristic diversity in tallgrass prairie." *Journal of Range Management* 49(5): pp. 413–420.
- Heisler, J. L., J. M. Briggs, and A. K. Knapp. "Long-Term Patterns of Shrub Expansion in a C4-Dominated Grassland: Fire Frequency and the Dynamics of Shrub Cover and Abundance." *American Journal of Botany* 90(3): pp. 423–428.
- Heitmeyer, M. E., R. L. Esser, J. D. Eash and B. J. Newman. 2012. "Hydromorphic evaluation of ecosystem restoration and management options for Hamden Slough National Wildlife Refuge." Prepared for U.S. Fish and Wildlife Service, Region 3, Minneapolis, MN. Greenbrier Wetland Services Report No. 12-01. Blue Heron Conservation Design and Printing LLC, Bloomfield, MO.

- Greenwood, R. J., A. B. Sargeant, D. H. Johnson, L. M. Cowardin, and T. L. Shaffer. 1995. "Factors associated with duck nest success in the Prairie Pothole Region of Canada." *Wildlife Monographs* 128:1–57. Jamestown, ND: Northern Prairie Wildlife Research Center Online; <http://www.npwrc.usgs.gov/resource/orthrdata/nestsuc/nestsucc.htm> (Version 02Jun99).
- Helzer, C. 2010. The ecology and management of prairies in the central United States. Published for The Nature Conservancy by the University of Iowa Press, Iowa City, IA.
- Herkert, J. R. 1994. "The effects of habitat fragmentation on Midwestern grassland bird communities." *Ecological Applications* 4(3): pp. 461–471.
- Herkert, J. R., D. W. Sample, and R. E. Warner. 1996. "Management of Midwestern grassland landscapes for the conservation of migratory birds." Pages 89–116 in F. R. Thompson, III, ed. *Management of Midwestern Landscapes for the Conservation of Neotropical Migratory Birds*. U.S. Forest Service, General Technical Report NC-187. North Central Forest Experimental Station, St. Paul, MN.
- Higgins, K. F. 1977. "Duck nesting in intensively farmed areas of North Dakota." *Journal of Wildlife Management* 41(2): pp. 232–242.
- Higgins, K.F. 1986. "Interpretation and compendium of historical fire accounts in the Northern Great Plains. Resource Publication 161. Washington DC: U.S. Dept. of the Interior, Fish and Wildlife Service.
- Houston Engineering, Inc. 2010. "Mainstem Planning Region Planning Summary" in Appendix G of "Buffalo-Red River Watershed District Revised Watershed Management Plan." Prepared by Houston Engineering, Inc., Buffalo-Red River Watershed District, Barnesville, Minnesota and Prescribed by Minnesota Board of Water and Soil Resources, St. Paul, MN. p. 50.
- Intergovernmental Panel on Climate Change (IPCC). 2007. "Climate Change 2007: Synthesis Report." Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland: p. 104.
- Joern, A. 2005. "Disturbance by fire frequency and bison grazing modulate grasshopper assemblages in tallgrass prairie." *Ecology* 86(4): pp. 861–873.
- Johnson R. R., Oslund, F. T., and D. R. Hertel. 2008. "The past, present, and future of prairie potholes in the United States." *Journal of Soil and Water Conservation* 63(3): pp. 84a–87a.
- Johnson, C., B. V. Millett, T. Gilmanov, R. A. Voldseth, G. R. Guntenspergen, and D. E. Naugle. 2005. "Vulnerability of northern prairie wetlands to climate change." *BioScience* 55(10): pp. 863–872.
- Johnson, C., B. Werner, G. R. Guntenspergen, R. A. Voldseth, B. Millet, D. E. Naugle, M. Tulbere, R. W. H. Carroll, J. Tracy, and C. Olawsky. 2010. "Prairie wetland complexes as landscape functional units in a changing climate." *BioScience* 60(2): pp. 128–140.
- Kaminski, R. M. and H. H. Prince. 1981. "Dabbling duck activity and foraging responses to aquatic macroinvertebrates." *Auk* 98: pp. 115–126.
- Kantrud, H. A. 1986. "Effects of vegetation manipulation on breeding waterfowl in prairie wetlands: A literature review." U.S. Fish and Wildlife Service, Technical Report 3.
- Kantrud, H. A. and R. E. Stewart. 1977. "Use of natural basin wetlands by breeding waterfowl in North Dakota." *Journal of Wildlife Management* 41: pp. 243–253.

- Knapp, A. K. and M. D. Smith. 2001. "Variation among biomes in temporal dynamics of aboveground primary production." *Science, New Series* (291)5503: pp. 481–484.
- Knapp, A. K., J. M. Blair, J. M. Briggs, S. L. Collins, D. C. Hartnett, L. C. Johnson, E. G. Towne. 1999. "The keystone role of bison in North American tallgrass prairie." *BioScience* (49)1: pp. 39–50.
- Knopf, F. L. 1996. "Prairie Legacies – Birds" in F. B. Sampson and F. L. Knopf, eds. *Prairie Conservation: Preserving North America's Most Endangered Ecosystem*. Island Press, Washington, DC and Covelo, CA.
- Krapu, G. L., P. J. Pietz, D. A. Brandt, and R. R. Cox. 2004. Does presence of permanent fresh water affect recruitment in prairie-nesting dabbling ducks? *Journal of Wildlife Management* 68: pp. 332–341.
- Leopold, A. 1949. "A Sand County Almanac." Oxford University Press: pp. 226.
- Lincoln, F. C., S. R. Peterson, and J. L. Zimmerman. 1998. "Migration of Birds." U.S. Department of the Interior, U.S. Fish and Wildlife Service, Washington, DC; Circular 16. Jamestown, ND: Northern Prairie Wildlife Research Center Online; <http://www.npwrc.usgs.gov/resource/birds/migratio/index.htm> (Version 02Apr2002).
- McClain, W.E. and S.L. Elzinga. 1994. "The occurrence of prairie and forest fires in Illinois and other Midwestern states, 1679–1854." *Erigenia* 13: pp. 79–90.
- Minnesota County Biological Survey. 2008. "Minnesota's remaining prairie 100 years after the public land survey." Minnesota DNR; http://files.dnr.state.mn.us/eco/mcbs/prairie_map.pdf.
- Minnesota Department of Natural Resources. 2003. Otter Tail Regional Hydrological Assessment, Part B. GIS Specialist, Division of Waters, Minnesota DNR, St. Paul, MN.
- Minnesota Department of Natural Resources. 2005. "Field guide to the native plant communities of Minnesota: The prairie parkland and tallgrass aspen parklands provinces." Ecological Land Classification Program, Minnesota County Biological Survey and Natural Heritage and Nongame Research Program. Minnesota DNR, St. Paul, MN.
- Murkin, H. R., R. M. Kaminski, and R. D. Titman. 1982. "Responses by dabbling ducks and aquatic invertebrates to an experimentally manipulated cattail marsh." *Can. J. of Zool.* 60: pp. 2324–2332.
- Murkin, H. R. 1989. "The basis for food chains in prairie wetlands." Pages 316–338 in A. van der Valk, editor. *Northern Prairie Wetlands*. Iowa State University Press, Ames, IA.
- Newman, B. and J. Eash. 2011. Hamden Slough National Wildlife Refuge, Water Resource Inventory and Assessment (WRIA), Water Resources Branch, U.S. Fish and Wildlife Service, Minneapolis, MN: p. 46.
- North American Bird Conservation Initiative (NABCI), U.S. Committee. 2010. "The State of the Birds 2010 Report on Climate Change, United States of America." U.S. Dept. of Interior: Washington, DC: p. 32.
- North American Bird Conservation Initiative (NABCI), U.S. Committee, 2011. "The State of the Birds 2011 Report on Public Lands and Waters." U.S. Department of Interior: Washington, DC: p. 48.
- Ojima, D.S. and J.M. Lockett. 2002. "Preparing for a changing climate: The potential consequences of climate variability and change --Central Great Plains." Fort Collins: Central Great Plains Steering Committee and Assessment Team, Colorado State University.
- Payer, R. D. and C. G. Scalet. 1978. "Population and production estimates of fathead minnows in a South Dakota prairie wetland." *Prog. Fish-Cult.* 40: pp. 63–66.

