Draft Comprehensive Conservation Plan and Environmental Assessment

Long Lake National Wildlife Refuge Complex

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Acronyms and Abbreviations

BBS	North American Breeding Bird Survey
BLS	Bureau of Labor Statistics
Botulism	avian botulism
CCC	civilian conservation corps
CCP	comprehensive conservation plan
Complex	Long Lake NWR Complex
CRP	Conservation Reserve Program
CWD	chronic wasting disease
Delta	Delta Waterfowl Foundation
DFM	drainage facility maps
DNC	dense nesting cover
Duck Stamp Act	Migratory Bird Hunting and Conservation Stamp Act
DWG	Dakota Working Group
EA	environmental assessment
EVS	Education and Visitor Services
FmHA	Farmers Home Administration
FONSI	finding of no significant impact
GIBA	Globally Important Bird Area
HAPET	Habitat and Population Evaluation Team
HPAI	highly pathogenic avian influenza
Improvement Act	National Wildlife Refuge Improvement Act of 1997
IPM	integrated pest management
ISS	international shorebird survey
JAKES	Juniors Acquiring Knowledge Ethics and Sportsmanship
LWCF	Land and Water Conservation Fund
MBCF	Migratory Bird Conservation Fund
MMS	maintenance management system
MSL	mean sea level
NAWCA	North American Wetland Conservation Act
NAWMP	North American Waterfowl Management Plan
NDGF	North Dakota Game and Fish Department
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NPWRC	Northern Prairie Wildlife Research Center

NRCS	Natural Resources Conservation Service
NWI	national wetlands inventory
NWR or refuge	national wildlife refuge
Refuge System	national wildlife refuge system
PA	programmatic agreement
PPJV	prairie pothole joint venture
PPR	prairie pothole region
RLGIS	refuge lands geographic information system extension
RONS	refuge operations needs system
Service or USFWS	United States Fish and Wildlife Service
SHIPO	North Dakota state historic preservation office
State	state of North Dakota
SUP	special-use permit
SWAP	Small Wetlands Acquisition Program
TNC	The Nature Conservancy
USC	U.S. code of federal regulations
USGS	United States Geological Survey
VOR	visual obstruction reading
WCS	water control structures
WDA	wildlife development area
WHSRN	Western Hemisphere Shorebird Reserve Network
WMD	wetland management district, or district
WPA	waterfowl production area

Summary

Long Lake National Wildlife Refuge Complex (the complex) oversees management of three national wildlife refuges: Long Lake National Wildlife Refuge (NWR or refuge), Slade NWR, Florence Lake NWR, and a three-county wetland management district that consists of 79 waterfowl production areas in Burleigh, Emmons, and Kidder counties in south-central North Dakota, as well as conservation easements which protect approximately 147,000 acres. The districts continue to grow with the acquisition of additional easements annually.

Long Lake National Wildlife Refuge
Long Lake NWR was established on February 25, 1932, by President Herbert Hoover through Executive Order No. 5808 "… as a refuge and breeding ground for migratory birds and wild animals," and "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act.)

The refuge is located in south-central North Dakota in an area famous for its wealth of waterfowl-producing prairie potholes. Long Lake NWR is 22,310 acres in size and consists of approximately 15,000 acres of brackish to saline marsh and lake, 1,000 acres of other wetlands, and about 6,000 acres of tame- and native grassland, woodland, and cropland. The refuge serves as an important staging area for migrating sandhill cranes, Canada geese and other waterfowl, shorebirds, and other migratory birds. Endangered whooping cranes often utilize refuge marshes during spring and fall migration periods.

Slade National Wildlife Refuge
Slade NWR was established "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

Slade NWR was established through a donation by Northern Pacific Railroad executive G.T. Slade, who originally began acquiring the area around Harker Lake in 1924 for the establishment of a private shooting club.

It is located in south-central Kidder County, approximately 20 miles northeast of the complex's headquarters and is adjacent to Lake Isabel Recreational Area. The refuge consists of 3,000 acres of gently rolling prairie dotted by lakes and marshes, which were formed by glacial action. Habitat centers around five semi-permanent and permanent wetlands and numerous other prairie potholes, which altogether total more than 900 wetland acres. Much of the upland acreage had been farmed prior to the donation. Current management targets restoring native grasses and forbs that are characteristic to this area.

Florence Lake National Wildlife Refuge
Florence Lake NWR was established on May 10, 1939, by President Franklin D. Roosevelt through Executive Order No. 8119 "… as a refuge and breeding ground for migratory birds and other wildlife" and "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act.)

It is located in northern Burleigh County approximately 45 miles northwest of Long Lake NWR. The refuge consists of 1,468 acres of fee title and 420 acres of easement (132 acres of which is meandered lake). The fee portion of the refuge consists of 977 acres of native grassland, 202 acres of tamegrass, 111 acres of seeded native grass, 163 acres of wetland and 16 acres of woodland. The refuge serves as an important migratory bird production and migration area.

Long Lake Wetland Management District
The district was started as part of the Small Wetlands Acquisition Program in the 1950s to save wetlands from various threats, particularly drainage. The passage of Public Law 85-585 in August 1958 amended the Migratory Bird Hunting and Conservation Stamp Act of 1934, allowing for the acquisition of waterfowl production areas and easements for waterfowl production.

The Long Lake wetland management district contains 1,036 perpetual wetland easement contracts which protect 102,646 acres; 93 perpetual grassland contracts which protect 41,181 acres; 16 Farmers Home Administration perpetual easements which protect 669 wetland acres, and

2,759 acres of upland; one wildlife development area (Garrison diversion unit mitigation tract) totaling 794 acres; and 78 WPAs totaling 21,789 acres. Easement restrictions generally prohibit wetland drainage, grassland conversion and development, and require a special-use permit issued by the U.S. Fish and Wildlife Service for vegetative manipulation. The lands remain in private ownership. There continues to be an active acquisition program in the Long Lake wetland management district, which currently focuses on acquiring grassland and wetland easements.

Long Lake wetland management district was established "…to assure the long-term viability of the breeding waterfowl population and production through the acquisition and management of waterfowl production areas, while considering the needs of other migratory birds, threatened and endangered species, and other wildlife." (This purpose statement was developed for all region 6 wetland management districts in June 2004.)

Migratory Bird Hunting Stamp Act 16 U.S.C. 718(c) "…as waterfowl production areas subject to all provisions of the Migratory Bird Conservation Act …except the inviolate sanctuary provisions…"

Migratory Bird Conservation Act 16 U.S.C. 715d "…for any other management purposes, for migratory birds."

Consolidated Farm and Rural Development Act 7 U.S.C. 1924 "… for conservation purposes"

Consolidated Farm and Rural Development Act 7 U.S.C. 2002 "…for conservation purposes"

Refuge Vision and Goals

The vision for each refuge is based on the establishing purposes of the refuge, resource conditions and potential, and their respective issues. Goals help the complex staff achieve the vision.

Refuge Vision

Vision for the Long Lake National Wildlife Refuge

The echo of the sandhill cranes though the rolling prairie hills of Long Lake invites today's visitors to follow in the footsteps of the plains Indians. The refuge lies along the west-central boundary of the prairie pothole region where the Missouri Coteau meets the Coteau Slope. Here an abundance of migratory birds and other wildlife flourish in the native mixed-grass prairie and a mosaic of wetlands. The mixed hues and textures of wildflowers, grasses, mudflats, and water please the eye and soothe the soul. Refuge stewards work collaboratively to understand, restore, and protect biological communities. Expanded wildlife-dependent recreation and environmental education opportunities foster a greater understanding of the refuge's resources and the mission of the Refuge System.

Vision of the Florence Lake National Wildlife Refuge

A classic prairie-pothole landscape, Florence Lake NWR provides a unique perspective of pre-settlement prairie conditions. At this visual oasis of the prairie ecosystem, visitors enjoy solitude and excellent grassland bird viewing opportunities in a peaceful, protected environment that supports a wealth of migratory birds and other wildlife. Florence Lake serves as a reference area for northern prairie ecosystems with ongoing restoration, monitoring, and research.

Vision of Slade National Wildlife Refuge

Located within the central flyway, Slade NWR historically served as a foundation for the restoration of the nearly extirpated giant Canada goose population. Management strives to restore mixed-grass prairie and continues to provide quality migratory stopover and breeding habitat for birds of conservation concern. Enhanced wildlife-dependent recreation opportunities and interpretation foster a greater understanding and appreciation of conservation and restoration within an agricultural landscape.

Vision of the Long Lake Wetland Management District

Long Lake waterfowl production areas and all conservation easements provide a network of wetland and grassland habitats that preserve the integrity of the historic and vital nesting and breeding grounds of North America's migratory waterfowl resource. These conservation and management efforts support populations of nesting ducks and geese at, or above, historic levels. New and expanded habitats are provided for trust species including nongame migratory birds, threatened and endangered species, and resident wildlife. The public recognizes these wetlands and uplands as a beneficial and important component of a diverse, healthy, and productive prairie landscape. There is consumptive and nonconsumptive compatible recreational use of public lands. Landowners, sportsmen/sportswomen,

conservationists, and others actively support and encourage our habitat conservation programs. There are a wide variety of partners assisting the Service's efforts to educate the public on the value of habitat conservation and the benefit to current and future generations. These partnerships join us financially and physically to ensure a broad base of support so that the Service can conserve high-quality habitats.

Long Lake National Wildlife Refuge Complex Goals

Wildlife and Habitat Management
Conserve, restore, and enhance the ecological diversity of the mixed-grass prairie ecosystem (including wetlands, grasslands, and native trees and shrubs) for migratory birds with an emphasis on waterfowl and other grassland and wetland-dependent species.

Research, Inventory and Monitoring
Use sound science, monitoring and applied research to advance the understanding of natural resource functions and management within the mixed-grass prairie pothole ecosystem.

Public Use, Education, and Interpretation
Provide a safe environment for visitors of all abilities to enjoy wildlife-compatible recreation while increasing their knowledge and appreciation of the mixed-grass prairie ecosystem and the mission of the National Wildlife Refuge System.

Cultural Resources
Identify, value, and preserve the cultural resources and history of the complex to connect staff, visitors, and the community to the area's past.

Refuge Operations
Through effective communication and innovative technology, secure and efficiently utilize funding, staffing partnerships, and volunteer programs for the benefit of all natural resources in support of the National Wildlife Refuge System mission.

Partnerships
Engage a wide array of partners to support outreach, research and management, promote awareness, and foster an appreciation of the mixed-grass prairie pothole ecosystem.

Decisions to be Made

Based on the analysis document in the environmental assessment, the Service's regional director for region 6 (Mountain-Prairie Region) will choose the alternative to manage the complex for the next 15 years. The environmental assessment describes four alternatives for achieving the above goals.

Alternative A—Current Management (No Action):
This alternative promotes a continuation of all aspects of the complex's current management.

Alternative B— Natural Processes Management
This alternative focuses on a return to more natural wetland and upland habitats and habitat functions (e.g., removal of manmade water control structures) within the complex. Intensive management strategies (i.e., reseeding disturbed upland sites with native plant seed, chemical control of noxious weed species) may be used to achieve objectives and goals, but end results focus on minimal use of manmade infrastructure (e.g., water control structures) and a minimal number of non-natural areas (e.g., tamegrass fields). Additionally, public use and environmental education/interpretation objectives and goals are achieved through the use of minimal non-natural structures (e.g., signs, trails, kiosks, wildlife viewing structures) in order to promote a more natural (primitive) experience for the participating public. Changes in complex research and monitoring, staffing, operations, and infrastructure may be required to ultimately accomplish this alternative's objectives and goals. Furthermore, partnerships will focus on initiatives that help enhance and protect natural areas (e.g., easement acquisition, Partners for Wildlife projects, grassland restoration methods research, system sustainability research on Long Lake).

Alternative C— Single Wildlife Group-level Intensive Management
This alternative promotes intensive upland and wetland management (e.g., development of additional water control capability) throughout the complex. Management objectives for particular tracts (i.e., NWR, WPA) will be based on fulfilling the life needs of either one wildlife taxonomic group (i.e., family) or a small number of closely related wildlife taxonomic groups (e.g., shorebirds). Additionally, public use and environmental education/interpretation opportunities will be maximized to the extent compatible with other objectives (e.g., increased hunting and fishing opportunities, additional environmental learning facilities and programs, increased interpretive signage). Changes in complex research and monitoring, staffing, operations, and infrastructure may be required to ultimately accomplish this

alternative's objectives and goals. Partnerships will focus on projects, habitat acquisition, research, and monitoring related to specific wildlife taxonomic groups and their life requirements.

Alternative D— Target Species Group-level Modified Management (Proposed Action)
This alternative allows for intensive upland and wetland management, where warranted in the complex. Management objectives for particular tracts (i.e., NWR, WPA) will be based on fulfilling the life needs of a group of target (indicator) species, which may consist of members of various wildlife taxonomic groups (e.g., shorebirds, raptors, waterfowl, wading birds, native gallinaceous birds). Therefore, management objectives for a particular habitat type (e.g., developed wetlands) will be based on a compromised universal benefit concerning particular life needs of multiple wildlife groups. Additionally, public use and environmental education/interpretation opportunities will be maximized to the extent compatible with other objectives (e.g., increased hunting and fishing opportunities, additional environmental learning facilities and programs, increased interpretive signage). Changes in complex research and monitoring, staffing, operations, and infrastructure may be required to ultimately accomplish this alternative's objectives and goals. Furthermore, partnership opportunities will be maximized and will vary widely, spanning the following subject areas: habitat protection and enhancement, land acquisition, monitoring and research, education and outreach.

Chapter 1. Introduction

The U.S. Fish and Wildlife Service (Service) has developed this draft comprehensive conservation plan (CCP) to provide a foundation for the management and use of the Long Lake National Wildlife Refuge Complex (complex), which includes Long Lake NWR, Slade NWR, Florence Lake NWR, and the Long Lake Wetland Management District (WMD or district). The plan is intended to serve as a working guide for management programs and actions over the next 15 years.

The CCP was developed in compliance with the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and Part 602 (National Wildlife Refuge System Planning) of the Service Manual. The actions described within this plan also meet the requirements of the National Environmental Policy Act of 1969 (NEPA). Compliance with NEPA is being achieved through the involvement of the public and the inclusion of an integrated environmental assessment (EA).

When fully implemented, this CCP will strive to achieve the program vision and the purposes of the complex. Fish and wildlife and their habitats are the first priority in management of Service lands, and public use (wildlife-dependent recreation) is allowed and encouraged as long as the activity has been determined to be compatible with the biological objectives outlined in this CCP.

A planning team comprised of representatives from various Service programs, including complex staff and the North Dakota Game and Fish Department (NDGF), prepared this CCP.

After reviewing a wide range of public comments and management needs, the planning team developed a proposed alternative. This alternative will attempt to address all significant issues while determining how best to achieve the intent and purposes of the complex. The proposed alternative is the Service's recommended course of action for the future management of these refuges and the district, and is embodied in this draft.

Purpose and Need for Plan

The purpose of this CCP is to identify the role that the complex will play in support of the mission of the National Wildlife Refuge System (Refuge System), and to provide long-term guidance to management programs and activities. The CCP is needed to:

- provide a clear statement of direction for the future management of the program;
- provide landowners, neighbors, visitors, and government officials with an understanding of the Service's management actions on and around these refuges and waterfowl production areas (WPAs);
- ensure that the Service's management actions are consistent with the mandates of the Improvement Act;
- ensure that the management of these refuges and WPAs is consistent with federal, state, and county plans, and;
- provide an outline for the development of budget requests for the programs operational, maintenance, and capital improvement needs.

