

# Chapter 1: Introduction and Planning Background

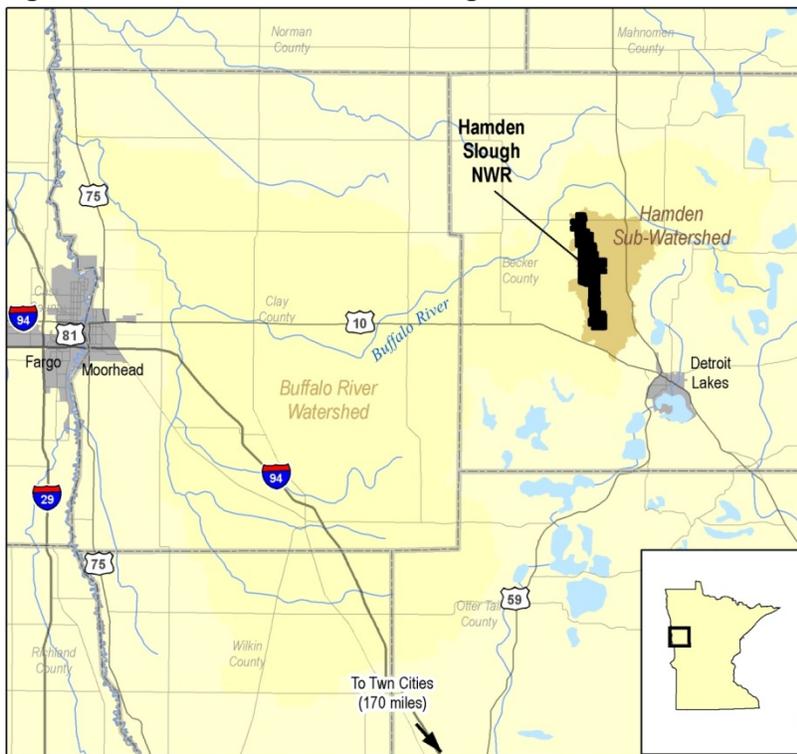
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## 1.1 Introduction

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 19<sup>th</sup> 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:

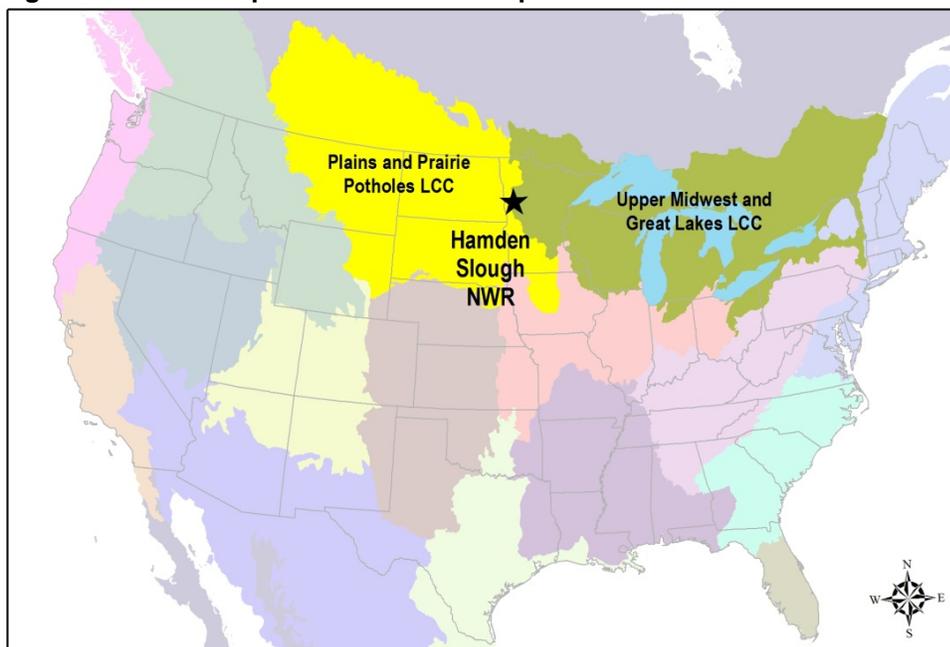
- Improve habitat for migratory birds, threatened and endangered species, inter-jurisdictional fish, marine mammals, and other declining species.
- Complement activities on Refuge System lands, or contribute to the resolution of problems on refuges that are caused by off-refuge practices.
- Address species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