- Pemble, R. H. 1995. "A survey of native prairie remnants and prairie species of special interest in the vicinity of the Hamden Slough National Wildlife Refuge, Becker County, Minnesota." Report prepared for U. S. Fish and Wildlife Service. Department of Biology, Moorhead State University, Moorhead, MN.
- Plumb, G. E. and J. L. Dodd. 1994. "Foraging ecology of bison and cattle." *Rangelands* 16(3): pp. 107–109.
- Pyne, S. J. 1982. *Fire in America: A Cultural History of Wildland and Urban Fire*. University of Washington Press: p. 264.
- Salk, R.J. and Schneider, I.E. 2007. *Study of Current Area Visitors: Detroit Lakes-Mahnomen 2007*. University of Minnesota, Tourism Center.
- Sampson, F. and F. Knopf. 1994. "Prairie conservation in North America." *BioScience* 44 (6): pp. 418–421.
- Sample, David W., and Michael J. Mossman. 1997. "Managing habitat for grassland birds - a guide for Wisconsin." Wisconsin Department of Natural Resources, Madison, WI, PUBL-SS-925–97: p. 154. Jamestown, ND: Northern Prairie Wildlife Research Center Online.
<http://www.npwrc.usgs.gov/resource/birds/wisbird/index.htm> (Version 03Jun2002).
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2011. *The North American Breeding Bird Survey, Results and Analysis 1966–2010. Version 12.07.2011* USGS Patuxent Wildlife Research Center, Laurel, MD.
- Shaffer, Terry, Ann Dahl, Mike Johnson, Ron Reynolds, Kathy Baer, and Glen Sargeant. 1999. *Mallard Use of Nesting Islands Depends on Surrounding Upland Cover*. Waterfowl 2000 12(2):16. Jamestown, ND: Northern Prairie Wildlife Research Center Online.
<http://www.npwrc.usgs.gov/resource/birds/nstisle/index.htm> (Version 02DEC99).
- Smith, A. G., J. H. Stoudt, and J. B. Gollop. 1964. "Prairie potholes and marshes." Pages 39–50 in J. P. Linduska, editor. *Waterfowl Tomorrow*. U.S. Fish and Wildlife Service, Washington, DC.
- Sovada, M. A., M. C. Zicus, R. J. Greenwood, D. P. Rave, W.E. Newton, R. O. Woodward and J. A. Beiser. 2000. "Relationships of habitat patch size to predator community and survival of duck nests." *Journal of Wildlife Management* 64(3): pp. 820–831.
<http://www.npwrc.usgs.gov/resource/2000/habpatch/habpatch.htm> (Version 17Nov2000).
- Stewart, R. E. and H. A. Kantrud. 1971. "Classification of natural ponds and lakes in the glaciated prairie region." U.S. Fish and Wildlife Service Resource Publication 92: p. 26.
- Swanson, G. A. and H. F. Duebbert. 1989. "Wetland habitats of waterfowl in the Prairie Pothole Region." Pages 228–267 in A. van der Valk, eds. *Northern Prairie Wetlands*. Iowa State University Press, Ames, IA.
- Towne E. G., D. C. Hartnett, and R. C. Cochran. 2005. "Vegetation trends in tallgrass prairie from bison and cattle grazing." *Ecological Applications* 15(5):pp. 1550–1559.
- Transeau, E. N. 1934. "The prairie peninsula." *Ecology* 16(3): pp. 423–437.
- U.S. Census Bureau. 2012. *State and County QuickFacts*. Accessed 21 May 2012 at: <http://quickfacts.census.gov/qfd/states/27/27005.html>.
- U.S. Department of Agriculture. 2007. *Census of Agriculture County Profile: Becker County -- Minnesota*. National Agricultural Statistics Service. Accessed 21 May 2012 at: <http://www.agcensus.usda.gov>.

- U.S. Department of Energy. 1999. Carbon sequestration research and development. Report # DOE/SC/FE-1. U.S. Department of Energy, Office of Science, Office of Fossil Energy.
- U.S. Environment Protection Agency. 2002. "Methods for evaluating wetland condition: Land-use characterization for nutrient and sediment risk assessment." Office of Water, U.S. EPA, Washington DC. EPA-822-R-02-025.
- U.S. Global Change Research Program (USGCRP). 2009. Climate Literacy: The Essential Principles of Climate Sciences. 2nd Version. U.S. Global Change Research Program/Climate Change Science Program, Washington, DC: p. 17; www.climate-science.gov.
- U.S. Fish and Wildlife Service. 1988. Final Environmental Assessment for Proposed Establishment of the Hamden Slough National Wildlife Refuge, Becker County, Minnesota. U.S. Dept. of Interior, Fish and Wildlife Service, Region 3, Twin Cities, MN: p. 86.
- U.S. Fish and Wildlife Service. 1992. Hamden Slough National Wildlife Refuge Concept Plan: A description of the long-range management and development objectives of Hamden Slough National Wildlife Refuge. U.S. Dept. of Interior, Fish and Wildlife Service, Region 3, Twin Cities, MN: p. 24.
- U.S. Fish and Wildlife Service. 2005. Hunting Plan: Hamden Slough National Wildlife Refuge. U.S. Dept. of Interior, Fish and Wildlife Service, Region 3, Ft. Snelling, MN: p. 19.
- U.S. Fish and Wildlife Service. 2005. Partners for Fish and Wildlife Program: Restoring Wildlife Habitat on Minnesota's Private Lands: p.6.
- U.S. Fish and Wildlife Service. 2010. Identifying Refuge Resources of Concern and Management Priorities: A Handbook. Washington, DC: p. 60.
- van der Valk, A. G., and C. B. Davis. 1978. "The role of seed banks in the vegetation dynamics of prairie glacial marshes." *Ecology* 59: pp. 322–335.
- Ward, J. A.; Cromwell, R.J.; McCarthy, J.P.; Dobbs, C.A. 1997. A Cultural Resources Management Plan for the Hamden Slough National Wildlife Refuge - Becker County, Minnesota. IMA Consulting, Inc., Minneapolis, MN.
- Weaver, J. E. 1954. North American Prairie. Johnsen Publishing Company, Lincoln, NE: p. 357.
- Weller, M. W. and C. E. Spatcher. 1965. "Role of habitat in the distribution and abundance of marsh birds." Iowa Agriculture and Home Economics Experiment Station, Special Report 43: p. 31.
- Wilcox, A.H. 1907. A Pioneer History of Becker County. Pioneer Press Company, St. Paul, MN: p. 757.
- Wright, H. A. and A. W. Bailey. 1980. "Fire ecology and prescribed burning in the Great Plains: A research review." USDA For. Serv. Gen. Tech. Rep INT-77.

Appendix G: Compatibility Determinations

In this appendix:

Hunting
Wildlife Observation and Photography (including means and dates of access)
Environmental Education and Interpretation
Cooperative Farming as a Habitat Management Tool to Enhance and Restore Refuge Grasslands
Haying
Prescribed Grazing
Tree Harvest – Wood Cutting
Placement/Construction of New, Small Parking Areas
Scientific Studies and Research Projects by Third Parties

COMPATIBILITY DETERMINATION

Use: Hunting

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “ . . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “ . . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Administration Act of 1966, as amended [668dd–668ee])

Description of Use:

Public hunting will be allowed on all or portions of the Refuge in accordance with the State of Minnesota regulations and seasons for two separate hunts: the Youth Waterfowl Hunting Day and the Muzzleloader Deer Season.

The Youth Waterfowl Hunting Day will take place on Refuge fee title property, in Audubon and Riceville Townships. Hamden Township (60percent of the Refuge) will be closed to waterfowl hunting. The hunting season for the Youth Waterfowl Hunting Day is usually one week ahead of the opening of the State Waterfowl Season. Tentatively it will take place on Saturday, September 23, 2006, the 4th weekend in September.

The White-tailed Deer Muzzleloader Season will take place on all tracts of Hamden Slough NWR purchased in fee title. The State of Minnesota Deer Muzzleloader season is usually approved for 15 days beginning on the last weekend in November.

Both hunts will take place in accordance with Minnesota regulations and seasons. No additional Refuge permits or taking regulations are expected. Biological data from harvested deer in Units #259 and #297 are collected by the Minnesota DNR to reconstruct basic information on the deer herd. The Refuge staff will consult with Minnesota DNR biologists to adjust harvest recommendations for future hunts and in conjunction with the state, sample deer for Chronic Wasting Disease and other diseases.

The Youth Waterfowl Hunting Day will take place on Refuge fee title property in Audubon and Riceville Townships, a total of 1360 acres. Hamden Township (60 percent of the Refuge) will be closed to waterfowl hunting. Hunting will take place on restored native tallgrass prairie and restored wetlands. Fall migrating waterfowl will be the primary users of restored wetlands during the Youth Waterfowl Hunting Day. Well-developed county and township roads provide public access to all hunting areas.

The White-tailed Deer Muzzleloader Season will take place on all tracts of Hamden Slough NWR purchased in fee title in Audubon, Hamden, and Riceville Townships. This will allow hunting on all 3,402 acres of Hamden Slough NWR in Audubon, Hamden, and Riceville Townships. Hunting will take place on restored native tallgrass prairie and restored wetlands. Resident winter wildlife will be the primary users of that habitat during the muzzleloader season for white-tailed deer. Well-developed county and township roads provide public access to all hunting areas.

The hunting season for the Minnesota Youth Waterfowl Hunting Day is usually one week ahead of the opening of the Minnesota State Waterfowl Season. Tentatively, the first Youth Waterfowl Hunt will take place on Saturday, September 23rd, the 4th weekend in September, 2006. The Minnesota Youth Waterfowl Hunt will take place for one day, on the 3rd or 4th weekend of September, during each subsequent year, subject to Minnesota State regulations.