Perhaps the greatest need of the Service is to build relationships with landowners and communicate with the public and other partners in efforts to carry out the mission of the Refuge System. Sustaining our nation's fish and wildlife resources is a task that can be accomplished only through the combined efforts of governments, businesses, and private citizens.

The U.S. Fish and Wildlife Service and the National Wildlife Refuge System

The U.S. Fish and Wildlife Service

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

Over 100 years ago, America's fish and wildlife resources were declining at an alarming rate. Concerned citizens, scientists, and hunting and angling groups joined together to restore and sustain our national wildlife heritage. This was the genesis of the Service.

Today, the Service enforces federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores vital wildlife habitat, protects and recovers endangered species, and helps other governments with conservation efforts. It also administers a federal aid program that distributes hundreds of millions of dollars to states for fish and wildlife restoration, boating access, hunter education, and related programs across America.

The Service manages the program along with the rest of Refuge System, thousands of WPAs, and other special management areas. It also operates 66 national fish hatcheries and 78 ecological services field stations.

Service Activities in North Dakota
Service activities in North Dakota (State) contribute to the State's economy, ecosystems, and education programs. The Service employs approximately 160 people and provides economic benefits that are a result of the fishing, hunting, and wildlife observation and photography activities in the complex. Although a figure has not been determined, most visitors from outside Burleigh, Kidder, and Emmons counties frequent motels, restaurants, and other businesses in Bismarck, Steele, Linton, and other surrounding communities, while visiting the complex.

The complex employs eight full-time equivalent employees, with a current budget of $741,700. Long Lake NWR has 10,000 visitors annually, while approximately 60,000 visitors utilize WPAs for recreation annually. The budget includes funds for the fire program and management of one wildlife development area (WDA). WDAs are transfer lands acquired by the Bureau of Reclamation and then transferred to the Service. Their purpose is to mitigate project impacts associated with development of the Garrison Diversion Project. In addition, 997 volunteer hours are annually contributed to complex operations.

The North Dakota Federal Aid in Sport Fish and Wildlife Restoration program is a source of federal excise taxes paid by hunters, anglers, and boaters on fishing and hunting equipment. The monies generated from this tax have economic benefits to the State. In 1998 the economic impact of angler expenditures was $206 million and hunters contributed $176 million to the overall economy of the State.

The Service's Partners for Wildlife program contributes significantly to the rural economy of the State. Along with several partners, the Service has helped 3,318 landowners enhance wildlife habitat on 191,225 acres of private wetlands and uplands and 48 miles of riparian habitat since 1987. Over 233,354 acres of wetlands and associated uplands have been restored, enhanced, or protected in the State through funds from the North American Wetland Conservation Act (NAWCA). Substantial portions of the districts are part of the Chase Lake Prairie Project area which targets protection and development of migratory bird habitat on private lands.

The Service's Ecological Services Program augments the Refuge System by assuming a primary role in endangered species consultation, tracking, recovery, and listing activities as well as monitoring development projects, which are federally funded for compliance with environmental laws, regulations, and policies.

The State contains two national fish hatcheries and one Fish and Wildlife Management Assistance Office. These programs augment and assist fishery programs on refuges and WPAs in the State.

The district continues to pursue an active acquisition program through funding provided by the Small Wetlands Acquisition Program (SWAP). Most activity focuses on protecting wetland and grassland habitat through the purchase of perpetual easements.

Substantial private organization funding augments the Service's habitat protection and development efforts. Ducks Unlimited, Inc., Delta Waterfowl Foundation (Delta), The Nature Conservancy (TNC), and the NDGF, along with others, are primary partners.

The National Wildlife Refuge System
In 1903 President Theodore Roosevelt designated the 5.5-acre Pelican Island in Florida as the nation's first wildlife refuge for the protection of brown pelicans and other native, nesting birds. This was the first time the federal government set aside land for the sake of wildlife. This small but significant designation was the beginning of the Refuge System. One hundred years later, this system has become the largest collection of lands in the world specifically managed for wildlife, encompassing over 96 million acres within 544 refuges and over 3,000 small areas for waterfowl breeding and

nesting. Today, there is at least one refuge in every state in the nation, as well as in Puerto Rico and the U.S. Virgin Islands.

In 1997 a clear mission was established for the Refuge System through the passage of the Improvement Act. That mission is "... to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

The Improvement Act further states that each refuge shall be managed to:

- fulfill the mission of the Refuge System;
- fulfill the individual purposes of each refuge;
- consider the needs of fish and wildlife first;
- develop a CCP for each unit of the Refuge System, and fully involve the public in the preparation of these plans;
- maintain the biological integrity, diversity, and environmental health of the Refuge System;
- recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority public uses, and;
- retain the authority of refuge managers to determine compatible public uses.

In addition to the overall mission for the Refuge System, the wildlife and habitat vision for each refuge stresses the following principles:

- Fish and wildlife come first.
- Ecosystems, biodiversity, and wilderness are vital concepts in refuge management.
- Refuges must be healthy.
- Growth of refuges must be strategic.
- The Refuge System serves as a model for habitat management with broad participation from others.

Following passage of the Improvement Act, the Service immediately began efforts to carry out the direction of the new legislation, including the preparation of CCPs for all refuges. The development of these plans is now ongoing nationally. Consistent with the Improvement Act, all refuge CCPs are being prepared in conjunction with public involvement, and each refuge is required to complete its own CCP within the 15-year schedule (by 2012).

People and the National Wildlife Refuge System
America's fish and wildlife heritage contributes to the quality of our lives and is an integral part of our Nation's greatness. Wildlife and wild places have always given people special opportunities to have fun, relax, and appreciate our natural world.

Whether through bird watching, fishing, hunting, photography, or other wildlife pursuits, wildlife recreation also contributes millions of dollars to local economies. In 2002 approximately 35.5 million people visited a refuge, mostly to observe wildlife in their natural habitats. Visitors are most often accommodated through nature trails, auto tours, interpretive programs and hunting and fishing opportunities. Significant economic benefits are being generated to the local communities that surround the refuges. Economists have reported that refuge visitors contribute more than $792 million annually to local economies.

The Service has made draft compatibility determinations for the complex (appendix A).

Ecosystem Descriptions and Threats
Central Flyway
The complex is located in the Central Flyway, which is one of four administrative flyways in North America (see figure 2, regional context map). The states and Canadian provinces included are: Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Wyoming, Alberta and Saskatchewan. The Central Flyway Council is made up of federal, state, and provincial representatives, who meet regularly to coordinate population surveys, regulate and set hunting seasons, and plan for management of the migratory bird resource.

In 1986 Canada, the United States, and Mexico united to form the North American Waterfowl Management Plan (NAWMP), designed to restore diminishing continental waterfowl populations to the levels of the 1970s.

The NAWMP brought together federal, state/provincial agencies, private conservation organizations, private landowners, and business leaders from the three countries into "Joint Ventures." Joint Ventures are regionally based, self-directed partnerships that carry out science-

based conservation through a wide array of community participation. Joint Ventures strive to:

- build partnerships for conservation where participation is voluntary and programs are nonregulatory;
- work on public and private lands to protect, restore and enhance critical habitats for waterfowl, shorebirds, waterbirds, and land birds, and;
- build a scientific foundation through improvement of databases, scientific technologies, and monitoring that help partners target conservation efforts to where they will do the most good and make the best use of resources.

Prairie Pothole Joint Venture
The complex lies within the boundaries of the Prairie Pothole Joint Venture (PPJV). The PPJV was established in 1987, 1 year after the establishment of the NAWMP, and was one of the original six priority joint ventures under the plan. It serves to protect, restore, and enhance priority wetland and grassland habitats throughout one-third (100,000 square miles) of North America's prairie pothole region (PPR) The remaining two-thirds of the PPR is located in prairie Canada. The PPJV includes portions of North Dakota, South Dakota, Montana, Minnesota, and Iowa.

Habitats within the PPJV consist of some of the most productive wetland systems in the world. Millions of glacially derived depressional wetlands, commonly referred to as "prairie potholes", and their associated grasslands are tremendously productive and support a diversity of wildlife, especially migratory waterfowl. Although the PPR makes up only 10 percent of North America's total waterfowl breeding area, this region can produce greater than 50 percent of the continental duck population during wet years (Batt et al. 1989).

The PPJV is a dynamic partnership, involving state and federal agencies, private conservation organizations, landowners, universities, and others. It has been an unqualified success since its inception, due in large part to the fact that the above entities have realized that they can achieve more through collaboration that they can accomplish by acting alone.

Missouri River Mainstem Ecosystem Plan
The Service has adopted watersheds as the basic building blocks for implementing ecosystem conservation. The complex is found in the Missouri River Mainstem Ecosystem. This vast area covers all of North Dakota and South Dakota and small portions of Nebraska, Wyoming, and Montana. The major threats identified for this ecosystem include conversion of prairie to cropland and invasive species. The complex contributes to the accomplishment of goals and objectives for this ecosystem through its Partners for Fish and Wildlife Program and the partnerships that exist throughout the complex.

Key legislation and policies can be found in appendix D.

National and Regional Mandates
The administration of the Refuge System is guided by a variety of international treaties, federal laws, and presidential Executive Orders (EOs). Management options under each refuge and district's establishing authority and Improvement Act (the legal and policy guidance for the operation of refuges) are contained in the documents and acts listed in appendix D.

The Improvement Act amends the Refuge System Administration Act by providing a unifying mission for the Refuge System, a new process for determining compatible public uses on refuges, and a requirement that each refuge will be managed under a CCP. The Improvement Act states that wildlife conservation is the priority of Refuge System lands and that the Secretary of the Interior will ensure that the biological integrity, diversity and environmental health of refuge lands are maintained. Each refuge must be managed to fulfill the Refuge System's mission and the specific purposes for which it was established. The Improvement Act requires the Service to monitor the status and trends of fish, wildlife, and plants in each refuge. A list of other laws and EOs that may affect the CCP or the Service's implementation of the CCP is provided in appendix D. Service policies providing guidance on planning and the day-to-day management of a refuge are contained within the Refuge System Manual and the Service Manual.

The Planning Process
This draft CCP and EA for the complex are intended to comply with the Improvement Act and NEPA and their implementing regulations. The Service issued a final refuge planning policy in 2000 that established requirements and guidance for Refuge System planning, including CCPs and step-down management plans, ensuring that planning efforts comply with the provisions of the

Improvement Act. The planning policy identified several steps of the CCP and EA process (see figure 1):

- Form a planning team and conduct pre-planning;
- Initiate public involvement and scoping;
- Draft vision statement and goals;
- Develop and analyze alternatives, including proposed action;
- Prepare draft CCP and EA;
- Prepare and adopt final CCP and EA and issue a Finding of No Significant Impact (FONSI) or determine if an environmental impact statement is needed;
- Implement plan, monitor and evaluate, and;
- Review plan (every 5 years) and revise (every 15 years).

The Service began the pre-planning process in November 2003 (see appendix E). A planning team comprised of Service personnel from the complex and the regional office, as well as from the NDGF (appendix C), was developed during the kickoff meeting in February 2004.

A notice of intent was published in the *Federal Register* on May 21, 2004. Notification of a public open house was distributed through press releases.

Draft issues and qualities lists were developed during a workshop held at the Service's Bismarck office in late September 2004. Over the course of pre-planning and scoping, the planning team collected available information about the resources of the complex and the surrounding areas. This information is summarized in chapter 4: Affected Environment.

This CCP provides long-term guidance for management decisions; sets forth goals, objectives, and strategies needed to accomplish refuge purposes; and identifies the Service's best estimate of future needs. This CCP details program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. This CCP does not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

