

Chapter 4: Future Management Direction

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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

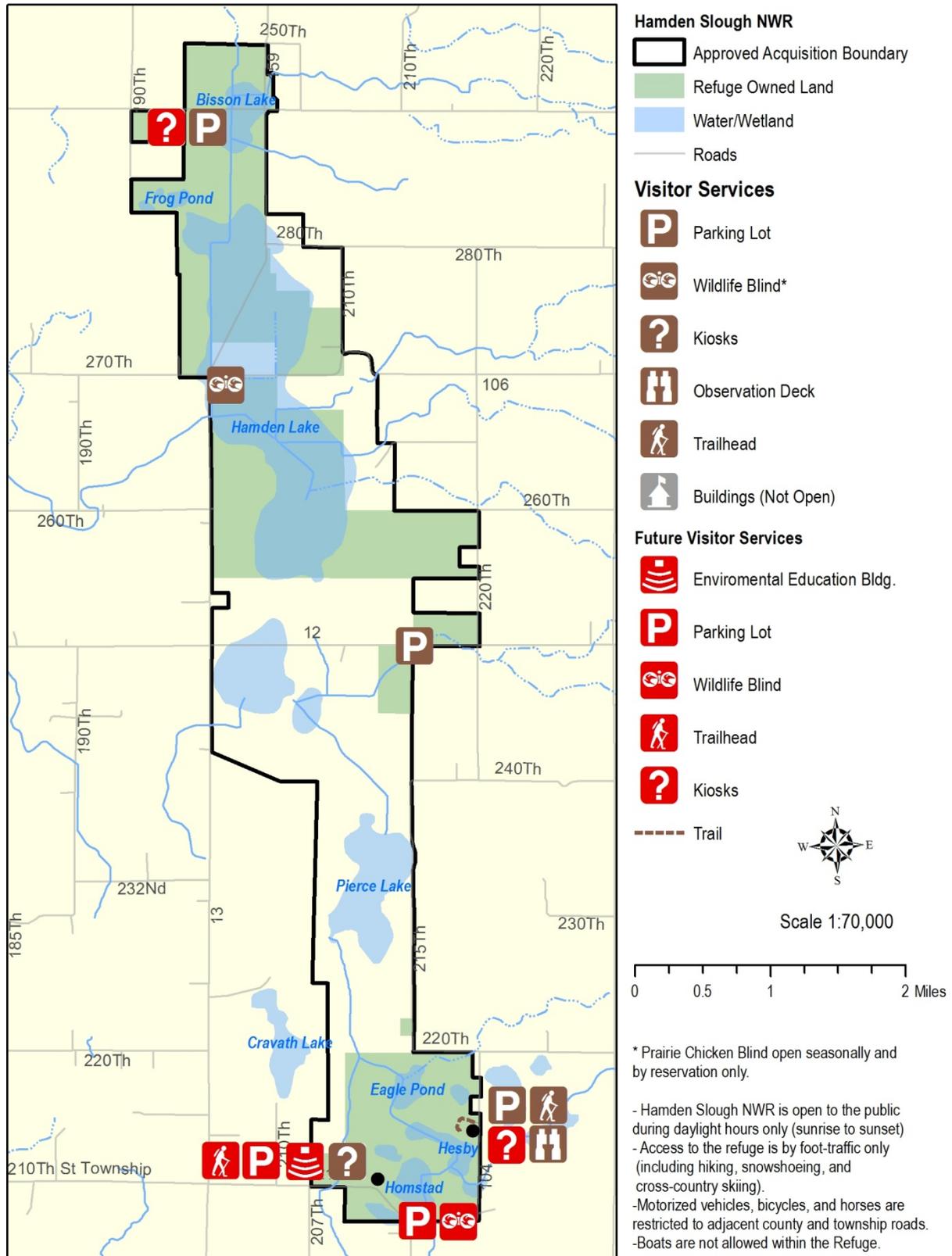
- Identify and improve locations for vehicle pull-offs that will offer additional opportunities for wildlife observation and photography.
- Identify an area suitable for a seasonal observation/photo blind on the south side of Homstad Lake.
- Explore the option of constructing an observation deck or photo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