The State of Minnesota Deer Muzzleloader season is usually approved for 15 days beginning on the last weekend in November. For 2006, the Minnesota Deer Muzzleloader is scheduled for November 25 - December 10. The Minnesota Deer Muzzleloader hunt will take place for 15 days, beginning on the last weekend in November, during each subsequent year, subject to Minnesota State regulations.

Both hunts will take place in accordance with Minnesota regulations and seasons. No additional Refuge permits or taking regulations are expected. No supporting facilities or structures are expected to be used. An estimated 75 youth hunters, ages 15 and below, are expected for the Youth Waterfowl Hunting Day and should be accompanied by approximately 30 non-hunting adults. An estimated total of 200 deer hunters is expected during the 15-day Muzzleloader Hunt.

Maintaining the "Closed to Hunting" status of the Refuge does not provide for all the priority public uses identified as goals of the National Wildlife Refuge System. The Refuge Recreation Act of 1962 (16 U. S. C. 460K) and the National Wildlife Refuge System Administration Act of 1966 (16 U. S. C. 668dd—668ee) provide authorization for hunting and fishing on national wildlife refuges. The effects of hunting and fishing on refuges have been examined in several environmental review documents, including the Final Environmental Impact Statement on the Operation of the National Wildlife Refuge System (1976), Recommendations on the Management of the National Wildlife Refuge System (1978), and the Draft Environmental Impact Statement on the Management of the National Wildlife Refuges (1988). Nothing in the establishing authority for the Hamden Slough NWR (Migratory Bird Conservation Act {16 U. S. C. § 715}) precludes hunting on the Refuge.

Maintaining the "Closed to Hunting" status of the Refuge does not provide for all the public uses identified as goals of the Refuge. The 1988 Hamden Slough Final Environmental Assessment developed for the establishment of the Hamden Slough NWR identified providing compatible wildlife-dependent recreational uses, including " . . . waterfowl and resident game hunting, wildlife observation and photography . . . " as public use benefits. It further states, "An estimated 50 percent of the public use would be for these activities." There are no known administrative conflicts associated with the proposed hunting program. All features of the program are in compliance with Refuge objectives.

Fifteen federal Waterfowl Production Areas (WPAs) are adjacent to or near Hamden Slough National Wildlife Refuge. They are used by waterfowl, deer, and upland game hunters during the Minnesota State hunting seasons.

Availability of Resources:

The current staffing levels are sufficient to support a public hunting program on Hamden Slough NWR. Refuge funding is available to manage both hunts. No increase in costs is expected above the Refuge's current Operations and Maintenance budget.

Anticipated Impacts of the Use:

Youth Waterfowl Hunting and white-tailed deer hunting activities are intended to meet the conservation and priority public use objectives of the National Wildlife Refuge System Improvement Act and Refuge objectives and management goals without adversely affecting the primary objectives and mission of the Refuge. Refuge white-tailed deer hunting and Youth Waterfowl Hunting follow all applicable laws, regulations, and policies including the Migratory Bird Conservation Act, 50 CFR, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Hamden Slough National Wildlife Refuge goals and objectives. These activities are compliant with the purpose of the Refuge and the National Wildlife Refuge System mission. Operating the hunting activity does not alter the Refuge's ability to meet habitat goals, provides for the safety of the areas' citizens, and supports several of the primary objectives of the Refuge.

Disturbance to wildlife is an anticipated affect, as people participate in the Youth Waterfowl Hunting Day. Disturbance to wildlife is limited to occasional flushing of non-target species and the harvest of individual members of the waterfowl species approved for taking on the Youth Waterfowl Hunting Day. Waterfowl hunting would only occur on Refuge tracts in Audubon and Riceville Townships. Some temporary dispersal of migratory birds from the north and south ends of the Refuge may occur. The dispersal of migratory birds could include Canada geese, which can be harvested by hunters hunting on Waterfowl Production Areas or private land around the Refuge, during the Minnesota Special Goose Season. Refuge tracts in Hamden Township, which total 60 percent of the Refuge acreage, will be undisturbed. Maintaining Hamden Township as a closed area during the Youth Waterfowl Hunt, as outlined in the Hunting Management Plan, provides a resting and feeding area for waterfowl during the hunting day.

Disturbance to wildlife is the anticipated effect, as people participate in the Muzzleloader Deer Hunt. White-tailed deer hunting would occur on all Refuge tracts in Audubon, Hamden and Riceville Townships. Some temporary dispersal of deer from the Refuge may occur. These deer could be harvested by hunters hunting on Waterfowl Production Areas or private land around the Refuge. Disturbance by vehicles will be limited, as off-road travel will not be permitted. Special access accommodations for persons with disabilities will be minimal, utilizing existing gravel trails on the Refuge.

Disturbance to wildlife is limited to occasional flushing of non-target species and the harvest of individual members of white-tailed deer during the Minnesota State muzzleloader hunt. Restrictions to the hunting program assure that these activities have no adverse impacts on other wildlife species and little adverse impact to other public use programs.

Restrictions on both hunting programs assure that these activities have no adverse impacts on other wildlife species and little adverse impact to other public use programs. Disturbance by vehicles will be limited, as off-road travel will not be permitted. Special access accommodations for persons with disabilities will be minimal, utilizing existing gravel trails on the Refuge.

As indicated in the Hamden Slough NWR Hunting Management Plan, adjustments to the species hunted and harvestable limits will be annually evaluated by wildlife surveys conducted by both the State of Minnesota and U.S. Fish and Wildlife Service.

Long-term impacts:

- The muzzleloader hunt helps control the size of the deer herd, reducing the stress of disease and the damaging effects to habitat causes by over population. As indicated in the Hamden Slough NWR Hunting Management Plan, adjustments to the species hunted and harvestable limits will be annually evaluated by wildlife surveys conducted by both the State of Minnesota and U.S. Fish and Wildlife Service. Conducting deer hunting during the late November muzzleloader season, as outlined in the Hunting Management Plan, will not disturb resting and feeding areas for migratory birds during their migration period. The first week of November is the normal freeze-over period of area wetlands, and most migrating birds have left the area by November 10th.
- No long-term impacts to wildlife are expected from the Youth Waterfowl Hunting Day.

By facilitating hunting on the Refuge, program participants' knowledge and appreciation of wildlife will increase, which should lead to increased public stewardship of wildlife and their habitats at the Refuge. Increased public stewardship will support and complement the Service's actions in achieving the Refuge's purposes and the mission of the National Wildlife Refuge System.

The Service has allowed public hunting and administered a hunting program on WPAs since the early 1960s. Most recent estimates show that more than 125,000 people visit WPAs located in Minnesota annually for the purpose of hunting. During its history, the Service has not noted any significant adverse effects of this program on the administration of WPAs and has determined that this use is compatible with the purposes of the WPAs and the Refuge System's mission statement. The hunting program for Hamden Slough NWR will be consistent with the program administered by the Service for WPAs. Based on the similarities between adjacent and nearby WPAs and the Refuge, it is expected that the establishment of a hunting program for Hamden Slough NWR should not adversely affect the Refuge's purpose or goals.

Public Review and Comment:

The first period of public review and comment began November 30, 2004 and ended January 10, 2005. A second period of review began November 4, 2005 and ended December 9, 2005.

The following methods were used to solicit public review and comment:

- Posted notice at Refuge headquarters
- Public notice in newspaper with wide local distribution
- Posted notices in public places
- Letter to other interested persons
- Public meeting
- Extended comment period
- Media used to solicit public review and comment included Becker County Record, and Detroit Lakes Tribune.

Why was this level of public review and comment selected?

The public was notified by newspaper, radio, and other media regarding a public meeting on November 30, 2004 to review opening the Refuge to hunting and also propose various Refuge hunting options. At the meeting, the public was given the opportunity to make comments on opening the Refuge to hunting, and the types of hunting desired. Following the meeting, a public comment period lasted from November 30, 2004 to December 15, 2004. Comments or letters were received from 23 respondents, of which a majority favored either limited waterfowl hunting or limited deer hunting. Some respondents recommended either the waterfowl or deer hunt but were opposed to the other. Most expressed concern about wildlife disturbance and the effect on hunting on nearby private and public lands. Recorded public comments and letters are maintained for review at the Refuge office.

After initial public comments from the 2004 November public meeting were received, a draft Hunting Plan, and draft Hunting Environmental Assessment and draft Compatibility Determination were placed at the Detroit Lakes Public Library on December 17, 2004. Legal notification and news articles on December 19 and 22, 2004 informed the public that the hunting proposal documents were available for review and that additional public comments would be received through January 10, 2005. With the comments generated during the first public comment period being generally favorable to the proposed Hunting Plan, and since no new information was obtained to revise the plan, the Refuge submitted a draft Hamden Slough Hunt Plan, draft Environmental Assessment, and draft Compatibility Determination to the Region 3 Office of the U.S. Fish and Wildlife Service.