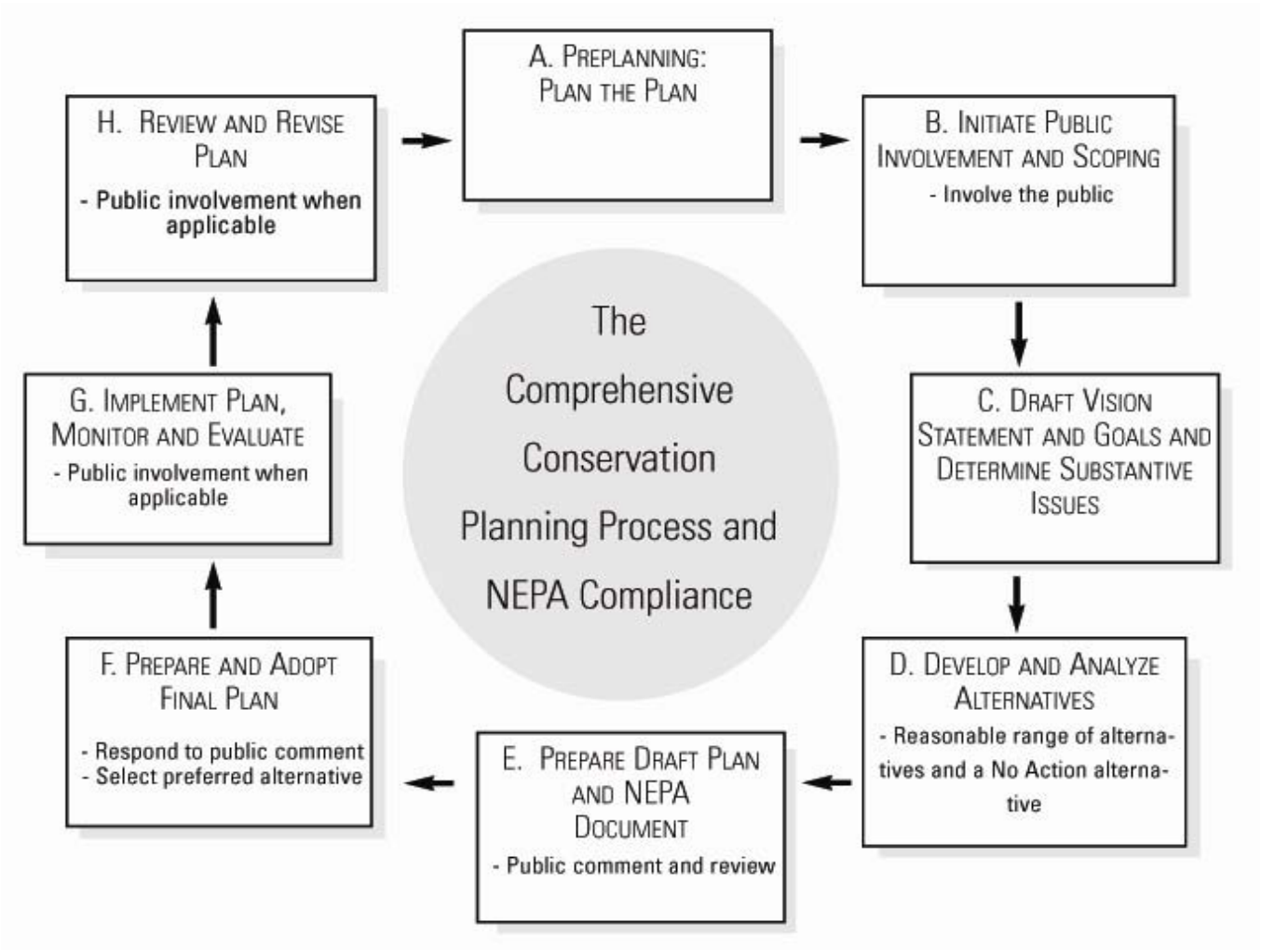


Figure 1. The steps in the CCP process

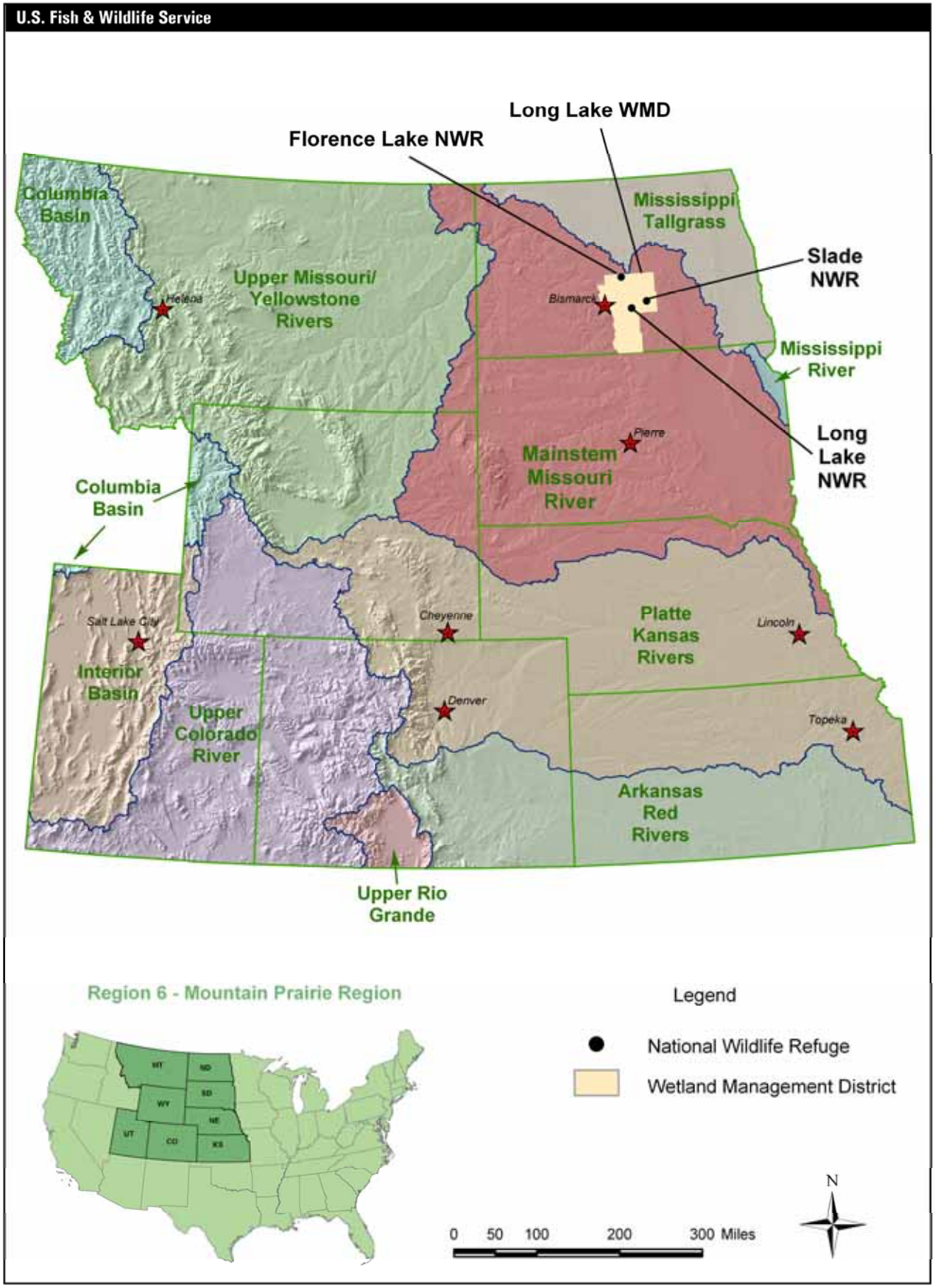


Figure 2: Regional context map

Chapter 2. Long Lake National Wildlife Refuge Complex

Establishment, Acquisition, and Management History

The complex oversees management of three national wildlife refuges: Long Lake National Wildlife Refuge (NWR), Slade NWR, Florence Lake NWR, and a three-county wetland management district (WMD or district) that consists of 79 waterfowl production areas (WPAs) in Burleigh, Emmons, and Kidder counties in the south-central portion of the State, as well as conservation easements which protect approximately 147,000 acres. The wetland management districts continue to grow with the acquisition of additional easements annually.

Long Lake NWR was established on February 25, 1932, by President Herbert Hoover through EO No. 5808 "… as a refuge and breeding ground for migratory birds and wild animals" and "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act.)

The refuge is located in the south-central part of the State in an area famous for its wealth of waterfowl-producing prairie potholes. Long Lake NWR is 22,310 acres in size and consists of approximately 15,000 acres of brackish to saline marsh and lake, 1,000 acres of other wetlands, and about 6,000 acres of tame- and native grassland, woodland, and cropland (see figures 3 and 4, location map and Long Lake National Wildife Reguge base map). The refuge serves as an important staging area for migrating sandhill cranes, Canada geese and other waterfowl, shorebirds, and other migratory birds. Endangered whooping cranes often utilize refuge marshes during spring and fall migration periods.

A primary resource goal is to prevent or at least manage avian botulism (hereafter, botulism), which has, on occasion, devastated migratory bird resources found in the complex. Throughout the history of the refuge outbreaks have been sporadic and have ranged from mild to severe.

The refuge provides a variety of habitats for resident wildlife and supports populations of white-tailed deer, sharp-tailed grouse, and ring-necked pheasants during the fall and winter.

Slade NWR was established through donation by Northern Pacific Railroad executive G.T. Slade, who originally began acquiring the area around Harker Lake in 1924 for the establishment of a private shooting club. It is located in south-central Kidder County, approximately 20 miles northeast of the complex's headquarters and is adjacent to Lake Isabel Recreational Area. The refuge consists of 3,000 acres of gently rolling prairie dotted by lakes and marshes, which were formed by glacial action. Habitat centers around five semi-permanent and permanent wetlands and numerous other prairie potholes, which altogether total more than 900 wetland acres (see figure 5, Slade National Wildlife Refuge base map). Much of the upland acreage had been farmed prior to the donation. Current management targets restoring native grasses and forbs that are characteristic to this area.

Florence Lake NWR was established on May 10, 1939, by President Franklin D. Roosevelt through EO No. 8119 "… as a refuge and breeding ground for migratory birds and other wildlife" and "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act.)

It is located in northern Burleigh County approximately 45 miles northwest of Long Lake NWR. The refuge consists of 1,468 acres of fee title and 420 acres of easement (132 acres of which is meandered lake). The fee portion of the refuge consists of 977 acres of native grassland, 202 acres of tamegrass, 111 acres of seeded native grass, 163 acres of wetland and 16 acres of woodland. The refuge serves as an important migratory bird production and migration area.

Long Lake Wetland Management District

The wetland management district was started as part of the Small Wetlands Acquisition Program

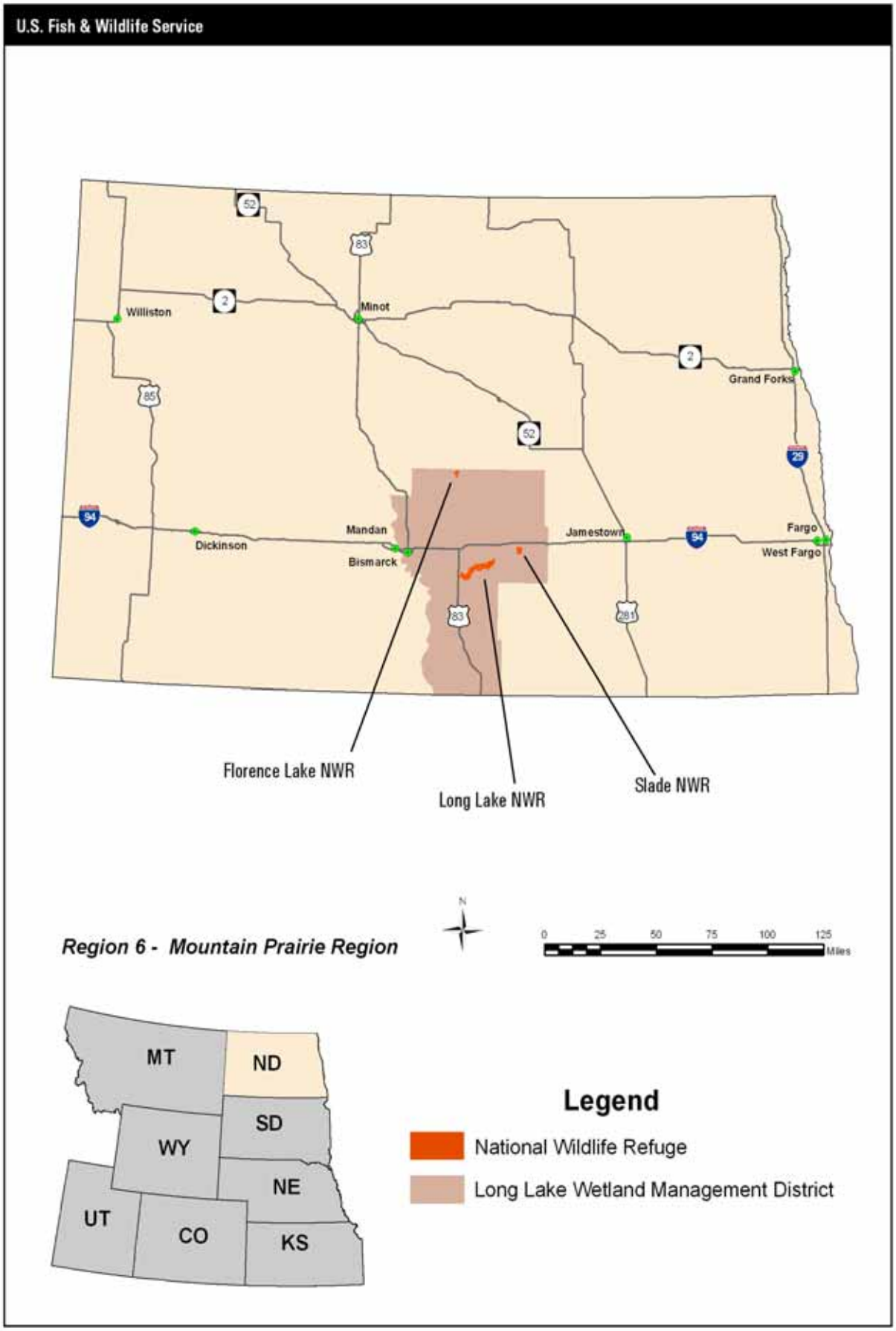


Figure 3: Location Map

(SWAP) in the 1950s to save wetlands from various threats, particularly drainage. The passage of Public Law 85-585 in August 1958 amended the Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) of 1934, allowing for the acquisition of WPAs and easements for waterfowl production.

The Long Lake WMD contains 1,036 perpetual wetland easement contracts which protect 102,646 acres; 93 perpetual grassland contracts which protect 41,181 acres; 16 Farmers Home Administration (FmHA) perpetual easements which protect 669 wetland acres, and 2,759 acres of upland; one wildlife development area (WDA; Garrison diversion unit mitigation tract) totaling 794 acres; and 78 WPAs totaling 21,789 acres (see figures 6 and 7, Long Lake WMD fee title and easement land maps). Easement restrictions generally prohibit wetland drainage, grassland conversion and development, and require a special-use permit issued by the U.S. Fish and Wildlife Service (Service) for vegetative manipulation. The lands remain in private ownership. There continues to be an active acquisition program in the Long Lake WMD, which currently focuses on acquiring grassland and wetland easements.

Long Lake National Wildlife Refuge Complex Purposes

Long Lake National Wildlife Refuge was established "…as a refuge and breeding ground for migratory birds and wild animals…" (EO No. 5808, February 25, 1932) and "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act.)

Florence Lake NWR was established "…as a refuge and breeding ground for migratory birds and wild animals…" EO No. 8119, May 10, 1939, "…. for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act.)

Slade NWR was established through a donation to the Service in 1940 under the authority of the Migratory Bird Conservation Act "…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

Long Lake WMD was established "…to assure the long-term viability of the breeding waterfowl population and production through the acquisition and management of waterfowl production areas, while considering the needs of other migratory birds, threatened and endangered species and other wildlife." (The purpose statement was developed for all Region 6 WMDs in June 2004.)

Migratory Bird Hunting Stamp Act 16 U.S.C. 718(c) "…as Waterfowl Production Areas subject to all provisions of the Migratory Bird Conservation Act …except the inviolate sanctuary provisions…"

Migratory Bird Conservation Act 16 U.S.C. 715d "…for any other management purposes, for migratory birds."

Consolidated Farm and Rural Development Act 7 U.S.C. 1924 "… for conservation purposes."

Consolidated Farm and Rural Development Act 7 U.S.C. 2002 "…for conservation purposes"

Vision and Goals

Vision for the Long Lake National Wildlife Refuge
The echo of the sandhill cranes though the rolling prairie hills of Long Lake invites today's visitors to follow in the footsteps of the plains Indians. The refuge lies along the west-central boundary of the PPR where the Missouri Coteau meets the Coteau Slope. An abundance of migratory birds and other wildlife flourish in the native mixed-grass prairie and a mosaic of wetlands. The mixed hues and textures of wildflowers, grasses, mudflats, and water please the eye and soothe the soul. Refuge stewards work collaboratively to understand, restore, and protect biological communities. Expanded wildlife-compatible recreation and environmental education opportunities foster a greater understanding and appreciation of the mixed-grass prairie ecosystem and the mission of the Refuge System.

Vision of Florence Lake National Wildlife Refuge
A classic prairie-pothole landscape, Florence Lake NWR provides a unique perspective of pre-settlement prairie conditions. At this visual oasis of the prairie ecosystem, visitors enjoy solitude and excellent grassland bird viewing opportunities in a peaceful, protected environment that supports a wealth of migratory birds and other wildlife. Florence Lake serves as a reference area for northern prairie ecosystems with ongoing restoration, monitoring, and research.

Vision of Slade National Wildlife Refuge
Located within the central flyway, Slade NWR historically served as a foundation for the restoration of the nearly extirpated giant Canada

goose population. Management strives to restore mixed-grass prairie and continues to provide quality migratory stopover and breeding habitat for Birds of Conservation Concern. Enhanced wildlife-dependent recreation opportunities and interpretation foster a greater understanding and appreciation of conservation and restoration within an agricultural landscape.

Vision of Long Lake Wetland Management District
WPAs and all conservation easements provide a network of wetland and grassland habitats that preserve the integrity of the historic and vital nesting and breeding grounds of North America's migratory waterfowl resource. These conservation and management efforts support populations of nesting ducks and geese at or above historic levels. New and expanded habitats are provided for trust species including nongame migratory birds, threatened and endangered species, and resident wildlife. The public recognizes these wetlands and uplands as a beneficial and important component of a diverse, healthy, and productive prairie landscape. There is consumptive and nonconsumptive compatible recreational use of public lands. Landowners, sportsmen/sportswomen, conservationists, and others actively support and encourage the complex's habitat conservation programs. There are a wide variety of partners assisting the Service's efforts to educate the public on the value of habitat conservation and the benefit to current and future generations. These partnerships join us financially and physically to ensure a broad base of support, so that the Service conserves high-quality habitats.

