

Appendix A: Environmental Assessment

In this appendix:

- A.1 Purpose and Need
- A.2 Description of Alternatives
- A.3 Affected Environment
- A.4 Environmental Consequences

Finding of No Significant Impact

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

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

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

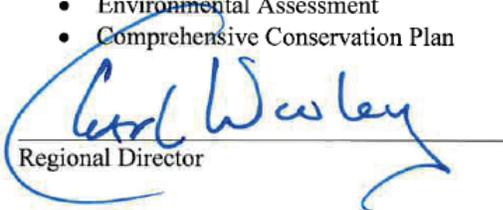
For reasons presented above and below, and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative C as the management alternative for Hamden Slough NWR is not a major federal action which would significantly affect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

Additional Reasons:

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

Supporting References:

- Environmental Assessment
- Comprehensive Conservation Plan


Regional Director

10/9/12
Date

A.1 Purpose and Need for Proposed Action

A.1.1 Purpose

The purpose of this Environmental Assessment (EA) is to adopt and implement a Comprehensive Conservation Plan (CCP) for Hamden Slough National Wildlife Refuge (NWR, Refuge) as mandated in the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and that the CCP meets the purposes for which the Refuge was established, contributes to the overall mission of the Refuge System, and adheres to Service policies and mandates.

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

Purposes for Hamden Slough NWR:

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

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

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

The mission of the National Wildlife Refuge set forth in the Refuge Improvement Act of 1997 is:

"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

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

A.1.2 Need for Action

This EA addresses the need to adopt a 15-year management plan for Hamden Slough NWR in order to provide guidance for future Refuge management; address significant issues; identify priorities; ensure consistent and integrated management; protect the biological integrity, diversity, and environmental health of the Refuge; evaluate the appropriateness and compatibility of public uses; and meet other requirements of the Improvement Act.

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

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

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

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

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

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

A.1.3 Scoping of the Issues

Internal scoping began in August 2010 when Service planning staff and Hamden Slough NWR staff developed a preliminary list of issues, concerns, and opportunities associated with management of the Refuge. A second internal scoping session was held with the Service's Regional Office staff at Fort Snelling, MN, in March 2011 to get input on issues from regional supervisors, biologists, planners, and other program specialists.

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

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

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

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

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

Wetlands

Prairie pothole wetlands

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

Managed wetlands

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

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

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

Relict glacial lake restoration

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

Uplands

Tallgrass prairie restoration

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

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

Tallgrass prairie remnants

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

Management tools

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

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

Watershed

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

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

People

Hunting

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

Wildlife observation and photography

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

Environmental education and interpretation

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

Outreach and community partnerships

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

A.1.5 Decision Framework

This EA describes three alternatives for future Refuge management and the environmental consequences of each alternative. Each alternative has a reasonable mix of wildlife habitat prescriptions and wildlife-dependent recreational opportunities.

This EA is an important step in the Service’s formal decision-making process. In compliance with the National Environmental Policy Act of 1969 (NEPA), the Regional Director of the Midwest Region (Region 3 of the Service) will consider the information presented in this document to select the preferred management alternative. Selection of the preferred alternative is based on its environmental consequences and ability to achieve Refuge purposes and goals. The planning team has recommended Alternative C to the Regional Director. The Draft CCP was developed for implementation based on this recommendation.

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

A.2 Description of Alternatives

A.2.1 Alternatives Development

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

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

A.2.2 Elements Common to All Alternatives

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

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

A.2.3 Description of Alternatives

Alternative A: Current Management (No Action)

This alternative reflects the current management direction of Hamden Slough NWR. It provides the baseline against which to compare other alternatives. It is also a requirement of NEPA that a no-action alternative is addressed in the planning process. A detailed description of the existing programs and uses contained in this alternative is found in chapter 3 of the CCP.

These are key elements of Alternative A:

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

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

Alternative B: Wetland Focus

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

These are key elements of Alternative B:

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

Alternative C: Wetland and Prairie Focus (Preferred Alternative)

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

These are key elements of Alternative B:

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

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

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

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

Table A-1: Summary of Actions by Alternative

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

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

A.3 Affected Environment

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

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

A.3.1 Physical Environment

Geology and Topography

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

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

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

Hydrology

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

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

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

Soils

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

Climate

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

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

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

A.3.2 Vegetation and Wildlife

Historic conditions

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

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

Current conditions

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

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

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

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

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

A.3.3 Public Use

Hunting and Fishing

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

Wildlife Observation and Photography

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

Environmental Education and Interpretation

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

Socioeconomics

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

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

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

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

A.3.4 Archeological and Cultural Values

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

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

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

A.4 Environmental Consequences

A.4.1 Effects Common to All Alternatives

Air Quality

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

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

Environmental Justice

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

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

Cultural Resources

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

Climate Change

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long-range planning endeavors. Some potential impacts of climate change on the prairie pothole ecosystem in Minnesota have been identified that may need to be considered and addressed in the future. For example:

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

Managers and resource specialists on the Refuge need to be aware of the potential effects of climate change. When feasible, documenting long-term vegetation, wildlife, and hydrologic changes should become a part of research and monitoring programs. Adjustments in management direction may be necessary over time to adapt to a changing climate.

Carbon Sequestration

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

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

Prescribed burning releases carbon dioxide directly to the atmosphere from plants consumed during combustion. However, new vegetation quickly replaces the burned vegetation and, over multiple years of burns, an increasing root network develops below the soil surface in prairies, effectively capturing large quantities of carbon. No net decrease in the amount of carbon sequestered on the Refuge will occur due to prescribed burning. Restoration of uplands and wetlands previously cleared for agriculture will increase the total quantity of sequestered carbon on the Refuge under all alternatives. All alternatives would result in increased carbon storage due to continuing land acquisition and restoration. Grasses and forbs characteristic of the Refuge ecosystem are effective at capturing and storing carbon both above and below the ground.

A.4.2 Summary of Effects by Alternative

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

Habitat

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

Wetland

Alternative A

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

Alternatives B and C

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

Prairie

Alternative A

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

Alternative B

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

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

Alternative C

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

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

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

Watershed

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

Wildlife

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

Waterfowl

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

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

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

Grassland Birds

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

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

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

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

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

Other Wildlife

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

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

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

People

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

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

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

Table A-2: Summary of Impacts by Alternative

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