Their comments and suggestions were incorporated into a final draft Hunt Plan, final draft Environmental Assessment, and final draft Compatibility Determination, in November, 2005. The public was notified a second time by newspaper, radio, and other media about a second public comment period, which lasted from November 4 through December 9, 2005. With the comments generated during both public comment periods being generally favorable to the proposed Hunting Plan, and since no new information was obtained to revise the Plan, the Refuge submitted the final draft Hunting Plan, final draft Environmental Assessment, and final draft Compatibility Determination to the U.S. Fish and Wildlife Service Region 3 office for approval.

Summarize comments received and any actions taken or not taken because of comments received.

Comments or letters were received from 23 respondents, of which a majority favored either limited waterfowl hunting or limited deer hunting. Some respondents recommended either the waterfowl or deer hunt, but were opposed to the other. Most expressed concern about wildlife disturbance and the effect on hunting on nearby private and public lands. The comments are summarized below:

Public Comment	Number of comments
Maintain No Hunting status	5
Open for general waterfowl hunting	1
Open for restricted waterfowl hunting	14
Maintain no waterfowl hunting status	1
Open for general deer hunting	1
Open for restricted deer hunting	11
Maintain no deer hunting status	1
Open small game and upland bird hunting	1

1) Issue/Concern: Traditional public use opportunities, especially limited hunting, should be provided on Service lands.

There would be a positive impact on this issue, since lands would be open to limited hunting. If Hamden Slough National Wildlife Refuge remained closed, it would essentially represent a sanctuary unavailable to the public for the harvest of wildlife resources. The public desire for public use opportunities would not be met and actually decrease from levels when private ownership controlled public use. National Wildlife Refuge System goals, the President's Executive Order, and Refuge objectives for public use opportunities would not be met.

If the Refuge was opened for Big, Small, Upland, and season length Waterfowl Hunting, there would be a negative impact on this issue. A significant proportion of the public would view the general hunting as disturbing wildlife, particularly waterfowl, and adversely affecting hunting on public and private lands surrounding the Refuge.

2) Issue/Concern: A balance of public uses should be accommodated.

During the Youth Waterfowl Hunting Day and Deer Muzzleloader season, areas open to wildlife observation, environmental education, and interpretation would also be open for specified public hunting. Time and spacing considerations in the Hunting Management Plan would help accommodate a variety of user groups. Disturbance of public use and wildlife would be minimal with one day of youth waterfowl hunting in September. The muzzleloader hunting season in late November takes place after wetlands freeze over, and numbers of migrating birds and public use is minimal. If no hunting is permitted, some negative impact is expected on this issue.

If the Refuge was opened to all Minnesota State hunt seasons, areas open to wildlife observation, environmental education, and interpretation would also be open to public hunting. Refuge general hunting will disturb the high concentration of waterfowl that now use the Refuge in September, October, and early November. This will reduce public wildlife viewing opportunity, and reduce the quantity of waterfowl, which are hunted on the surrounding private and public lands. Time and spacing considerations in the Hunting Management Plan would help accommodate a variety of user groups, but the disturbance of other public use activities would be a factor negatively affecting a quality visitor experience.

3) Issue/Concern: A concern by private landowners near or adjacent to Refuge land is that Refuge hunting will reduce the quality of hunting on surrounding property.

With a September Youth Waterfowl Hunting Day and a late November Deer Muzzleloader season, there would be some minimal disturbance having a negative impact on this issue. The disturbance factor is considered minimal, as the Refuge would be open for only one day of waterfowl hunting in September, and for a 15 day period of muzzleloader deer hunting, in late November and early December. It is also possible that Refuge hunting will increase hunting opportunities on surrounding lands by increasing the wildlife moving beyond the Refuge boundary.

If the Refuge remains closed to hunting, Hamden Slough NWR would act as a wildlife sanctuary and maintain a reservoir of migratory game birds and white-tailed deer. These animals do move beyond the Refuge boundary and are available for hunting on private and public property. The public's desire for Refuge public use opportunities would not be met and actually decrease from levels when private ownership controlled public use. National Wildlife Refuge System goals, the President's Executive Order, and Refuge objectives for public use opportunities would not be met.

If the Refuge was opened to all Minnesota State hunt seasons, there would be significant negative impact on this issue, with multiple hunting seasons disturbing wildlife, particularly waterfowl, from early September through early December. This could adversely affect hunting on public and private lands surrounding the Refuge by moving migratory game birds to other sanctuary areas.

4) Issue/Concern: Hunting programs should be biologically sound from a populations and habitat standpoint.

With a September Youth Waterfowl Hunting Day and a late November–early December Deer Muzzleloader season, hunting will result in the removal of white-tailed deer and a decrease in the population of waterfowl species. However, this loss of individuals from populations, in accordance with specified seasons and regulations, is expected to be compensatory in nature. By compensatory, this means removing part of the population by hunting is only at the level that is lost naturally from predation, injury, disease, weather, competition, and other factors.

Disturbance of non-targeted wildlife species under limited hunting could result in additional stress on these animals, but the impacts are not expected to be significant. Hunter entry and exit will be limited to foot travel, and Refuge regulations prohibit the removal of any plant materials. With these constraints on visitor behavior, impacts to wildlife habitat and local plant communities are expected to be minor. The Youth Waterfowl Hunt would provide a closed migratory bird hunting area (Hamden Township) since that

portion of the Refuge will be closed to any migratory game bird hunting to comply with the 40 percent restriction considered in policies of the Migratory Bird Conservation Act.

If the Refuge remained closed to hunting, ecological impacts would center on the expected increase of the white-tailed deer population without hunting and the absence of natural predators. Large numbers of deer would degrade the existing Refuge and adjacent habitat through over-browsing, having negative impacts on flora and other fauna and deer health. The Minnesota Department of Natural Resources target for deer density in this area is 4.4 deer/square mile. Deer density in Unit #259 is currently estimated at 8.4 deer/square mile.

If the Refuge was opened to all Minnesota State hunt seasons, there would be significant negative impact on this issue. General hunting will result in the removal of game species and a disturbance and decrease in the populations of these species. However, this loss of individuals from populations, in accordance with specified seasons and regulations, is expected to be compensatory in nature. By compensatory, this means removing part of the populations of animals by hunting is only at the level that is lost naturally from predation, injury, disease, weather, competition, and other factors.

Disturbance of non-targeted wildlife species, with the Refuge open to hunting for all Minnesota State hunting seasons, will result in additional stress on resident wildlife, particularly migratory birds, over a period from early September through mid-November. Daily usage of the Refuge is expected by multiple hunter groups for any state season. Their entry and exit will be limited to foot travel, and Refuge regulations prohibit the removal of any plant materials. Impacts to wildlife populations and local plant communities are expected to be moderate.

Public Notification

Legal notification and news articles on December 19 and 22, 2004 informed the public that the hunting proposal documents were available for review, and that additional public comments would be received through January 10, 2005. Two comments were received: one by the White Earth Reservation Tribal Council and one from the Minnesota Department of Natural Resources. No comments were received from the general public.

A second comment period was posted for review at the Detroit Lakes Public Library and Refuge headquarters, on November 4, 2005. Legal notification and news articles on November 3 and November 6, 2005 informed the public that the hunting proposal documents were available for review, and that additional public comments would be received through December 9, 2005. Public review was taken in the form of written comments and phone calls for a period of 35 days. No additional comments during the second public review period. With the comments generated during both public comment periods being generally favorable to the proposed Hunting Plan, and since no new information was obtained to revise the plan, the Refuge will implement the Hunting Plan as written.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Ensure annual wildlife surveys are completed and that the hunting program is adjusted to populations.
2. Annually review all hunting activities and operations to ensure compliance with all applicable State and Federal laws, regulations and policies.
3. Construction and use of permanent blinds is not permitted.
4. Use of motorized boats is not permitted.
5. All boats, decoys, and blind materials must be removed at the end of the day.

6. Hunting dogs are under the immediate control of the hunter.
7. Public entry to hunting areas is not allowed earlier than 2 hours before legal shooting hours.

The following additional special regulations are necessary to ensure the planned public hunting seasons are compatible with Hamden Slough NWR's goals, objectives, and purposes.

Suggested Regulations for Hamden Slough National Wildlife Refuge:

A. Hunting of White-tailed Deer is permitted on the Refuge subject to the following conditions:

1. Hunting of white-tailed deer is permitted in accordance with Minnesota state hunting regulations during the state Deer Muzzleloader Season only, with muzzleloaders.
2. Hunters may use portable stands. Hunters may not construct or use permanent blinds, permanent platforms, or permanent ladders.
3. All stands and personal property must be removed from the Refuge at the end of each day's hunt.
4. Entry to hunting areas is not allowed earlier than two hours before legal shooting hours.
5. Allowable equipment: State regulations will govern all weapons and ammunition used for hunting on the refuge. All-terrain-vehicles (ATV) will be allowed on Refuge roads, for disabled hunting only.