Goals of the Long Lake National Wildlife Refuge Complex

1. Wildlife and Habitat Management
Conserve, restore, and enhance the ecological diversity of the mixed-grass prairie ecosystem (including wetlands, grasslands, and native trees and shrubs) for migratory birds with an emphasis on waterfowl and other grassland- and wetland-dependent species.

2. Research, Inventory, and Monitoring
Use sound science, monitoring and applied research to advance the understanding of natural resource functions and management within the mixed-grass prairie pothole ecosystem.

3. Public Use, Education, and Interpretation
Provide a safe environment for visitors of all abilities to enjoy wildlife-compatible recreation while increasing their knowledge and appreciation of the mixed-grass prairie ecosystem and the mission of the Refuge System.

4. Cultural Resources
Identify, value, and preserve the cultural resources and history of the complex to connect staff, visitors, and the community to the area's past.

5. Refuge Operations
Through effective communication and innovative technology, secure and efficiently utilize funding, staffing partnerships, and volunteer programs for the benefit of all natural resources in support of the Refuge System mission.

6. Partnerships
Engage a wide array of partners to support outreach, research and management, promote awareness, and foster an appreciation of the mixed-grass prairie pothole ecosystem.

Special Values
The planning team and public identified special values and qualities that make the complex valuable for wildlife and for the American people. The complex has the following attributes:

- It comprises a diverse natural environment of mixed-grass prairie with an abundance of paulestrine and alkali wetlands.
- The complex staff operates in cooperation with landowners and partners to acquire easements (wetland and grassland) and establish WPAs to protect and manage lands for wildlife.
- It is home to, and attracts, a wide diversity of birds. Multiple areas within its boundaries have been designated as globally significant.
- Wildlife is abundant and highly visible because of varied habitat types and relatively low disturbance levels.
- Visitors can still find wide-open spaces that remain relatively undisturbed.

Planning Issues
Prior to writing the draft CCP, complex staff and other planning team members met to identify significant issues that should be addressed in the plan. The team hosted five public open houses, issued news releases in the local and regional press, as well as an announcement in the *Federal Register*,

and conducted numerous mailings to find out what issues were important to the public. The following are the most significant issues the team identified.

Upland Habitat Management
The complex's primary purpose is to provide optimal habitat conditions for the needs of a suite of migratory birds, and, to a lesser extent native, resident wildlife. To achieve goals and objectives, aggressive upland habitat management must be conducted. The complex include uplands, which were previously farmed and have since been restored to various mixes of tame and native grasses interspersed with native uplands, the bulk of which have the native vegetation character but are compromised by invading species. For the purpose of this CCP, native upland habitat is considered previously unbroken (virgin) sod. Soil composition is generally intact, although the vegetative community is often altered substantially due to a host of environmental factors. Vegetation typically has a native component, but often has become invaded by nonnative plant species.

Primary invasive weed species include leafy spurge, Canada thistle, and absenth wormwood. Kentucky bluegrass and smooth brome are primary invasive grass species. Western snowberry and silverberry are native shrubs which have greatly expanded their coverage in some areas where natural regimes of fire and grazing have been altered.

These nonnative grasses and forbs and potentially invasive native woody species substantially diminish the quality and suitability of upland habitat for many native wildlife species. Invasives have been an issue throughout the complex for many years. A large portion of the refuge's resources are directed at control of leafy spurge and other invasive species. Integrated pest management (IPM) strategies currently used include: prescribed burning, grazing, mowing, herbicides, insects, interseeding, and farming in combination to provide control.

New invasive species (i.e., salt cedar or purple loosestrife) pose additional threats to complex lands. Generally, an immediate control response to new invasive species is most effective in the long-term; however, due to the scattered nature of land holdings in the complex, early detection is a primary issue but is often unachievable.

Tamegrass (i.e., nonnative grass species) fields persist, providing sources of seed that invade and degrade adjacent native uplands. These fields need to be restored to native grass.

Public Use
Hunting, fishing, wildlife observation and photography, and environmental education and interpretation are all uses currently authorized on lands administered by the complex. A growing demand for public recreation in the area makes the six priority public uses a primary issue of interest.

Water Management
A small number of the complex's wetlands are impounded by earthen dams, many with water control structures (WCSs) that can be used to either create deep and stable water levels or mimic natural wet and dry cycles.

The water management capability at Long Lake NWR is limited and primarily targets single-issue management (i.e., managing water levels to deter botulism outbreaks). The limitations are exacerbated by the "hard sill" elevation of the outlet which limits drawdown capability and subjects water management to interpool regulation of water levels only when nature allows.

Wildlife Disease
The complex administers migratory bird programs and has the lead role in addressing wildlife and in particular avian disease issues. There are 21 sites in the wetland management district that have a history of botulism outbreaks.

Success in combating botulism, especially on Long Lake NWR occurs at the expense of other resources. There exists an ongoing issue of striking a balance between providing optimal habitat, maintaining other complex programs, and managing botulism.

Severe disease years consume substantial staff time, reducing the complex's capacity to attain other goals and objectives.

Disease issues are increasing. Historically, the only disease issue was botulism; however, recently Newcastle, West Nile virus, chronic-wasting disease, chlymidiosis, and avian influenza have created additional issues and concerns.

Long Lake Hydrology and Water Quality
Development of dikes and water control structures to manage waters at increased levels in order to combat botulism has altered the hydrology of Long

Lake and its associated marshes. During the era of refuge development, the area was experiencing severe drought conditions and development of water management facilities focused on conservation of water. This strategy failed to recognize a need to periodically lower and de-water refuge units and thus the capability to do so was never developed. This has severely limited the refuge's ability to manage water effectively.

There are questions regarding the altered hydrology and long-term ability of Long Lake NWR to provide beneficial wildlife habitat. The developments have reduced the ability to "flush" the system and have created hypotheses that this situation has accelerated salinification of refuge wetlands, reducing the sustainability of wetland habitats. This creates an obvious need to examine historical data related to past water-quality parameters and to develop a monitoring program to compare and track Long Lake NWR waters in order to prescribe viable alternatives to address and avoid potential productivity declines of refuge marshes and/or catastrophic collapse of the system.

Predator Management
Despite substantial investment in land protection and habitat management, recruitment rates which are not high enough to sustain and/or increase populations of bird trust species have been documented on Service areas within the complex. Predation rates, which are unacceptable, must be addressed through management of predator populations.

Additionally, protection provided by refuges in the complex allow predators which hunt domestic livestock (i.e., coyotes) adjacent to the refuges to continue to grow unchecked, perpetuating depredation problems and economic losses to refuge neighbors in localized areas surrounding the refuges.

Lake Isabel Recreation Area
The Lake Isabel Recreation Area, which is adjacent to Slade NWR, provides the only public access for Lake Isabel. The recreation area has been managed over the years by Kidder County and while most of the nontraditional uses occur off-refuge, facilities on the refuge promote the uses, which are not allowed on refuge lands (e.g., swimming, jet-skiing). Recently the facilities have been minimized and converted to promote more traditional and acceptable refuge public uses (fishing).

Habitat Protection and Acquisition
Urbanization, development, and conversion of native uplands for agricultural crop production continue to threaten native grassland habitat and the support capability for native wildlife. The Service needs to protect additional grassland and wetland habitat in order to achieve its goals and objectives.

The majority of the wetlands on complex fee lands are natural prairie potholes, which function through dynamic prairie weather cycles. Wetlands continue to be lost annually to agricultural drainage and impacts of development.

Over 60 percent of native grassland in the complex remains intact; however, it is in degraded condition due to annual use for livestock production. Native grasslands are also continuously threatened by development and other uses.

While various regulations and programs have provided some temporary relief from broad-scale destruction, the only permanent protection for grassland and wetland habitat is afforded through purchase of perpetual easements by the Service. While these programs afford protection of the habitats, additional issues persist as economic pressure on these private lands provides less than optimum habitat for trust resources, especially those with narrow habitat requirements (e.g., marbled godwit, chestnut collared longspur).

Budget and Staffing
Budget and staffing is not sufficient to fulfill the purposes and goals of the complex. Identifying priorities and directing resources efficiently will always be an issue for the complex. Service staff needs to identify and articulate unfunded needs so that they will be able to compete effectively for additional funds from both within The Service and from partners and other sources.

Monitoring
Monitoring wildlife populations is an essential element in achieving the primary goals and objectives of the complex. Basic data related to recruitment, mortality, and habitat use for a representative group of species must be collected and analyzed on a regular basis in order to make appropriate decisions that will affect the habitats upon which these species depend. Decision making in the absence of resource information is a primary issue for the complex.

Threatened and Endangered Species
Breeding piping plovers occur in small numbers on numerous alkali wetlands, which are characteristic to the complex.

The complex holds habitat, which when enhanced, or restored may be suitable for Dakota skippers (a candidate species). Small, isolated populations may exist on certain WPAs, which retain remnant native prairie vegetation. Surveys are planned to determine the status of this species in these areas.

Endangered whooping cranes are regularly observed on the marshes of Long Lake NWR. Throughout the complex several observations are documented during each spring and fall migration.

The primary issues related to these and other species of concern center on: monitoring their populations; monitoring habitat use; identifying, securing, and maintaining essential habitat; and developing habitat conditions in areas which hold potential for these species and which will promote increased recruitment or population protection to secure and increase their populations.

Threatened and Endangered Species
The Biological Integrity, Diversity, and Environmental Health Policy (published January 16, 2001, effective April 16, 2001) (http://policy.fws.gov/library/ 01fr3809.pdf) guides Refuge System personnel in maintaining the "biological integrity, diversity, and environmental health" of the Refuge System. This policy further guides the Service to consider restoring lost or severely degraded components of the system "where appropriate and in concert with refuge purposes and the Refuge System mission."

The complex staff reviewed all threatened and endangered species with historical ranges on or near the refuge to determine if additional actions could be taken to restore or enhance habitat for endangered species. Only the piping plover was determined to be appropriate for restoration actions.

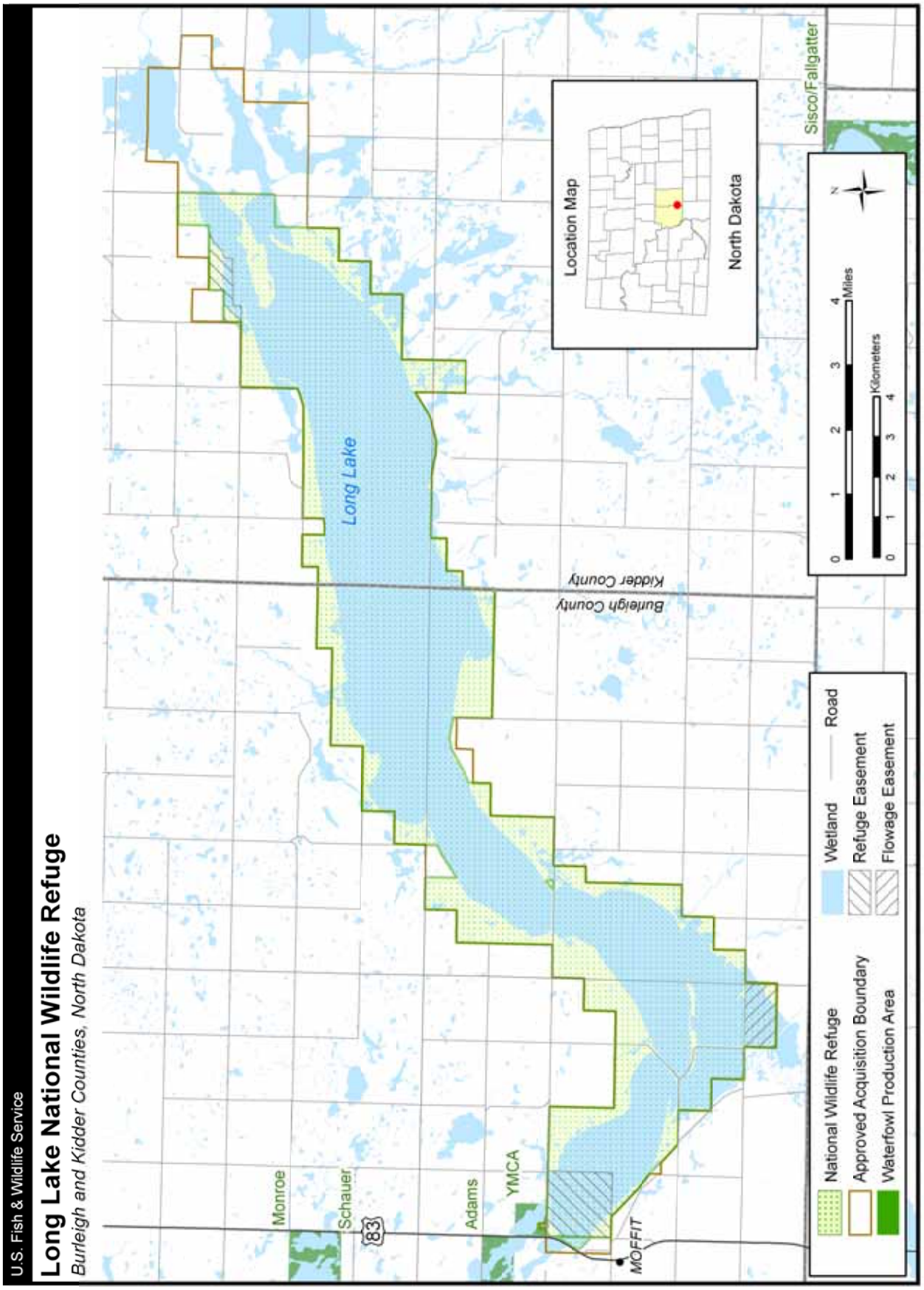
Although the status of the Dakota skipper has not warranted listing, the complex staff has consulted with ecological services staff and evaluated habitats as to their present and future potential to support this species. The complex has adopted interim guidelines targeting management for Dakota skippers resulting from those consultations.

Predators
Predators on the complex are diverse, ranging from coyotes and short-tailed weasels to bald eagles and American kestrels. This array of predators helps maintain the "biological integrity, diversity, and environmental health" of Service lands. Several species, including red fox, coyotes, striped skunks, Franklin's ground squirrels, mink, badger, and raccoons, are found at higher than historical levels due to modifications of habitat and other factors. These species can impact migratory bird populations and reduce the likelihood of reaching wildlife population goals and objectives outlined for the complex, primarily by preying upon the nests of numerous grassland-nesting bird species.