B. Hunting of Waterfowl is permitted on designated areas of the Refuge subject to the following conditions:

1. Hunting of waterfowl is permitted in accordance with state hunting regulations during the Minnesota State Youth Waterfowl Hunting Day only, by hunters age 15 and under. Waterfowl hunting will be limited to Refuge tracts in Audubon and Riceville Townships, only. Refuge tracts in Hamden Township are closed.
2. We prohibit the use of motorized boats.
3. We prohibit the construction or use of permanent blinds, stands, or scaffolds.
4. You must remove all personal property, which includes boats, decoys, blinds, and blind materials (except for blinds made entirely of marsh vegetation) brought onto the Refuge following that day's hunt.
5. We allow the use of hunting dogs, provided the dog is under the immediate control of the hunter at all times during the state approved hunting season.
6. Entry to hunting areas is not allowed earlier than two hours before legal shooting hours.

Subsequent modifications in hunting regulations will be addressed in an amendment process as needed, and the public will be informed through leaflets or postings. Hunter numbers and success, observations or measurements of animal health, and measurements of habitat conditions may all be used to determine if changes in hunting regulations are necessary.

Justification:

Waterfowl hunting is a historical and current tradition of residents of northwestern Minnesota. Allowing waterfowl hunting on Hamden Slough National Wildlife Refuge, with the stipulations above, will have a positive effect on the wildlife resources of the Refuge. The dispersal of migratory birds during the Youth Waterfowl Hunting Day will include Canada geese, which can be harvested by hunters hunting on Waterfowl Production Areas or private land around the Refuge, during the Minnesota Special Goose Season. Canada goose populations in western Minnesota need to be kept within the limits necessary to prevent extensive crop depredation to private lands surrounding the Refuge. Failure to maintain the goose population within normal levels supported by the public will result in serious degradation of Refuge

support and cooperation, particularly from adjacent and local private landowners. This will impact other wildlife species on the Refuge.

The Hamden Slough NWR Hunting Management Plan provides the management needed to ensure compatibility with the goals of the Refuge and to maintain compliance with the 1997 National Wildlife Refuge System Improvement Act. The 1997 Improvement Act identified hunting, when compatible, as one of six priority public uses. Waterfowl hunting will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or Refuge purposes, including migratory bird conservation. Compliance with the Hamden Slough NWR Hunting Management Plan ensures associated disturbance to wildlife is localized, temporary and minor. Those portions of the Refuge with increased activities generally have facilities present to accommodate the public use with minor impacts to the habitat. The stipulations will reduce or eliminate any unwanted impacts from waterfowl hunting.

Annual wildlife surveys conducted by the State of Minnesota and the U.S. Fish and Wildlife Service have provided the data to ensure that hunting of waterfowl species doesn't jeopardized their long-range population goals. The continuation of these surveys on Hamden Slough National Wildlife Refuge will provide the necessary data for managing the hunting program into the future.

Mandatory 15-year Re-Evaluation Date: 2020

Signature: Refuge Manager: /Mike Murphy/ 12/12/2005
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 12/14/2005
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Wildlife Observation and Photography (including means and dates of access)

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “ . . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “ . . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System 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 will not be allowed within the Refuge.

Wildlife observation and photography are priority public uses on National Wildlife 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:

The needed staff for developing and administering the wildlife observation/photography program is available. 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 the 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.

This CD also allows for the siting of the prairie-chicken blind as well as a photography blind to be placed in easily accessible areas and allowing the public unique opportunities to enjoy Refuge wildlife. Blinds will be placed in areas to provide opportunities for specific wildlife observation/photography while minimizing disturbance to wildlife and habitat.

Public Review and Comment:

This Compatibility Determination was part of the Draft Hamden Slough NWR Comprehensive Conservation Plan and Environmental Assessment. Public notification and review included a notice of availability published in the *Federal Register*, 30-day comment period, local media announcements, and a public meeting. Additionally, drafts of this and all CDs were available at the Detroit Lakes WMD

headquarters for review and comment. Comments received and agency responses are included in the final CCP.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with 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.
3. Blinds for wildlife observation/photography can be placed to provide specific wildlife viewing opportunities.

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.

Mandatory 15-year Re-Evaluation Date: 2027

Signature: Refuge Manager: /Ryan Frohling/ 10/01/2012
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 10/05/2012
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Environmental Education and Interpretation

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “. . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “. . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Administration Act of 1966, as amended [668dd–668ee])

Description of Uses:

To allow wildlife interpretation and environmental education programs to be conducted on Hamden Slough NWR. Formal programs include activities prepared, scheduled, and organized for school-aged children and organized groups by U.S. Fish and Wildlife Service staff. Programs conducted by the Prairie Wetlands Learning Center and Tamarac National Wildlife Refuge would be included in this category. In most cases, curriculums and program schedules are prepared in advance. These curriculums address a number of wildlife conservation issues including wetland and grassland conservation, migratory bird management, and the conservation of endangered species. Informal programs include self-guided auto tour routes and nature trails and impromptu presentations and discussions of wildlife conservation issues with interested citizens, casual visitors, and unscheduled groups. 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 be classified as an informal program.

In addition, this use includes the development of indoor interpretive areas at the Refuge’s environmental education building. The purposes of these exhibits are many, but include telling the story of the National Wildlife Refuge System and conservation of prairie-wetland habitats.

Availability of Resources:

The current staffing levels are sufficient to support environmental education and interpretation programs on Hamden Slough NWR. No increase in costs is expected above the Refuge's current Operations and Maintenance budget. However, increases in visitor services staff may result in an expanded effort.

Anticipated Impacts of the Uses:

The overall impacts to the Refuge and associated wildlife populations from this use will be minimal. There will be some disturbance to waterfowl and other wildlife but at levels that will not likely interfere with waterfowl production. School buses and personal vehicles will utilize parking areas already constructed for use by waterfowl hunters and 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. Any auto tour routes will be designed to minimize disturbance to waterfowl during the spring breeding/nesting season.

Public Review and Comment:

This Compatibility Determination was part of the Draft Hamden Slough NWR Comprehensive Conservation Plan and Environmental Assessment. Public notification and review included a notice of availability published in the *Federal Register*, 30-day comment period, local media announcements, and a public meeting. Additionally, drafts of this and all CD's were available at the Detroit Lakes WMD headquarters for review and comment. Comments received and agency responses are included in the final CCP.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

The stipulations for environmental education and interpretation are the same as for wildlife observation and photography.

1. Environmental education /interpretation activities are allowed on the Refuge from August 1st through March 31st.
2. Environmental education/interpretation will be allowed year round from adjacent township and county roads, Refuge trails, and parking lots.
3. Access on the Refuge will be by foot traffic only (including hiking, snowshoeing, and cross country skiing).
4. Motorized vehicles, bicycles, and horses are restricted to adjacent county and township roads. Boats are not allowed within the Refuge.
5. The headquarters area, including the environmental education building, will remain open year round for environmental education and interpretation.
6. 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.

Mandatory 15-year Re-Evaluation Date: 2027

Signature: Refuge Manager: /Ryan Frohling/ 10/01/2012
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 10/05/2012
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Cooperative Farming as a Habitat Management Tool to Enhance and Restore Refuge Grasslands

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is "...for use as an inviolate sanctuary, or for any other management purposes, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act) and including "...conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife Refuge System Mission:

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.

Description of Use:

Cooperative farming is the term used for cropping activities done by a third party on land that is owned by the Service. This type of activity is usually done on a short term basis (five years or less) to prepare an optimum seedbed for the establishment of native prairie species.

The cropping is done under the terms and conditions of a Cooperative Farming Agreement or Special Use Permit issued by the Refuge Manager. The terms of the Agreement or Permit insure that all current Service and Refuge restrictions are followed.

Cooperative farming activities are only compatible on previously disturbed areas that have unacceptable levels of chemical residue, noxious weeds, or non-native plant species or ecotypes or to honor the land use clauses of a purchase agreement. To ensure that all Service policies are met, all such land use clauses must be approved by the Refuge Manager prior to Service acceptance of the purchase agreement.

Contracts are typically written for three to five years. The cooperator breaks up the ground the first year and then farms it for the remaining two to four years. The last year of the contract requires the cooperator to seed the field to soybeans. Soybean stubble is the preferred substrate for the Refuge to seed native grasses and forbs into.

Farming entails the use of mechanical equipment such as tractors, disks, and seeders. Each site is tilled prior to spring planting, once ground conditions permit. Tilling requires one to two days per site. Some sites may also be treated with herbicide prior to planting. Crops such as corn and soybeans are planted. Typically, planting is completed in one day or less on any individual site, and planting on all sites usually begins as early as mid-April and is completed as late as early June depending on soil conditions and type of crop planted. Cooperators are limited to using only Service-approved herbicides. The use of genetically modified crops (GMO crops), specifically glyphosate-tolerant corn and soybeans, will be authorized on Refuge lands consistent with current Regional policy. Beginning in calendar year 2012, the use of genetically modified, glyphosate-tolerant corn and soybeans will be used only for the purpose of habitat restoration.