Prioritization of Complex Lands
The complex staff is charged with managing habitat and protecting trust resources (i.e., migratory birds, threatened and endangered species) on 82 different tracts of fee-title land that is scattered throughout a three-county area that spans 7,490 square miles. Limited staff, budgets, and other resources require that lands are prioritized and those with the greatest management potential and/or most vulnerable resources are recognized. Therefore, complex staff used a number of important criteria to classify all fee-title lands in the complex as either HIGH, MODERATE, or LOW priority. The criteria include 1.) breeding duck pair density, with a minimum upland acreage, 2.) total tract size, with a minimum upland acreage, 3.) native prairie acreage, 4.) proximity to Grassland Bird Conservation Areas (Type I), with a minimum upland acreage, and resource of special concern designation (e.g., Piping Plover Critical Habitat). Based on these criteria, high priority tracts may be classified as such based on their management potential (e.g., native prairie) or their habitat support potential for priority wildlife populations (e.g., Dakota skippers). Based on the above criteria, all three fee-title refuges qualify as high priority, along with 36 WPAs. Twenty WPAs are classified as moderate priority and 23 WPAs are classified as low priority. Appendix F lists, by priority class, all fee-title lands and their qualifying criteria.

Additionally, due to the high visibility and attraction of the three fee-title Refuges to the public, these lands receive staff attention, which extends beyond managing habitat and protecting trust resources, with increased focus on these lands for compatible uses described in the Improvement Act (e.g., hunting, wildlife photography,

environmental education). Similar priority public use opportunities may be used in the future to help prioritize WPAs because of their location (e.g., close proximity to cities/towns and/or Interstate 94) and ability to provide enhanced opportunities for priority public uses, irrespective of an overall tract rating based on habitat or wildlife management potential and/or priority resource criteria.


U.S. Fish & Wildlife Service
Long Lake National Wildlife Refuge
Burleigh and Kidder Counties, North Dakota
Long Lake
Monroe
Schauer
83
Adams
YMCA
MOFFIT
Burleigh County
Kidder County
Sisco/Fallgatter
Location Map
North Dakota
0 1 2 3 4 Miles
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N
National Wildlife Refuge
Approved Acquisition Boundary
Waterfowl Production Area
Wetland
Road
Refuge Easement
Flowage Easement

Figure 4:

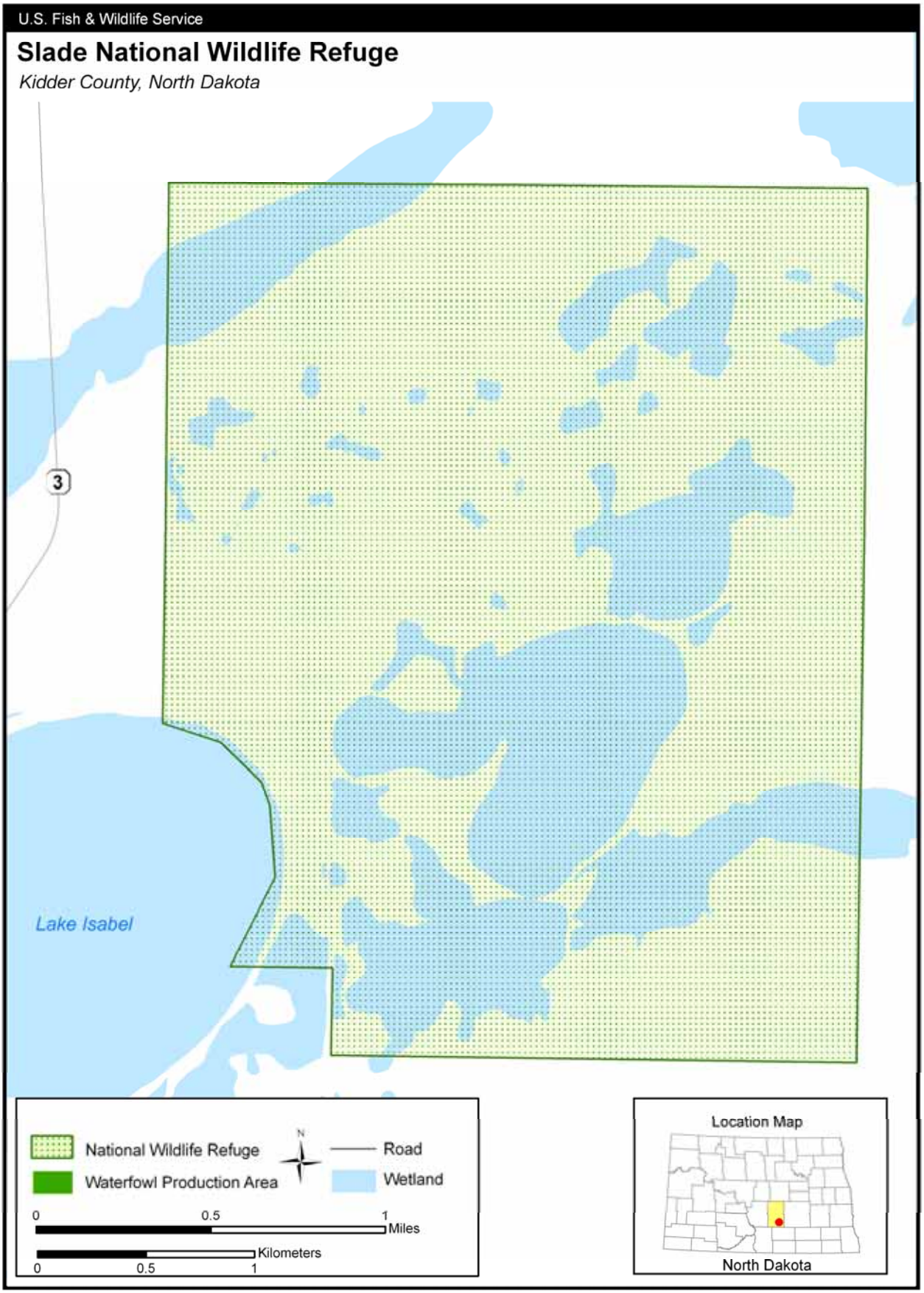


Figure 5: Slade National Wildlife Refuge Base Map

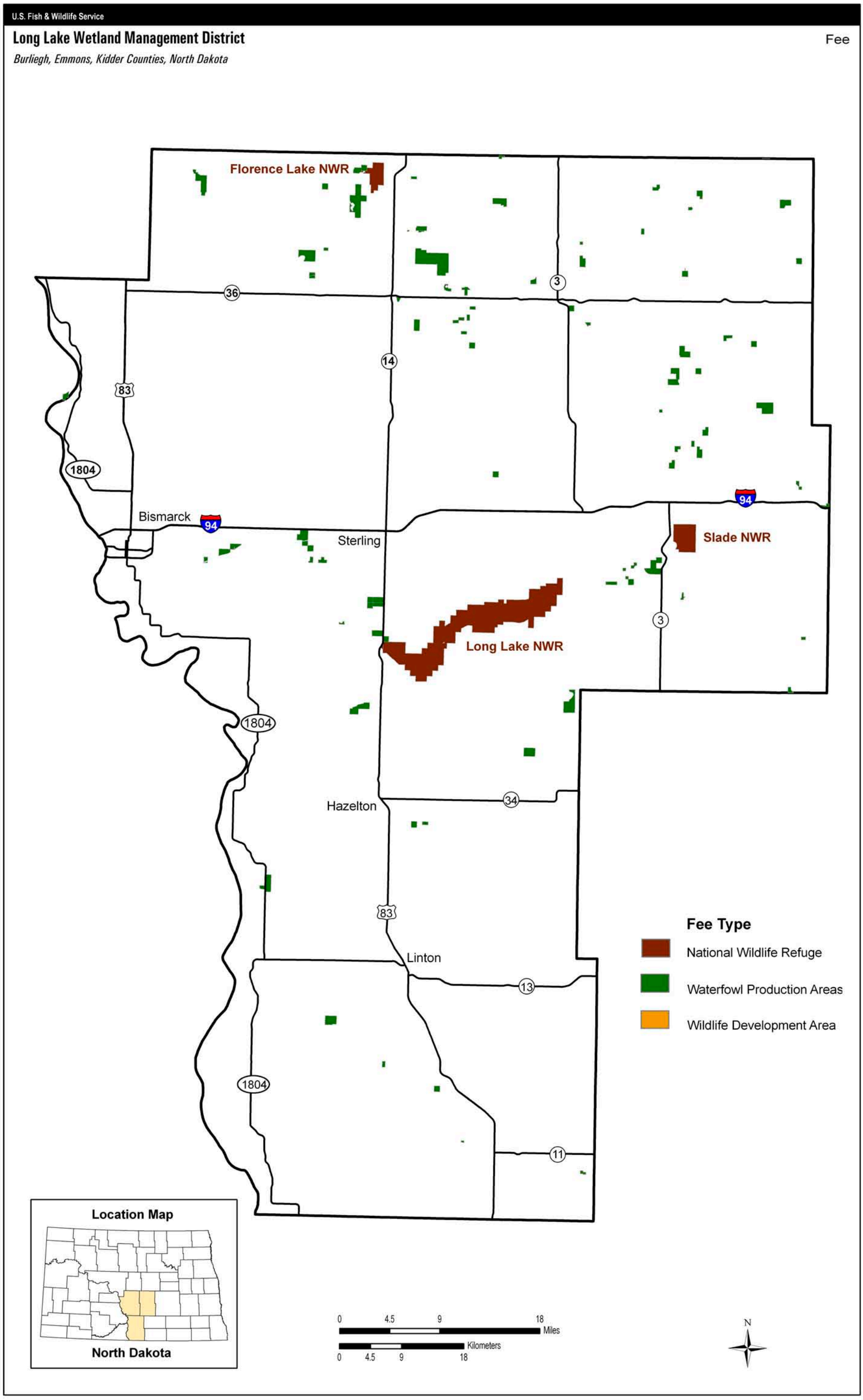


Figure 6: Long Lake Wetland Management District Fee Title Lands

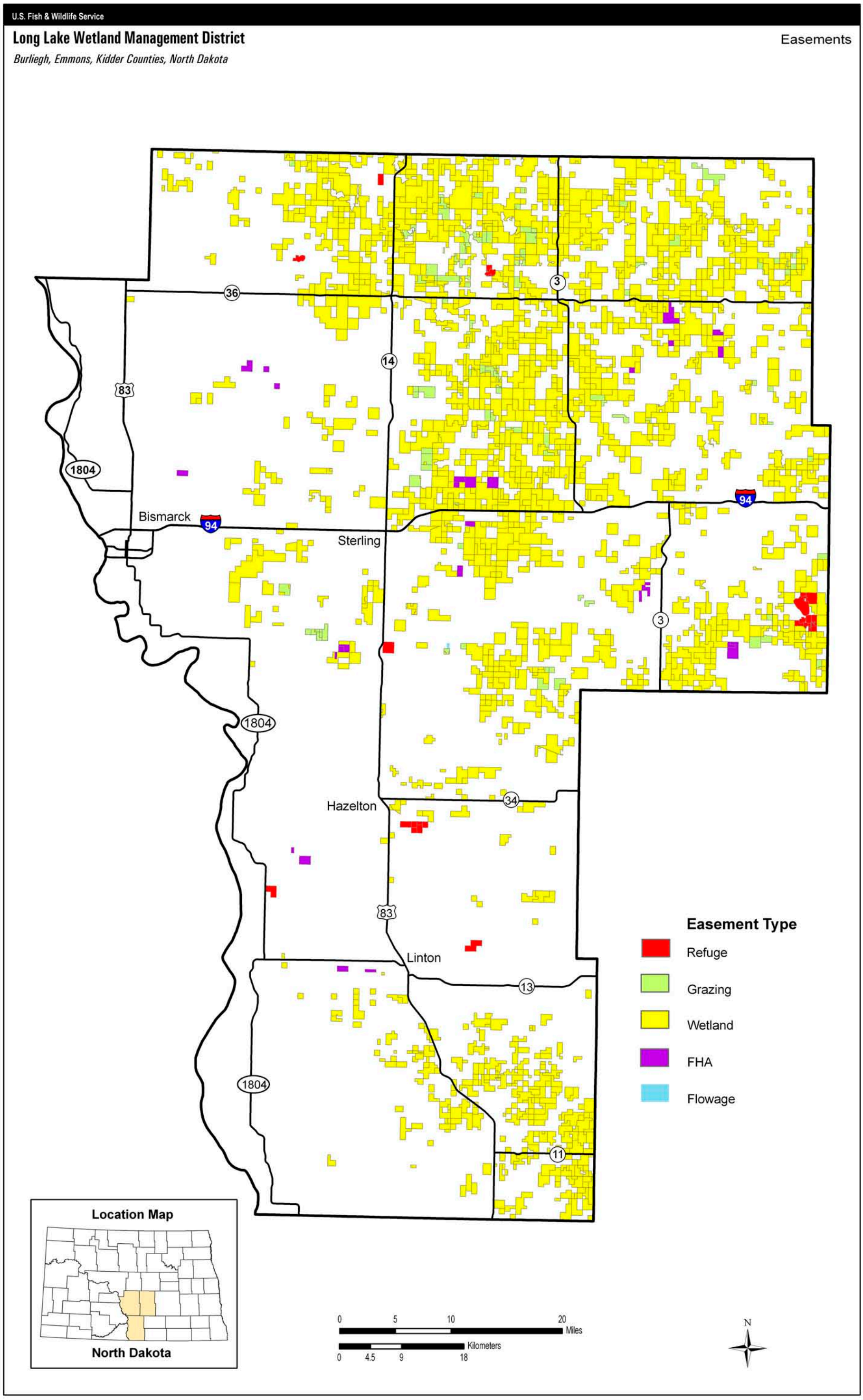


Figure 7: Long Lake Wetland Management District Easement Lands

Chapter 3. Alternatives

Introduction

Alternatives are different approaches to management of the complex designed to resolve issues, achieve the complex's purpose, vision, and goals as identified in the CCP, while helping to fulfill the mission of the Refuge System and comply with current laws, regulations, and policies. NEPA requires an equal and full analysis of all alternatives considered for implementation.

This chapter describes four management alternatives for the complex: alternative A, Current Management (No Action); alternative B, Natural Processes Management; alternative C, Single Wildlife Group-level Intensive Management, and; alternative D, Target Species Group-level Modified Management (Proposed Action).

Alternatives Development

In the spring of 2004, the Service held five public open houses in towns located throughout the complex's boundaries to identify the issues and concerns that were associated with the management of the complex. The public involvement process is summarized in greater detail in chapter 2. Based on public input, as well as guidelines from NEPA, the Improvement Act, and Service Planning Policy, the planning team selected the substantive issues that will be addressed in the alternatives. Substantive issues identified for the complex are:

- water management
- Long Lake hydrology and water quality
- upland habitat management
- predator management
- disease management
- public use
- research
- cultural resources
- socioeconomics
- Lake Isabel Recreation Area
- habitat protection and acquisition
- threatened and endangered species
- wildlife population monitoring
- budget and staffing
- partnerships

The planning team discussed alternatives for management that will address the substantive complex issues and meet Service goals. Each alternative described in the following sections addresses the substantive issues somewhat differently.

Elements Common to all Alternatives

A number of elements are common to all four alternatives listed. Water management concerns related to the possible negative impacts on Long Lake's hydrology and water quality are considered in all alternatives. The need to maintain suitable habitat for wetland-dependent birds is also a consistent theme throughout.

Management of upland habitats includes the potential use of an array of practices (i.e., fire, grazing, chemicals, biological control) in all alternatives. Across all alternatives, disturbed upland management (i.e., lands that have been, or are currently being, cropped, farmed, broken, or seeded to a native or tame-grass mixture) focuses on improved habitat quality for trust resources, whether that habitat is native or nonnative.

Reduced predation rates on ground- and overwater-nesting birds, achieved through a variety of means, is a common priority of every alternative.

Maintaining support for hunting, fishing, wildlife observation and photography, and environmental education and interpretation are common to all the alternatives.

The research and monitoring efforts in all alternatives focus on improving the Service's knowledge of how best to control invasive nonnative flora, increasing the intensity and extent of upland vegetation monitoring, and monitoring the long-term water quality and hydrologic parameters of Long Lake.

All four alternatives also promote, at a minimum, the opportunistic identification, documentation, and protection of the complex's cultural resources. Strong and diverse partnerships are also promoted throughout, in order to help meet objectives and achieve complex goals.

Description of Alternatives

The theme and general management direction for each alternative is described below.

Alternative A—Current Management (No Action)

Summary

Under alternative A, management activities being conducted by the Service throughout the complex would not change. The Service would not develop any new management, restoration, or education programs for the complex. Staff would not expand or change current habitat and wildlife management practices conducted for the benefit of migratory birds and other wildlife. Staff would conduct monitoring, inventory, and research activities at their current level (i.e., limited, issue-driven research and limited avian and vegetative monitoring and inventory). Funding and staff levels would not change and programs would follow the same direction, emphasis, and intensity as they do at present. Staff would continue to manage Florence Lake NWR and Slade NWR as unstaffed satellite refuges.

Water Management

This management targets one primary objective: reducing the potential for, or lessening the severity of, botulism outbreaks. Botulism is the primary resource concern on Long Lake. Water-level management would continue to be accomplished through the use of existing water control structures. Annual water-level targets for three Long Lake NWR pools are either full pool or empty (dry) (see figure 8, water control structures and water management facilities, alternative A).

While other resource benefits (e.g., deep marsh habitat) would potentially occur as a result of this management, they are not the primary target of water management planning and annual operations. Smaller Long Lake NWR impoundments, which are independent of Long Lake proper, would be managed specifically to target habitats for one or more of the following purposes: waterfowl production, shorebird migration, waterfowl and sandhill crane migration, and production of wetland plant and animal foods. Pumping can provide a source of water to smaller impoundments, providing wetland habitat when spring runoff is limited. As is current practice, Impoundments in the wetland management district would most often be managed as semi-permanent wetlands; however, periodically they would be managed in a drawdown phase to simulate the natural cycles of seasonal wetlands and consequently maintain high levels of productivity.

Service-owned wetlands throughout the wetland management districts are primarily natural basins that lack water-control capabilities. These wetlands would continue to be subject to little active management. Changes that incur would be largely a result of changing climatic conditions (i.e., periods of drought and deluge) that result in a corresponding change in their abiotic and biotic communities. Management of these wetlands typically consists of: 1) maintaining perennial grass cover around their perimeters to minimize negative anthropogenic impacts (i.e., sedimentation); 2) allowing prescribed fire and permitting grazing to consume wetland vegetation for the purpose of either nutrient recycling or noxious weed control, and; 3) actively managing noxious weed infestations (e.g., Canada thistle) in dry wetland basins or at wetland edge areas.

Long Lake NWR Hydrology and Water Quality

Under this alternative the staff would continue its efforts to try to manage water levels in Long Lake to avoid or minimize outbreaks of botulism. The refuge would maintain existing water management structures and associated facilities in good repair.

Upland Habitat Management

Management would continue to include grazing, prescribed burning, spraying, and clipping, as well as use of biological control agents to combat invasive nonnative and native (e.g., western snowberry, silverberry) plants and shrubs. Management would continue to be geared toward decreasing invasive exotic plants (i.e., smooth brome, Kentucky bluegrass, crested wheatgrass, leafy spurge, Canada thistle, absinth wormwood) while promoting the growth of native plant species. Some sites that do not respond to the above management treatments would be inter-seeded with a native-grass mix as per current practice. Altogether, the management activities described above will continue to occur on approximately 2,500 acres per year within the complex.

Current management of disturbed uplands would continue to focus on converting unsuitable migratory bird nesting habitat (i.e., cropland, degraded dense nesting cover [DNC], monotypic cool-season tame grass stands) to a native-grass mixture. Species included in the grass mix are based on historic vegetation and soil structure and

would continue to be seeded using a drill. The complex staff would follow the current protocol of seeding 250 to 300 acres per year. To achieve success in seeding, several management techniques would be utilized, including: cropping, burning, clipping, and/or chemically fallowing sites. Seeded native-grass stands and existing disturbed uplands are periodically managed to rejuvenate grass, reduce litter accumulations, and control undesirable noxious weeds through haying, grazing, burning, and chemical or biological treatments.

Current management of nonnative trees and shrubs (i.e., exotic species, planted native species) is conducted on an "as needed" basis. Management includes the removal of volunteer trees and shrubs from grassland areas to retain the native, early-successional character of mixed-grass prairie and thereby benefit grassland-dependent migratory birds (e.g., marbled godwit, northern pintail).

Predator management
Predator management throughout the complex (including on the WPAs) currently includes removing select "sentinel" trees, which serve as perches for various raptors (e.g., great horned owl, red-tailed hawk), from both migratory bird nesting habitats and stop-over and staging concentration areas, as well as issuing a limited number of trapping permits for mammalian predators (e.g., red fox, raccoon) during periods when their fur is of value and the Service can attract interested trappers to remove them. These periods are generally during the fall and winter, when removal of predators is less effective in managing avian recruitment than during the nesting season. Trapping is regulated by special use permits on all refuges in the complex, and permit holders are considered "management agents," selected to address specific management needs. Trappers are selected based on a combination of their interest, experience, and skill. Special emphasis is placed on mammal populations that are known to cause one of the following: 1) damage to refuge infrastructure; 2) localized depredation problems for adjacent landowners, or; 3) specific resource issues (i.e., spreading disease, elevating predation rates on ground-nesting birds to unacceptable levels). Occasionally, predator removal is needed at special sites (i.e., nesting islands, peninsulas, waterbird colonies). Sometimes, when complaints from adjacent landowners document depredation problems, a government control agent is allowed to remove coyotes from Long Lake NWR. On WPAs, recreational trapping and hunting of mammalian predators occurs throughout state-regulated seasons. These programs are authorized by law and are not management-directed predator control measures.

Wildlife Disease
The complex staff would continue to take a direct approach when faced with wildlife disease outbreaks. The most extensive and perennial disease issue in the complex is botulism. Management of botulism outbreaks involves the removal of all bird carcasses from affected wetlands as soon as an outbreak is discovered, followed by continued monitoring of the outbreak's status and continued carcass removal, as needed. West Nile Virus is another disease that has recently impacted some waterbird colonies in Long Lake's WMD. West Nile Virus outbreaks would be handled by complex staff in a manner similar to botulism outbreaks. A sample of wildlife carcasses from all disease outbreaks, as well as select wildlife carcasses with unknown mortalities, would be forwarded annually to the National Wildlife Health Center, in Madison, Wisconsin, so that the cause of mortality can be confirmed and more information can be gained on present and future disease-related issues. Each summer, prior to the occurrence of botulism outbreaks, specific habitats (i.e., wetlands with a history of botulism) would be monitored, so that the complex staff is aware of disease outbreaks at, or soon after, their inception. Other recent wildlife disease monitoring includes the collection of a sample of hunter-harvested white-tailed deer heads, for submission to veterinary diagnostic centers, to be tested for chronic wasting disease (CWD). Monitoring would be conducted according to the needs of the NDGF.

Priority Population Issues
We presently document the occurrence of federally threatened and endangered species (i.e., bald eagle, piping plover, whooping crane) on Service lands within the complex through opportunistic sightings and limited systematic surveys, with respect to piping plovers.

Priority Population Issues
Maintaining the current survey protocols and level of effort to locate and monitor populations of priority species will allow the staff to protect known populations of these species. However, locating and monitoring unknown populations within the complex will likely be the result of opportunistic discoveries.

Public Use
At Long Lake NWR, bank fishing would continue to be allowed only from specified areas, including two Long Lake Creek areas: one area along the north side of B Dike, and one area along the south side of A Dike (see figure 9, public use map, alternative A). Following current policy, Boats would be allowed on Long Lake Creek, as long as the speed limit and other restrictions were followed and access is gained from designated trails or established road right-of-ways. Fishing is permitted on WPAs. Known gamefish populations exist on only two WPAs and there are no plans to introduce fish to others.

The complex's hunting program would continue to include upland gamebird (i.e., ring-necked pheasant, sharp-tailed grouse, gray partridge) and deer hunting on Long Lake NWR. The upland gamebird season begins on the Monday immediately following the close of the State firearms deer season, and closes concurrent with the statewide closing date. Deer hunting is open to archery, muzzleloader, and other firearms users, with season dates paralleling the regular statewide seasons. A small portion (15 percent) of Long Lake NWR, close to complex headquarters, would remain closed to all hunting, with the exception of archery deer. Slade NWR and all WPAs are open to deer hunting (all State seasons), with season dates paralleling the regular statewide season. WPAs are open to all other types of hunting (i.e., waterfowl, small game, furbearer), consistent with State regulations. Florence Lake NWR would remain closed to all hunting. Access is limited to foot traffic on all Service lands, with the exception of identified motorized vehicle trails on specific WPAs.

Current environmental education and interpretation programs conducted by complex staff would continue. They include hosting annual youth events (e.g., Lines for Little Ones, Juniors Acquiring Knowledge Ethics and Sportsmanship [JAKES] Day), as well as opportunistic on-site and off-site environmental education programs. Displays and exhibits, including signage and brochures, would be maintained at the complex headquarters, as well as other public-use facilities throughout the complex.

The facilitation of wildlife observation and photography throughout the complex would still consist of providing sharp-tailed grouse observation blinds at Long Lake NWR, maintaining an up-to-date bird species list for Long Lake NWR, and allowing the public the opportunity to use portable viewing and photography blinds through the issuance of special use permits.

Public trapping is currently regulated by special use permits on all refuges in the complex and targets predator management objectives. There is no recreational trapping program on the refuges administered by the complex. On WPAs, recreational trapping is an activity that has been approved by legislation.

Research and monitoring of current socioeconomic conditions throughout the complex and in the communities surrounding the complex will remain informal, leaving staff with an insufficient understanding of what motivates the public to visit Service lands, or whether the public's needs and expectations are being met. It will remain very difficult for complex staff to ascertain what values the visiting public places on wildlife and other natural resources, or to tailor environmental education and public use infrastructure to their specific needs.

The complex staff would continue to have only limited means to determine the complex's influence on the economic conditions in surrounding municipalities and in the State. The complex staff would continue to have only limited knowledge of current visitation levels, or the areas from which the various visiting public travels.

Currently, complex staff would continue to document and protects new cultural resources as they are opportunistically found. Staff would also protect existing known resources from vandalism, theft, and destruction. Sites with historical significance will be maintained and preserved according to Service guidelines.

Threatened and Endangered Species
Under this alternative the staff would continue to monitor and document the presence and use of complex lands by federally listed species, such as piping plovers, whooping cranes, and bald eagles. The staff will continue to impose area closures to public use in order to protect federally listed species using the complex.

Habitat Protection and Acquisition
Under this alternative, the Service would continue to pursue opportunities to protect wildlife habitats on a willing owner/seller basis. The mechanisms to conserve valuable lands for wildlife would include,

but not be limited to, pursuing easements, contracts, and fee-title purchases of both wetland and grasslands.

Monitoring
The current wildlife and habitat monitoring effort throughout the complex would continue. It includes annual surveys of various bird groups (e.g., breeding and migrant shorebirds, breeding waterfowl, grassland passerines, sharp-tailed grouse, ring-necked pheasants) on certain Service lands, periodic monitoring of waterfowl and colonial waterbird nesting effort and success on certain Service lands, involvement in various nonavian wildlife projects (e.g., CWD monitoring, small mammal inventory), inventory and monitoring projects related to the flora of complex lands (i.e., belt transect monitoring of management effects, Refuge Lands GIS habitat mapping), and various cooperative research efforts with other agencies and organizations (e.g., U.S. Geological Service [USGS], University of North Dakota). Staff will continue to use available information and sound science to make informed management decisions.

Budget and Staffing
Current staffing levels would remain the same (see table 1 for list of positions).

Operations and maintenance for the complex would continue to consist of maintaining vehicles and other equipment in good working condition, in order to achieve management goals. Maintenance staff will operate with available funding and resources.

There would be no new infrastructure (see table 1 for list of facilities).

Partnerships
Staff would work to preserve existing partnerships that strive to address resource information needs, protect and enhance habitat (both public and private), and promote public use, education, and outreach. Current partners include local private landowners, for management, grassland and wetland easement acquisition, weed initiatives, and outreach. The complex also partners with government agencies (e.g., USGS) and nongovernment organizations as well (e.g., Bismarck-Mandan Bird Club, Delta Waterfowl Foundation, Manomet Center for Conservation Sciences) for biological monitoring and research activities. The complex also involves local wildlife clubs in supporting educational events (i.e., JAKES Day, Lines for Little Ones) and fosters partnerships with local communities for resource protection (e.g., developing memoranda of understanding with local fire departments). The complex promotes continued grant development with partners, seeking funding to accomplish mutual goals.

Alternative B—Natural Processes Management

Summary
This alternative focuses on a return to more natural wetland and upland habitats and functions (e.g., removal of WCSs throughout the complex. Intensive management strategies (e.g., reseeding disturbed upland sites with native plant seed, chemical control of noxious weed species) might be used to achieve objectives and goals, but end results focus on minimal use of artificial infrastructure and a minimal number of nonnatural areas (e.g., tamegrass fields). Additionally, public use and environmental education and interpretation goals would be achieved through the use of minimal nonnatural structures (e.g., signs, trails, kiosks, wildlife viewing structures) in order to promote a more natural (primitive) experience for the visiting public. Furthermore, changes in the complex's research and monitoring, staffing, operations, infrastructure, and partnership development would be required to accomplish this alternative's objectives and goals.

Water Management
Impounded wetlands in the wetland management district will be breeched in an attempt to restore these areas to their natural condition (i.e., temporary or seasonal marsh, upland), while subsequently restoring watersheds to a more natural hydrology; supplying water that was historically captured in portions of watersheds that flooded naturally prior to impoundment construction.

This alternative would explore the option of removing nonwetland substrate (via dredging) from natural wetlands that the Service determines to be heavily impacted by sedimentation. This activity would be in addition to paralleling the wetland activities outlined in alternative A.

Long Lake Hydrology and Water Quality
This alternative would promote the return of impounded Long Lake NWR pools to a more natural hydrology by reestablishing a more historic capacity to hold, flood, and evacuate water (Long

Lake's capacity is three feet higher than it historically was, due to constructed dikes and WCSs). WCSs and dikes will be decommissioned where practical, to allow Long Lake to revert back to more natural cycles of drought and deluge.

Upland Habitat Management
The actions of alternative B would parallel those in alternative A, but would target approximately 5,000 acres per year, rather than 2,500 acres per year.

Management would focus on an ongoing process to convert disturbed uplands (i.e., cropland, DNC, monotypic cool-season tamegrass stands) to a diverse native-grass and forb-species mix, representative of the historical vegetation composition at a given site. Sites would be tested to determine current soil structure, and appropriate native species would be seeded according to the soil types. Several soil types may exist within a treatment area; therefore, several grass mixtures would likely be needed for an individual site. Native grass seeding would continue throughout the complex, until all Service-owned lands have a substantial native mixed-grass prairie vegetation component. Established native grass stands and the remainder of the disturbed uplands would be periodically managed to rejuvenate grass, reduce litter accumulations, and control undesirable noxious weeds through haying, grazing, burning, and chemical or biological treatments. This management alternative would entail the removal of all nonnative trees and shrubs on all Service-owned lands in the complex. This action would benefit grassland-dependent bird species and return the face of these lands to more of a pre-European settlement look. The Service would continually monitor volunteer woody vegetation and remove it.