Harvest techniques are the same for both no-till and traditional farming practices. Harvest begins in the fall, using a self-propelled harvesting implement such as a combine, and usually takes about one day per site and is complete on all sites by late October.

Availability of Resources:

The needed staff time for development and administration of cooperative farming programs is already committed and available. Most of the work needed to prepare for this use would be done as part of routine grassland management duties. The decision to use a cooperative farmer would occur as part of strategies developed under grassland development and management discussions. The additional time needed to coordinate issuance and oversight of the needed Special Use Permit or Cooperative Farming Agreement is relatively minor and within existing Refuge resources.

The cooperative farming of Service land will in most cases generate income for the Service. In accordance with Service policy, some of the farming income may be reduced to achieve the ultimate purpose of the agreement (grassland cover) by having the cooperator purchase seed or apply herbicide for the grassland restoration as the final step of the farming agreement. All farming income received will be submitted for deposit in the Refuge Revenue Sharing Account and is not available at the Refuge level to offset station costs incurred in administration of this use. All Service employees involved in the administration of the program must, however, be sensitive to the primary purpose of cooperative farming; providing an optimum seedbed for native prairie plant species. The Service should receive a fair market value from cooperative farmers, but generation of income is a secondary consideration when developing the terms and conditions of a cooperative farming agreement.

To lessen any appearance of favoritism or impropriety, Refuge Managers should document how cooperators were selected and how rental rates were derived (see Refuge Manual).

Anticipated Impacts of the Use:

The use of farming provides Refuge staff with a management tool that allows the Refuge staff to meet the habitat goals and objectives. Service policy calls for maintaining or restoring Refuge habitats to historic conditions if doing so does not conflict with Refuge purposes (U.S. Fish and Wildlife Service 2001).

Cooperative farming to prepare suitable seedbeds for native prairie plantings will result in short-term disturbances and long-term benefits to both resident and migratory wildlife. Short-term impacts will include disturbance and displacement typical of any noisy heavy equipment operation. Cropping activities in old fields or abandoned croplands will also result in short-term loss of habitat for any animal or insect species using those areas for nesting, feeding, or perching. Long-term benefits are extremely positive due to establishment of diverse nesting cover including native tallgrass species. The resulting habitat will greatly improve conditions for most of the same species affected by the short-term negative impacts. Strict time constraints placed on this use will limit anticipated impacts to these relatively minor areas.

Public Review and Comment:

This Compatibility Determination was available for public review from April 18, 2011 through May 2, 2011.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Cooperative farming agreements will be limited to five years or less.
2. Farming activity will only take place on previously altered tracts of land within the Refuge and must meet specific habitat and related wildlife objectives and contribute to the purposes of the Refuge.

3. Cooperating farmers will be subject to Service policy and regulation regarding use of chemicals. Herbicide and pesticide use is restricted by type and to the minimum necessary amount applied.
4. Special conditions of Cooperative Farming Agreements will address unique local conditions as applicable.
5. Planting and harvest activities are restricted to minimize disturbance of wildlife species.
6. The use of GMO crops is limited to glyphosate-tolerant corn and soybeans.
7. Beginning in calendar year 2012, the use of genetically-modified, glyphosate-tolerant corn and soybeans will be used only for the purpose of habitat restoration.

Justification:

Farming, both conventional and with the use of glyphosate-tolerant corn and soybeans, contributes to the achievement of Refuges purposes and the National Wildlife Refuge System mission, because it helps enhance and restore grassland habitat for migratory birds and resident wildlife. The cooperative farming of previously disturbed areas which are owned by the Service and have unacceptable levels of chemical residue, noxious weeds, or non-native plant species or ecotypes or are being farmed to honor the land use clauses of a purchase agreement to prepare an optimum seedbed for the establishment of native prairie species, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission.

1. Only areas that have already been significantly manipulated or altered by cropping activities will be affected. These areas contain few if any native plants and offer extremely limited value to the ecological integrity of the unit or landscape.
2. Cooperative farming activities in most cases provide the fastest, most cost-effective way to establish native prairie species on areas that have unacceptable levels of chemical residue, noxious weeds, or non-native plant species or ecotypes. Refuge staff could complete all work, but for most districts that would require additional equipment and/or staff to efficiently break up non-native brome sod, or to cultivate and control weeds on small, widely scattered tracts of land. Hiring contractors to do this work at rates that can approach \$100/acre is a possibility but would require additional funds in years when the farming acres were high. By using local farmers to conduct these farming activities, Refuge budgets and staff time can be better allocated to completing the needed restoration (seeding of native grasses and forbs) on lands that have completed the farming cycle and are in good condition for seeding.
3. Short term impacts of farming small tracts of land are minor. No wildlife or habitat losses occur when land purchased in row crop is farmed for an additional period of two–five years. Low quality grasslands that are farmed as a first step to conversion to higher-value native grasslands will result in habitat loss for trust resources during the farming period. The long-term benefits to the ecological integrity of the Refuge and landscape by restoring these degraded or row-cropped areas to native prairie plant species are significant and exceed the short term losses incurred through the cropping process.

Mandatory 10-year Re-Evaluation Date: 2021

Signature: Refuge Manager: /Scott B. Kahan/ (undated)
(Signature and Date)

Concurrence: Regional Chief: /James T. Leach (Acting)/ 5/04/2011
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Haying

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “ . . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “ . . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Administration Act of 1966, as amended [668dd–668ee])

Description of Use:

Haying is the cutting and removal of grass, either non-native cool season species such as brome or native warm or cool season species. Haying of this type is typically done by a cooperative farmer acting under authority of a Cooperative Farming Agreement or Special Use Permit issued by the Refuge Manager.

Haying can be an effective management tool as part of an overall grassland management plan to improve and maintain district grasslands for the benefit of migratory birds. Grasslands need periodic renovation to maintain vigor, diversity, and the structure necessary for migratory bird use. Haying is an effective alternative for burning or grazing, which are two other means used by district staff to maintain grassland vigor. If local site conditions preclude use of prescribe fire due to hazards to neighboring property or a similar problem, removal of accumulated biomass through haying does serve to reduce unwanted overstory, reduce woody plant invasion, etc. Such removal will allow for more vigorous regrowth of desirable species following the haying, although results are neither as dramatic nor positive as with prescribed fire.

Hamden Slough NWR has historically allowed haying, especially within Hamden Lake bottom. Although specific acreages for fields to be hayed will vary by unit, they will typically range from five to 40 acres with only rare exceptions exceeding 100 acres.

Availability of Resources:

The current staffing levels are sufficient to support a haying program on Hamden Slough NWR. Refuge funding is available to manage this use. No increase in costs is expected above the Refuge's current Operations and Maintenance budget.

Anticipated Impacts of the Use:

Haying will result in short-term disturbances and long-term benefits to both resident and migratory wildlife using the Refuge. Short-term impacts will include disturbance and displacement typical of any noisy heavy equipment operation. Cutting and removal of standing grasses will also result in short-term loss of habitat for those species requiring tall grasses for feeding and perching such as obligatory grassland species such as the bobolink or dickcissel. Long-term benefits will accrue due to the increased vigor of

the regrown grasses or the establishment of highly desirable native tallgrass species, which will improve conditions for those same species affected by the short-term negative impacts. Longer-term negative impacts may occur to resident wildlife species such as pheasant that would lose overwintering habitat in the hay areas. Strict time constraints placed on this use will limit anticipated impacts to these relatively minor areas.

Public Review and Comment:

This Compatibility Determination was part of the Draft Hamden Slough NWR Comprehensive Conservation Plan and Environmental Assessment. Public notification and review included a notice of availability published in the *Federal Register*, 30-day comment period, local media announcements, and a public meeting. Additionally, drafts of this and all CD's were available at the Detroit Lakes WMD headquarters for review and comment. Comments received and agency responses are included in the final CCP.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Haying will only be allowed after July 15 to minimize disturbance to nesting migratory birds. In normal years, most birds are off the nest by this date.
2. Bales must be removed from the Refuge within two days of baling.
3. Windrowed grass left lying to dry prior to baling must be raked and moved every two days if left on newly seeded native grass and in no cases should it remain on the ground more than six days prior to baling.

Justification:

Haying will not materially interfere with waterfowl production if done within the necessary stipulations. Use of haying as a management tool can be a valuable technique for providing long-term habitat improvements to grassland that otherwise would degrade through natural succession or dominance of non-native plants. Without this tool, the areas would suffer encroachment of undesirable woody species such as box elder or ash or would remain in unwanted non-native cool season grasses such as brome.

Mandatory 10-year Re-Evaluation Date: 2022

Signature: Refuge Manager: /Ryan Frohling/ 10/01/2012
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 10/05/2012
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Prescribed Grazing

Station Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “ . . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “ . . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Administration Act of 1966, as amended [668dd–668ee])

Description of Use:

Allow the limited grazing by domestic livestock, chiefly cattle but potentially including other domestic livestock, on Hamden Slough NWR (Refuge) to improve grassland vigor and health. Controlled grazing is recognized as a valuable tool to remove standing vegetation, reduce vegetative litter, and suppress woody vegetation.