Predator Management
This alternative would promote reduced fragmentation of habitats and creation of large blocks of habitat, through restoration, protection, and management. This would be done to address the indirect causes of increased predation on ground-nesting birds. This alternative would target the removal of trees, rock piles, culverts, and other predator microhabitats. It would also minimize "edge" through large-block grass restoration. The Service would remove tree rows, plantings, and shelterbelts and reseed to grass. Furthermore, additional lands would be acquired, protected, and/or managed to increase "'block" size and reduce fragmentation and its associated intensified predation affects. Trapping and removal of individual predators will target restoring a more natural balance, regarding both species composition (i.e., native versus exotic) and population levels (i.e., focus on historical levels).

Wildlife Disease
This alternative would require no Service action for disease outbreaks within the complex, under most circumstances. An active response would be initiated only if an outbreak posed a possible human health threat.

Priority Population Issues
This alternative promotes a re-directed survey effort to identify lands that harbor breeding piping plovers, as well as lands that are suitable for the Dakota skipper butterfly (candidate species). It also entails 1) specific habitat enhancement and nest protection efforts for the piping plover, 2) enhanced protection efforts for fall migrant whooping cranes, and 3) implementation of statewide management guidelines for the Dakota skipper on certain Service lands.

Public Use
No expansion of the complex's current fishing program would occur under this alternative. At Long Lake NWR, bank fishing would still be allowed in specified areas; however, boats would no longer be allowed on any portion of the refuge. Fishing would still be permitted on WPAs and known gamefish populations on WPAs would continue to be exploited, but there would be no efforts to introduce fish to new WPAs or refuges. Boats would be allowed on WPAs in support of fishing, provided access is available from designated trails or established road right-of-ways.

The complex hunting program would be structured, first and foremost, to aid in achieving wildlife population objectives. It may involve refuge-specific permit limits for the firearms deer season on certain tracts (i.e., Long Lake NWR and Slade NWR). In order to decrease nonnative game-species populations (i.e., gray partridge, ring-necked pheasant), hunting regulations for these game species would be liberalized (e.g., open areas, season lengths) in comparison to the present structure, where compatible. Additionally, furbearer hunting would be allowed on refuge lands in order to help reduce nest predator populations (e.g., red fox, raccoon) to acceptable levels. Access would continue to be limited to foot traffic on all

Service lands, with the exception of identified motorized vehicle trails on specific WPAs. The possible closure of existing motorized vehicle trails on WPAs would be explored.

In addition to paralleling the environmental education and interpretation activities outlined in alternative A, this alternative would strive for a more natural (primitive) environmental learning experience for visitors throughout the complex, but especially at Slade NWR. This alternative would focus on minimizing off-road/trail impacts and reducing signage to a minimum level.

Management of the complex's wildlife observation/photography and recreational trapping programs would parallel alternative A.

Threatened and Endangered Species
Same as alternative A.

Research
In addition to paralleling the range and load of biological study that currently exists throughout the complex, biological staff would expand the scope of research for a variety of subjects. New or expanded research would ensue on the following subject areas: 1) improved success in native grass and forb seeding (i.e., establishment of a dominant native component with specific structural characteristics); 2) management technique effectiveness in reducing smooth brome and Kentucky bluegrass dominance at both native and nonnative sites, and; 3) management technique effectiveness in reducing noxious weed (e.g., leafy spurge, Canada thistle, wormwood) prevalence.

New monitoring efforts would ensue related to the long-term monitoring of temporal abiotic changes (e.g., salinity) to Long Lake and corresponding effects on Long Lake's floral and faunal (specifically, aquatic macroinvertebrates) communities. Further, the current monitoring effort for vegetative transect establishment would be expanded to gain a better understanding of vegetative community changes related to various management practices. Additionally, the Service would initiate research relating to how increased visitation (i.e., hunting, bird watching) at Long Lake NWR might affect various wildlife groups (i.e., wildlife tolerance to human disturbance).

Furthermore, under this alternative staff would develop ways to collect and monitor the public's use of the complex, as well as analyze the Service lands' impact on the socioeconomic environment of neighboring municipalities and the State. Staff would either actively engage in, or contract out, the collection and analysis of socioeconomic (e.g., expenditures), geographical (e.g., where are visitors from and how did they get to the complex), and qualitative/quantitative data (e.g., when they come and why) that would allow for expansion or modification of public-use programs to better accommodate compatible public uses.

Cultural Resources
This alternative would mandate that the Service's cultural resource staff oversees the identification, documentation, evaluation, protection, and interpretation of cultural resources on complex lands. Projects involving a potential adverse effect to significant cultural resources would follow procedures as outlined in Section 106 of the National Historic Preservation Act. Refuge areas with a high potential for cultural resources (based on a site-sensitivity model) would be intensively inventoried. Those with moderate potential would be inventoried based on random samples. Identified cultural resources would be documented and evaluated for eligibility to the National Register of Historic Places and those determined eligible would be protected and preserved to the extent possible. When appropriate, historic structures would have structural assessments and plans for adaptive reuse. Educational outreach opportunities, including workshops, presentations, signage, or literature would be provided on a continuing basis.

A substantial program expansion would accompany this alternative, in order to address program needs that target a "natural process" management strategy. In addition to the positions listed in alternative A, five new positions would be needed to accomplish the goals and objectives of this alternative (see table 1)

Habitat Protection and Acquisition
Same as Alternative A.

Monitoring
This alternative would continue current efforts delineated under alternative A, but would also promote further efforts to monitor for improved success of seeded areas to native grasses (both in composition and structure), as well as monitoring control efforts for nonnative grasses (e.g., Kentucky bluegrass, smooth brome, etc.) and other invasive plant species. Further research and monitoring would include water chemistry and quality and its

effects on flora and fauna at Long Lake. A new line of research and monitoring under this alternative would be the effects by and responses of wildlife as a result of public uses and visitation.

Budget and Staffing
The complex would increase operations and maintenance to support management of resource needs. Restoration and rehabilitation of altered habitats and ecosystems would require increased staffing, equipment, and funding. Management actions would include intensive rehabilitation of altered habitat (i.e., removal of nonnative tress, restoration of a native vegetation component, removal of WCSs, dredging of selected wetlands), and increased management to maintain restored habitats. Without increased funding for staffing, equipment, and supplies, the goals and objectives of this alternative could not be achieved.

Although some infrastructure (i.e., dikes, WCSs) would be eliminated under this alternative, there would be a need for office expansion, additional equipment storage areas, and possibly additional government housing.

Partnerships
Existing partnerships would be expanded to address resource information needs related to restoration of altered ecosystems and habitats. Continued work with local, state, and federal agencies would be promoted, as well as expanded and targeted private land partnerships to protect and enhance threatened habitats within the complex. Further, complex staff would promote the development of partnerships with local communities to better inform the public of available programs (i.e., easement, Partners for Wildlife, environmental education) or important complex events.

Alternative C— Single Wildlife Group-level Intensive Management

Summary
Long Lake's water management capability would be further developed by exploring an outlet (which would allow full drawdown) and developing other infrastructure (e.g., diversions, channels, pumping stations, additional dikes) to allow water supplies in different pools to be distributed and evacuated more independently. Conversely, WCSs and associated infrastructure would be removed and decommissioned if the habitat needs of a particular priority wildlife group (e.g., shorebirds) warranted it. This alternative would have the potential to provide additional management options to address habitat requirements and needs of specific groups of water-dependent birds (e.g., cranes). A similar wetland management philosophy (i.e., further development and management of impoundments or removal of WCSs, dependent on the habitat needs of specific groups of wetland birds) would apply to wetlands on Service lands throughout the complex.

Water Management
In addition to paralleling the management practices outlined in alternative B, the Service would examine natural wetland basins throughout the complex to determine which ones have the potential for some water-level control. Placement of new WCSs would be on a wetland-by-wetland basis and only considered if the benefits of water-control capability (e.g., increased wetland productivity, increased availability of preferred wetland plants) to a certain wildlife group (e.g., waterfowl) outweigh possible negative impacts to specific wetlands.

Upland Habitat Management
Management of native upland habitats would be driven by the resource needs of a specific wildlife group (i.e., grassland passerines). Vegetative-species composition and structure would be managed according to the needs of the target wildlife group, allowing for a native or nonnative (i.e., dense nesting cover) composition, depending on specific habitat requirements of the selected wildlife group.

Likewise, management of disturbed upland habitats would be driven by the resource needs of a specific wildlife group (e.g., grassland passerines). Under this alternative, management would be directed to convert unsuitable habitats into habitat types that meet the requirements of the particular wildlife group. Depending on the target wildlife group, disturbed habitats may be converted to any one of a number of cover types (i.e., cropland, tamegrass, DNC, native seeding).

Nonnative trees and shrubs would be managed on a tract-by-tract basis, allowing for management actions that provide benefit for a specific wildlife group. This alternative would allow for the planting of nonnative trees and shrubs for the benefit of a certain wildlife group (e.g., deer, warblers, exotic gallinaceous birds, raptors). Conversely, it would allow for the removal of existing nonnative trees and shrubs for the benefit of another wildlife group

(e.g., grassland-dependent passerines, upland-nesting shorebirds and waterfowl).

Predator Management
Predator management practices would target predators that hunt ground or over-water nesting birds. This alternative would promote "large block" (i.e., township-level), nesting-season trapping to remove mammalian predators from high-density waterfowl nesting areas. These areas presently host more than eighty breeding duck pairs per square mile. Predator management on these intensively managed sites would target improving populations of specific species within a specific bird group (e.g., waterfowl). It would also target the removal of raptor perches (e.g., shelterbelts, sentinel trees), to the extent practical, in, and adjacent to, nesting areas.

Wildlife Disease
Disease response activities would parallel those outlined in alternative A. Additionally, research would be initiated that would evaluate the efficacy of current Service-directed botulism cleanup activities, and ultimately determine under which situations, if any, carcass removal activities are warranted. Adaptive resource management would be employed to determine the long-term course of action regarding botulism outbreaks.

Priority Population Issues
Same as alternative B.

Public Use
Fishing program management would promote the following: 1) improved access for fishing, where compatible in the complex; 2) improved fisheries (e.g., stocking fish) in large wetlands where fish populations are sustainable and where compatible with other objectives, and; 3) improved facilities to support fishing programs. Boats would be allowed and access developed where fishing programs are compatible with other objectives.

The complex's hunting program would be structured so that it maximizes public-use opportunities, where compatible. Portions of all refuges would be open to hunting for deer, upland game, furbearers, and waterfowl. The possibility for increased and improved access for hunters of all abilities would be explored on both refuges and WPAs. Additionally, opportunities for special hunts (i.e., youth, physically challenged) would be explored, along with the possible construction of permanent and/or semi-permanent accessible public hunting structures (e.g., blinds, stands) on refuges and WPAs.

The current level and quality of environmental education and interpretation opportunities and facilities would be expanded to meet the needs of a wide array of target audiences of all abilities. Special emphasis would be placed on Long Lake NWR and Slade NWR, due to their geographic location and physical characteristics, respectively. A plan to rehabilitate Long Lake NWR's historic stone buildings into a year-round environmental education and interpretive center would be implemented. At Long Lake NWR, the Service would construct an observation tower, along with an accessible observation deck overlooking unit II Marsh and unit II. The tower and deck would include interpretive panels containing information about area wildlife. This area is a waterbird concentration area and would give the public an excellent opportunity to view the various species that utilize the wetland habitats at Long Lake NWR (e.g., ducks, geese, cranes, shorebirds, colonial-nesting waterbirds). To enhance and merge these two projects, complex staff would construct a trail from the stone buildings to the observation tower.

The Service would create a pamphlet to aid in the interpretation of the sights and sounds along the trail. It would also create an auto tour route using existing roads around Long Lake NWR, with its own pamphlet to help interpret popular wildlife viewing locations.

Facilities at Slade NWR would be upgraded to meet accessibility standards. Upgrades would include accessible trails and tables. Signage at the refuge would be reduced, by installing a centralized kiosk, which would include rules and regulations, wildlife information, and an interpretive panel about the history of the refuge. The expansion of the complex's environmental education and interpretation opportunities would also include Small WPA. The existing nature trail at this WPA would be made accessible, and include wildlife interpretation information either in the form of a pamphlet, or a panel. This WPA has the potential for increasing public use, as it is located only 6 miles from Bismarck.

With respect to wildlife observation and photography, the actions highlighted in alternative A would be paralleled. Additionally, wildlife viewing and photography opportunities would be

improved through the development of the aforementioned observation platform and auto tour at Long Lake NWR. The complex staff would also expand the number of permanent and nonpermanent public viewing blinds available throughout the complex. Pamphlets would also be created to include a comprehensive wildlife species list (i.e., birds, mammals, reptiles, amphibians) for the entire complex.

Recreational trapping would be promoted on all refuges within the complex. Recreational trapping would continue to be administered through the issuance of special use permits, because it is an economic activity. No changes would occur to trapping on WPAs.

Habitat Protection and Acquisition
Same as Alternative A

Threatened and Endangered Species
Same as alternative A

Monitoring
Same as Alternative B with the exception of the research and monitoring of wildlife responses to public uses and visitation.

Budget and Staffing
The intensive management strategies outlined in this alternative would require additional staffing. In addition to the new positions listed in alternative B, several other positions would be needed to accomplish the goals and objectives of this alternative (see table 1)

Operations and maintenance support would need to increase in order to accomplish the actions of this alternative. This would include an increase in staff, equipment, and funding.

This alternative would likely require additional infrastructure in the form of new and improved water management facilities. Additionally, the alternative would require additional staff to achieve the alternative's goal and objectives and consequently, there would be a need for office expansion and new government housing to accommodate this. The alternative would promote expanded public use programs and increased environmental education and interpretive programs, which would require the development of indoor learning facilities. Targeting more intensive upland habitat management practices would also require increased infrastructure, in the form of equipment storage space.

Partnerships
Partnership development and management would parallel the direction outlined in alternative B. Additionally, it would encourage the development of partnerships with community members who have an appreciation and interest in the welfare of area refuges by developing Friends Groups.

Additional issues
Research and monitoring activities would parallel those outlined in alternative B, with the exception of research related to wildlife tolerance to human disturbance: no research would be directed towards that topic. Socioeconomic activities would also parallel those in alternative B; however, under this alternative the staff would engage in the collection and analysis of information regarding expectations and needs of the visiting public. Additionally, the complex's management of cultural resources would parallel those in alternative B.

Alternative D— Target Species Group-level Modified Management (Proposed Action)

Summary
This alternative allows for intensive wetland and upland management, where warranted throughout the complex. Management objectives for various habitat types would be based on habitat preferences of groups of target (indicator) species, which consist of members of various wildlife taxonomic groups (e.g., shorebirds, raptors, waterfowl, wading birds, native gallinaceous birds). Therefore, management objectives for a particular habitat type (e.g., native prairie) would be based on a compromised universal benefit concerning particular life needs of multiple wildlife groups on an individual tract of land. Additionally, public use and environmental education and interpretation opportunities would be maximized to the extent compatible with other objectives. Changes in the complex's research and monitoring, staffing, operations, and infrastructure would likely be required to achieve this alternative's goals and objectives. Partnership opportunities would be maximized and would vary widely.