Grazing may take place anytime from April through November. Most commonly, the Refuge will use short duration grazing pulses lasting four to eight weeks and then require livestock removal. The Refuge will employ three typical seasons of use. One season will be early spring (mid-April to late May) on native prairie or seeded native grasses designed to reduce the vigor of exotic species and increase the vigor of native species. Summer grazing (July 15–September 1) may be used, especially on non-native grasslands, to stimulate the grassland after the peak nesting season yet allow vegetative regrowth in the fall. Fall grazing (September 1–October 31) will be designed to have effects similar to spring grazing, mostly on native prairie remnants or fields seeded with native tallgrass prairie species.

Fencing and control of livestock will be the responsibility of the cooperating private party. Market rate grazing fees will be required of permittees. Market rates will be determined annually in consultation with U.S. Department of Agriculture on prevailing local grazing rates.

Frequency of grazing on any unit will be based on site-specific evaluation of the grassland unit being managed. Historically, the Refuge has frequently grazed units for two consecutive years and then eliminated grazing from the unit for several years before resuming grazing.

Grazing is not a priority public use as identified in the National Wildlife Refuge System Improvement Act. As an economic use of Refuge System lands, a Compatibility Determination for grazing is mandatory.

Availability of Resources:

Developing grazing agreements and monitoring compliance and biological effects requires some U.S. Fish and Wildlife Service (Service) resources. Most grazing costs (fencing, monitoring herd health, etc.) are incurred by the permittee. Some alternative grassland management is required if we do not use grazing as a tool for grassland management. Typically, these other tools include prescribed burning,

mowing, and haying. Haying has comparable costs to controlled grazing, since it also requires administering Special Use Permits. Mowing is more expensive since all costs are the responsibility of the Service. Prescribed burning is an effective grassland management tool, but staff limitations prevent us from burning as many acres as desirable each year. In addition, there is likely an ecological benefit to rotating grassland management techniques and seasons over time so that a given field is grazed one year and burned another.

Anticipated Impacts of the Use:

Grazing will result in both short-term disturbance and long-term benefits to both resident and migratory wildlife at the Refuge. Short-term impacts will include disturbance and trampling of vegetation and aesthetic concerns. Grazing will result in short-term loss of habitat, but the long-term benefits will greatly outweigh this loss by establishing a diverse nesting cover of tall grasses and promoting increased vigor of regrown grasses. The resulting habitat will greatly improve conditions for most of the same species affected by the short-term loss.

Public Review and Comment:

This Compatibility Determination was part of the Draft Hamden Slough NWR Comprehensive Conservation Plan and Environmental Assessment. Public notification and review included a notice of availability published in the *Federal Register*, 30-day comment period, local media announcements, and a public meeting. Additionally, drafts of this and all CD's were available at the Detroit Lakes WMD headquarters for review and comment. Comments received and agency responses are included in the final CCP.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Grazing will not occur more frequently than three out of every five years on any tract without the preparation of a site-specific Compatibility Determination.
2. No insecticides, including insecticidal dusting bags, will be allowed on the Refuge
3. No supplemental feeding will be allowed without specific authorization of the Refuge Manager.
4. Control and confinement of the livestock will be the responsibility of the permittee.

Justification:

Controlled grazing by domestic livestock will not materially interfere with or detract from the purposes for which the units were established. Limited livestock grazing creates temporary disturbances to vegetation. Many of these disturbances are desirable for grassland management. Grazing produces an undesirable but short-term impact to grassland bird nesting and site aesthetics. Controlled grazing is an alternative management tool that can be used to replace or compliment prescribed burning, mowing, or haying on grasslands. Without occasional disturbance caused by mowing, haying, burning, or grazing the health of the grassland community would decline, as would the areas' potential for waterfowl production.

Mandatory 10-year Re-evaluation Date: 2022

Signature: Refuge Manager: /Ryan Frohling/ 10/01/2012
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 10/05/2012
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Tree Harvest – Wood cutting

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “ . . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “ . . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Administration Act of 1966, as amended [668dd–668ee])

Description of Use:

This Compatibility Determination involves the removal of standing or fallen trees by private individuals and applies to all wood removal activities regardless of the ultimate use of the wood (e.g., firewood, pulp, etc.). Differences in scope and necessary equipment will occur depending on the amount and type of wood available for removal. Impacts to the purpose of the Refuge and the Refuge System mission are similar regardless of the reason why the wood is removed. This activity will only occur where the U.S. Fish and Wildlife Service (Service) has determined that a management need exists to remove wood from the Refuge consistent with Refuge plans or other documents. Wood cutting is not a priority public use, as defined by the National Wildlife Refuge System Improvement Act of 1997, of the National Wildlife Refuge System.

Wood removal may be done within former homesites, along existing windbreaks/shelter belts and in other areas on the Refuge where trees are encroaching on the prairie. Harvest sites will vary in size from a portion of an acre up to several hundred acres depending on the site and management objectives.

Wood removal activities may be authorized throughout the year. Most often, wood removal activities will occur during the winter months when frozen ground will facilitate access and afford protection to underlying soils and vegetation.

The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Equipment used for harvest may range from chainsaws and axes, to traditional logging equipment such as feller bunchers and log skidders. Access may be by snow machine, all-terrain vehicle (ATV), pick-up truck, farm tractor, or larger traditional logging equipment.

Harvest of wood products may be permitted on the Refuge to stop, reduce, or reverse the encroachment and presence of trees on prairie habitats. The tallgrass prairie habitat is arguably the most endangered of all North American ecosystems, with less than one percent of the historic habitat remaining. Encroachment of woody vegetation due to fire suppression, absence of landscape-scale grazing, and tree planting practices continue to threaten this habitat type. The Refuge is established for migratory birds, and managing woody vegetation to enhance prairie habitat generally facilitates that purpose. In

accordance with the Refuge System mission, restoration of the tallgrass prairie habitat is appropriate on the Refuge. Managing woody vegetation is an important means to that end.

Availability of Resources:

The time required to plan, issue permits, and monitor the implementation of a wood product harvest program would require the dedication of some existing staff hours to this activity. In permitting a wood products harvest, the Refuge Manager has identified a management need and presumably has secured and prioritized station resources to that end.

Anticipated Impacts of the Use:

In permitting this type of activity, the potential exists to directly impact waterfowl production by displacement of birds from localized areas due to disturbance or crushing of nests as a result of access for this activity. These impacts are easily avoided by timing of the activity in accordance with site-specific characteristics. In limited and rare instances, a small number of individuals of tree-nesting species (e.g., wood duck, hooded merganser, etc.) may be displaced from a local area for obvious reasons.

Indirect impacts to waterfowl production will occur as a result of removing woody vegetation. In nearly every instance, these impacts will be positive. The removal of woody vegetation from historic prairie habitats positively impacts waterfowl production and the System mission by facilitating the restoration of tallgrass prairie and removing artificially created predator habitat from within the Refuge.

Access for the purpose of removing wood may impact habitat by rutting soils, destroying groundcover, creating weed seedbeds, and increasing sedimentation due to runoff in nearby wetlands. These impacts can be avoided by timing of the activity.

Anticipated long-term impacts include the reduction of woody species in Refuge grasslands and resulting benefits to grassland dependent wildlife.

Impacts to the habitat as a result of access to the Refuge for wood removal purposes are potentially significant, but also easily avoided. Areas where woody species are removed for the purpose of conversion of the habitat type to prairie will likely receive follow-up treatments of burning, farming, or both. Ground disturbance in these areas is less problematic and possibly desirable depending on the specific site. Access to and from these areas will need to be carefully controlled (via Special Use Permit) to avoid impacts such as rutting and increased sedimentation in area wetlands due to run-off. If existing roads are not present, access can be restricted to periods of frozen ground to avoid or minimize impacts to underlying vegetation and soils.

Other indirect impacts are generally considered positive and thus, do not materially interfere with or detract from the purpose of waterfowl production or the Refuge System mission. The removal of trees along trails, in shelter belts, and within old homesites will benefit waterfowl production by assisting with the restoration of prairie habitat and eliminating predator habitat and perch sites. Individuals participating in the wood harvest program will be under Special Use Permit and thus, site-specific stipulations will ensure resource protection and achievement of management goals. Control of woody species encroachment on prairie habitats is a necessary management activity for the Hamden Slough NWR in converting areas back to their historical grassland condition and directly supports the mission of the National Wildlife Refuge System.

Public Review and Comment:

This Compatibility Determination was part of the Draft Hamden Slough NWR Comprehensive Conservation Plan and Environmental Assessment. Public notification and review included a notice of availability published in the *Federal Register*, 30-day comment period, local media announcements, and a public meeting. Additionally, drafts of this and all CD's were available at the Detroit Lakes WMD headquarters for review and comment. Comments received and agency responses are included in the final CCP.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Work will generally be restricted to areas where soil types indicate that pre-settlement habitat was comprised of native prairie vegetation.
2. If work is in an area where waterfowl nesting is likely, no cutting operations will be permitted from April 1 through July 15.
3. Vehicle access for wood removal will be limited to existing trails or restricted to the frozen ground period when rutting and damage to growing vegetation would occur.
4. A Special Use Permit will be issued so that site-specific impacts can be reduced or eliminated and Service management goals are met.

Justification:

Any direct impacts on waterfowl production (take, disturbance, etc.) can be largely avoided by timing the activity so that it is not coincident with the waterfowl production season. Removal of trees in certain instances will, on occasion, eliminate wood duck, hooded merganser, or other cavity-nesting species habitat. This would be an irregular and occasional impact, and since most wood harvest will be associated with restoration sites, it is unlikely that these areas would have provided historic nesting sites. Due to the benefits that would be realized by other waterfowl species, and the abundance of artificial and natural nest sites for cavity-nesting species in the area, these impacts would not significantly detract from Refuge purposes or the Refuge System mission.

This use contributes to the achievement of Refuge purposes. Removal of woody vegetation that is encroaching into historic prairie habitat is an ongoing management concern for the Refuge, and private citizens can be a valuable partner in removing and controlling woody vegetation in localized areas to benefit migratory bird habitat.

Mandatory 10-year Re-Evaluation Date: 2022

Signature: Refuge Manager: /Ryan Frohling/ 10/01/2012
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 10/05/2012
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Placement/Construction of New, Small Parking Areas

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “ . . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “ . . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Administration Act of 1966, as amended [668dd–668ee])

Description of Use:

Allow the placement and construction of small parking areas on Hamden Slough NWR (Refuge) where the Refuge Manager considers necessary to provide safe off-road parking and access to the general public for the following permitted activities: hunting, wildlife observation and photography, environmental education and interpretation—all priority public uses on National Wildlife Refuge System lands. In addition, these parking areas will be used by U.S. Fish and Wildlife Service (Service) personnel while conducting management activities or biological surveys and assessments. This Compatibility Determination will also allow the expansion of current parking areas to better facilitate more Refuge users and staff, especially for special events, peak hunting, and others.

These parking areas will be less than one acre and will be relatively primitive with primarily grass or gravel surfaces. Barriers to restrict motorized vehicles within the parking areas and to identify the parking area boundary generally will be constructed of wood posts, wire fence, or rock barriers, as appropriate and available on a site-specific basis.

Availability of Resources:

Hamden Slough National Wildlife Refuge is open to most priority public uses at specific times during the year. One of the comments the Refuge has received in the past is the lack of adequate parking around Hamden Slough NWR, particularly during the muzzleloader deer hunting season. Because these will be primitive parking lots, the effort to establish or expand and maintain them should be minimal. Refuge staff and volunteers already maintain several parking lots around the Refuge; more parking lots would add a minimal amount of maintenance.

Anticipated Impacts of the Use:

Installation and use of these parking areas will result in minimal impacts, as these parking areas are used infrequently during most of the year by either the general public participating in authorized and permitted activities or by Service personnel. Peak use of these areas will generally occur during fall hunting seasons when no disturbance to nesting or young animals will result. Impacts to habitat will be minimal due to their relatively small size (less than one acre). Impacts will be lessened by selecting sites away from any wetland or native prairie. Generally, parking areas will be constructed at or near abandoned farm sites utilizing existing graveled driveways or previously constructed farm field approaches

immediately off public roadways. Parking lots will not be constructed within the interior of the Refuge to minimize wildlife disturbance, impacts to unique or critical habitats, and conflicts with other authorized public uses.

Public Review and Comment:

This Compatibility Determination was part of the Draft Hamden Slough NWR Comprehensive Conservation Plan and Environmental Assessment. Public notification and review included a notice of availability published in the *Federal Register*, 30-day comment period, local media announcements, and a public meeting. Additionally, drafts of this and all CD's were available at the Detroit Lakes WMD headquarters for review and comment. Comments received and agency responses are included in the final CCP.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Parking areas must not be constructed in areas where negative wetland impacts will result.
2. Parking areas must not be constructed on native prairie habitat.
3. Camping, overnight use, and fires are prohibited.
4. Construction of parking lots will be directly adjacent to existing township/county roads.
5. An archaeological review of each selected site shall be made through the State Historic Preservation Officer and Regional Historic Preservation Officer prior to construction.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is permitted, as it is deemed necessary to provide safe off-road access by the public to participate in appropriate and permitted priority uses and will not diminish the primary purposes of waterfowl production and the conservation of migratory birds and other wildlife. This use will meet the mission of the National Wildlife Refuge System by providing resources for the benefit of the American public while conserving fish, wildlife, and plant resources on these lands.

Mandatory 10-year Re-Evaluation Date: 2022

Signature: Refuge Manager: /Ryan Frohling/ 10/01/2012
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 10/05/2012
(Signature and Date)

COMPATIBILITY DETERMINATION

Use: Scientific Studies and Research Projects by Third Parties

Refuge Name: Hamden Slough National Wildlife Refuge

Establishing and Acquisition Authority:

Hamden Slough National Wildlife Refuge, located in Becker County, Minnesota, was established on September 18, 1989, by the Migratory Bird Conservation Commission as the 452nd national wildlife refuge.

Refuge Purposes:

The primary purpose of Hamden Slough National Wildlife Refuge is “ . . . for use as an inviolate sanctuary, or for any other management purposes, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act) and including “ . . . conservation management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

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 the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System 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 DNR, 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:

Facilities and staff are currently available to issue and oversee Special Use Permits required for research projects. Staff resources are deemed adequate to manage this use at anticipated levels.

Anticipated Impacts of the 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. These studies also 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 was part of the Draft Hamden Slough NWR Comprehensive Conservation Plan and Environmental Assessment. Public notification and review included a notice of availability published in the *Federal Register*, 30-day comment period, local media announcements, and a public meeting. Additionally, drafts of this and all CD's were available at the Detroit Lakes WMD

headquarters for review and comment. Comments received and agency responses are included in the final CCP.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with 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.

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.

Mandatory 10-year Re-Evaluation Date: 2022

Signature: Refuge Manager: /Ryan Frohling/ 10/01/2012
(Signature and Date)

Concurrence: Regional Chief: /Tom Worthington (Acting)/ 10/05/2012
(Signature and Date)

Appendix H: Appropriate Use Determinations

In this appendix:

[Haying](#)
[Construction of New Small Parking Lots](#)
[Cooperative Farming for Habitat Restoration Purposes](#)
[Prescribed Grazing](#)
[Scientific Studies and Research Projects by Third Parties](#)
[Tree Harvest – Wood Cutting](#)

Finding of Appropriateness of a Refuge Use

Refuge Name: Hamden Slough National Wildlife Refuge

Use: Haying

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

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

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

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

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: _____/Ryan R. Frohling/_____ Date: 10/1/12

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: _____/Richard T. Speer (Acting)/_____ Date: 10/5/12

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Hamden Slough National Wildlife Refuge

Use: Construction of New Small Parking Lots

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

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

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

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

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: _____/Ryan R. Frohling/_____ Date: 10/1/12

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: _____/Richard T. Speer (Acting)/_____ Date: 10/5/12

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Hamden Slough National Wildlife Refuge

Use: Cooperative Farming for Habitat Restoration Purposes

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

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

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

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

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

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

Not Appropriate Appropriate X

Refuge Manager: /Ryan R. Frohling/ Date: 10/1/12

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: /Richard T. Speer (Acting)/ Date: 10/5/12

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Hamden Slough National Wildlife Refuge

Use: Prescribed Grazing

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

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

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

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

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: /Ryan R. Frohling/ Date: 10/1/12

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: /Richard T. Speer (Acting)/ Date: 10/5/12

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Hamden Slough National Wildlife Refuge

Use: Scientific Studies and Research Projects by Third Parties

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

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

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

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

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: _____/Ryan R. Frohling/_____ Date: 10/1/12

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: _____/Richard T. Speer (Acting)/_____ Date: 10/5/12

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Hamden Slough National Wildlife Refuge

Use: Tree Harvest – Wood Cutting

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

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

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

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

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: /Ryan R. Frohling/ Date: 10/1/12

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: /Richard T. Speer (Acting)/ Date: 10/5/12

A Compatibility Determination is required before the use may be allowed.

Appendix I: List of Preparers

Detroit Lakes Wetland Management District Staff

Ryan Frohling, Project Leader

Rebecca Esser, Wildlife Biologist

Scott Kahan, Project Leader (former)

Branch of Conservation Planning Staff

Karen Westphall, Wildlife Biologist/Planner Region 3 USFWS

Gabe DeAlessio, GIS Specialist, Region 3 USFWS

Mark Hogeboom, Writer/Editor, Region 3 USFWS



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U.S. Fish and Wildlife Service

<http://www.fws.gov>

Region 3, U.S. Fish and Wildlife Service

<http://www.fws.gov/midwest>