Water Management
This alternative would promote a combination of removing and/or decommissioning existing water management facilities to restore natural flooding and evacuation where deemed appropriate, as well

as further development of water management capabilities by considering an outlet for Long Lake (which would allow full drawdown/natural evacuation), and developing other infrastructure (e.g., diversions, channels, pumping stations, additional dikes) to allow water supplies in different pools to be distributed and evacuated more independently. The benefits of these actions include the ability to: 1) provide a full range of options to address habitat requirements of multiple groups of wetland-dependent birds (i.e., waterfowl, shorebirds, wading birds), 2) address a principal resource concern (i.e, botulism), and; 3) address system sustainability concerns.

Upland Habitat Management
Management of native uplands would be driven by the habitat needs of a group of target species from multiple-bird groups (e.g., passerines, shorebirds, raptors, waterfowl). The focus of complex staff would be to maintain and enhance native prairie through intensive management, in order to provide quality habitat.

Old croplands would be managed for a select group of target species that span several wildlife groups. Management would focus on an ongoing process to convert unsuitable nesting habitat (i.e., cropland, degraded DNC, monotypic cool-season tamegrass stands) to a diverse plant mixture. Species included in the plant mix would be based on historic vegetation composition, soil structure, and requirements of the target species and may be native (e.g., big bluestem) or nonnative (e.g., intermediate wheatgrass). Established native grass stands and the remainder of the disturbed uplands would be periodically managed to rejuvenate grass, reduce litter accumulations, and control undesirable noxious weeds through haying, grazing, burning, and chemical or biological treatments.

Planted and exotic woody vegetation would be managed in a way that provides the greatest overall benefit to a select group of target wildlife species. This alternative would allow for the planting of trees and shrubs if it is decided that it is the most appropriate management direction for the benefit of the selected target species. Conversely, it would allow for the removal of existing planted and exotic trees and shrubs for the benefit of another group of target species. Once the most appropriate management direction is determined, active management will ensue, limited only by personnel and budgetary restrictions.

Predator Management
Intensive predator management would involve targeting the causes of predation of ground and overwater-nesting birds, which include habitat fragmentation and its associated indirect predation affects. This alternative would promote large-block (i.e., township-level) nesting-season trapping to remove mammalian predators from priority nesting areas. Waterfowl breeding pair density data are available and would aid the Service in selection of priority trapping areas. Raptor perches, tree plantings, rock piles, culverts, and other special sites for predators, would also be targeted for removal, to the extent practical, from and adjacent to, nesting areas. Predation issues that concern specific trust resource situations (e.g., waterbird colonies) would also be addressed. A reduction in habitat fragmentation would also be targeted in this alternative. Large blocks of perennial grassland habitat would be targeted, through restoration, protection, and management. Areas where shelterbelts and other tree plantings are removed would be seeded to perennial grass cover. Additional lands would be acquired, protected, and/or managed to increase block size and further reduce fragmentation and its associated intensified predation affects.

Wildlife Disease
Management of disease outbreaks would parallel alternative C.

Priority Population Issues
Same as alternative B.

Public Use
This alternative promotes completing a fishery resource status survey on select Service-owned lands in the complex and increasing public fishing opportunities where sustainable fisheries are documented and compatible. Access and facilities to support public fishing in these areas would be developed. This alternative would allow boat use in support of fishing with some restrictions (e.g., lift-in, life-out; motor size and horsepower).

The complex's hunting program will be driven by its compatibility with wildlife population objectives. The Service will explore opportunities for increased hunting on all three fee-title refuges within the complex. Examples include possible upland gamebird hunting on Slade NWR and Florence Lake NWR, deer hunting on Florence Lake NWR, and predator (e.g., red fox, coyote) and waterfowl hunting on some or all refuges. Decisions and

details related to the above hunting elements, as well as other possible hunting season framework changes, will be evaluated against various wildlife and human disturbance thresholds. Additionally, the Service plans to increase regulatory hunting signage (e.g., additional c*losed to hunting area* signs, *nontoxic shot required* signs) and interpretive materials (e.g., an updated and more comprehensive complex hunting leaflet, hunting tear sheets) in an effort to reduce unintentional hunting violations throughout complex. The only hunting-related changes on WPAs will be improved regulatory signage and interpretive materials.

This alternative would expand the current level and quality of environmental education and interpretation opportunities and facilities to meet the needs of a wide array of target audiences of all abilities. Special emphasis would be placed on Slade NWR and Long Lake NWR, due to their physical characteristics and geographic location, respectively. A plan to rehabilitate the historic stone buildings into a year-round environmental education and interpretive center could be implemented. The Service also plans to construct an observation tower, along with an accessible observation deck overlooking unit II marsh and unit II. The tower and deck would include interpretive panels containing information about the area wildlife. This area is a waterbird concentration area and would give the public an excellent opportunity to view the various species that utilize the marsh and wetland habitats at Long Lake NWR (e.g., ducks, geese, cranes, shorebirds, colonial-nesting waterbirds). To enhance and merge these two projects, complex staff will develop a trail from the stone buildings to the observation tower. Also, a pamphlet will be developed to interpret the sights and sounds along the trail. The Service would also develop an auto tour route using existing roads around Long Lake NWR, along with a pamphlet to interpret popular wildlife viewing locations (see figure 10, public use, alternative D).

Facilities at Slade NWR, as well as other complex lands with public use facilities, would be reviewed, and if necessary, upgraded to meet accessibility standards. At Slade NWR, upgrades would include accessible trails and tables. Signage at the refuge would be reduced by installing a centralized kiosk, which would include rules and regulations, wildlife information, and an interpretive panel about the refuge's history.

The expansion of environmental education and interpretation opportunities would also include Small WPA. The existing nature trail would be made accessible and include wildlife interpretation information either in the form of a pamphlet or a panel. This waterfowl production area has the potential to see an increasing amount of public use because it is located only 6 miles from the city of Bismarck.

Wildlife observation and photography uses would be similar to alternative A, but staff would expand the number of public viewing blinds available on Long Lake NWR. The complex staff would also produce a pamphlet to include a comprehensive wildlife species list (i.e., birds, mammals, reptiles, amphibians, fish) for either Long Lake NWR or the entire complex.

This alternative would promote recreational trapping on refuges administered by the complex, when and where compatible. Recreational trapping would continue to be administered through the issuance of SUPs, because it is an economic activity. On WPAs, recreational trapping is an activity that was approved by legislation.

Habitat Protection and Acquisition
Same as alternative A.

Threatened and Endangered Species
Same as alternative A.

Monitoring
The complex's research, monitoring, and cultural resources activities would both parallel alternative B with the exception of the research and monitoring of wildlife responses to public uses and visitation.

Budget and Staffing
This program expansion would necessitate an increase in complex operations to address program needs that target a "modified management" strategy. In addition to the new staff positions listed in alternative B, one GS-9 outdoor recreation planner would be needed to achieve the goals and objectives of this alternative.

Operations and maintenance would be increased in order to support management of priority resources. An increase in staff, equipment, and funding would be needed to support management. Without increased funding for staffing, equipment, and

supplies, the goals and objectives of this alternative could not be achieved.

Partnerships
Under this alternative, existing partnerships would be expanded to address resource information needs for a broad group of wildlife species (e.g., ducks, shorebirds, passerines). This alternative would encourage continued work with local, state, and federal agencies to explore new avenues to implement the goals of this alternative. Private land partnerships would be targeted and expanded in order to protect and enhance threatened habitats within the complex. This alternative would also promote developing and fostering partnerships with local communities to inform the public of complex programs and special events.

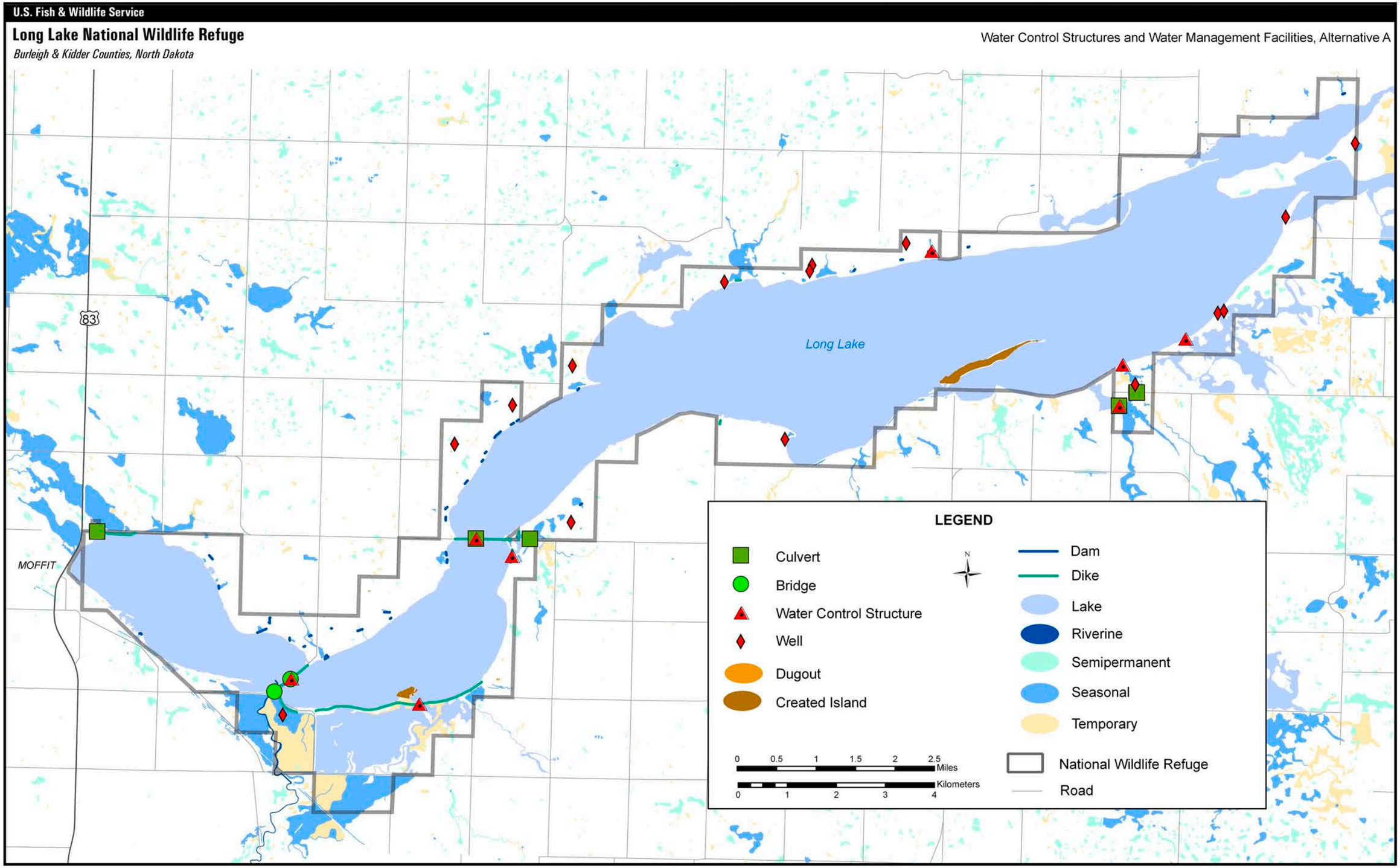


Figure 8: Water Control Structures and Water Management Facilities, Alternative A

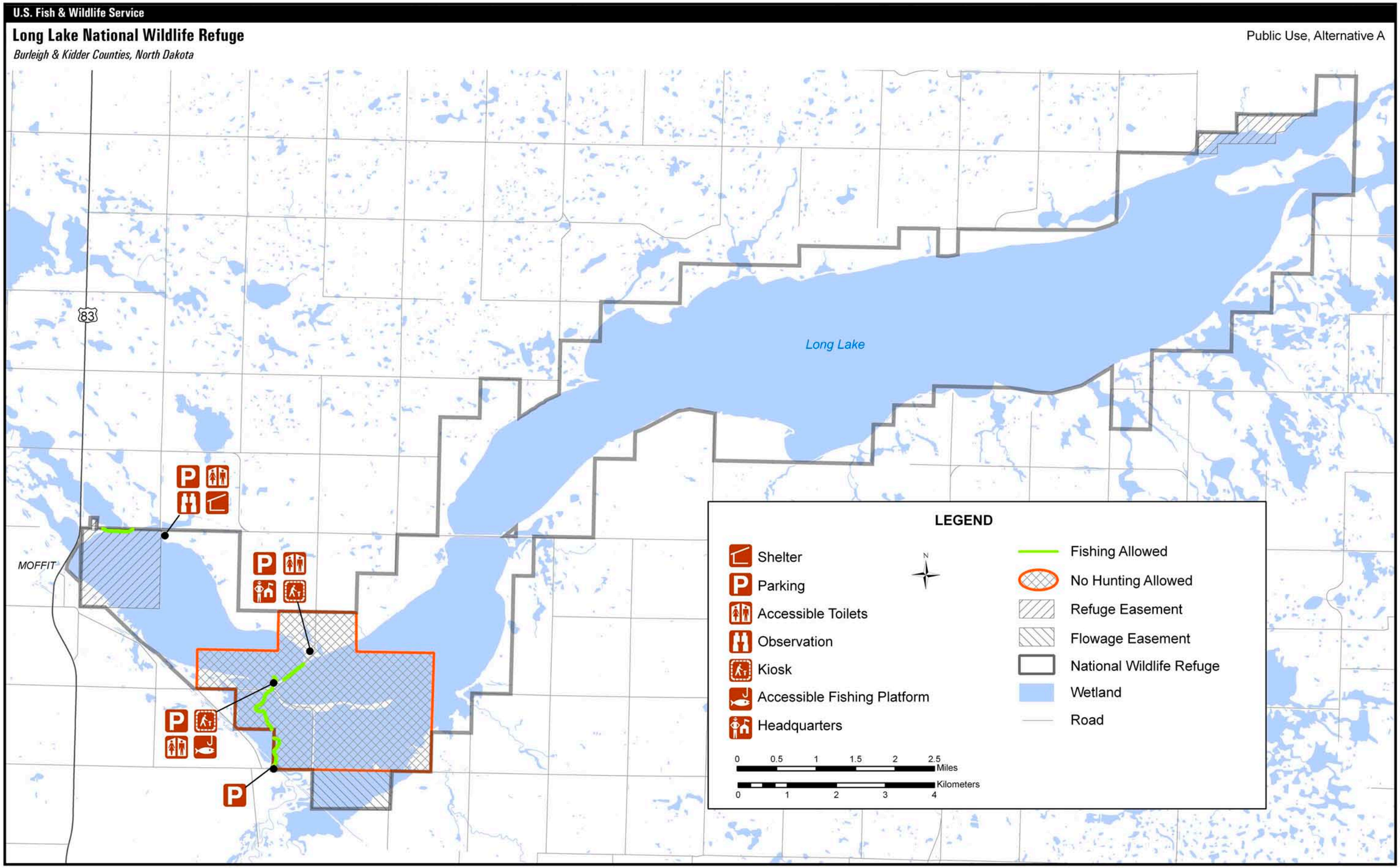


Figure 9: Public use, alternative A

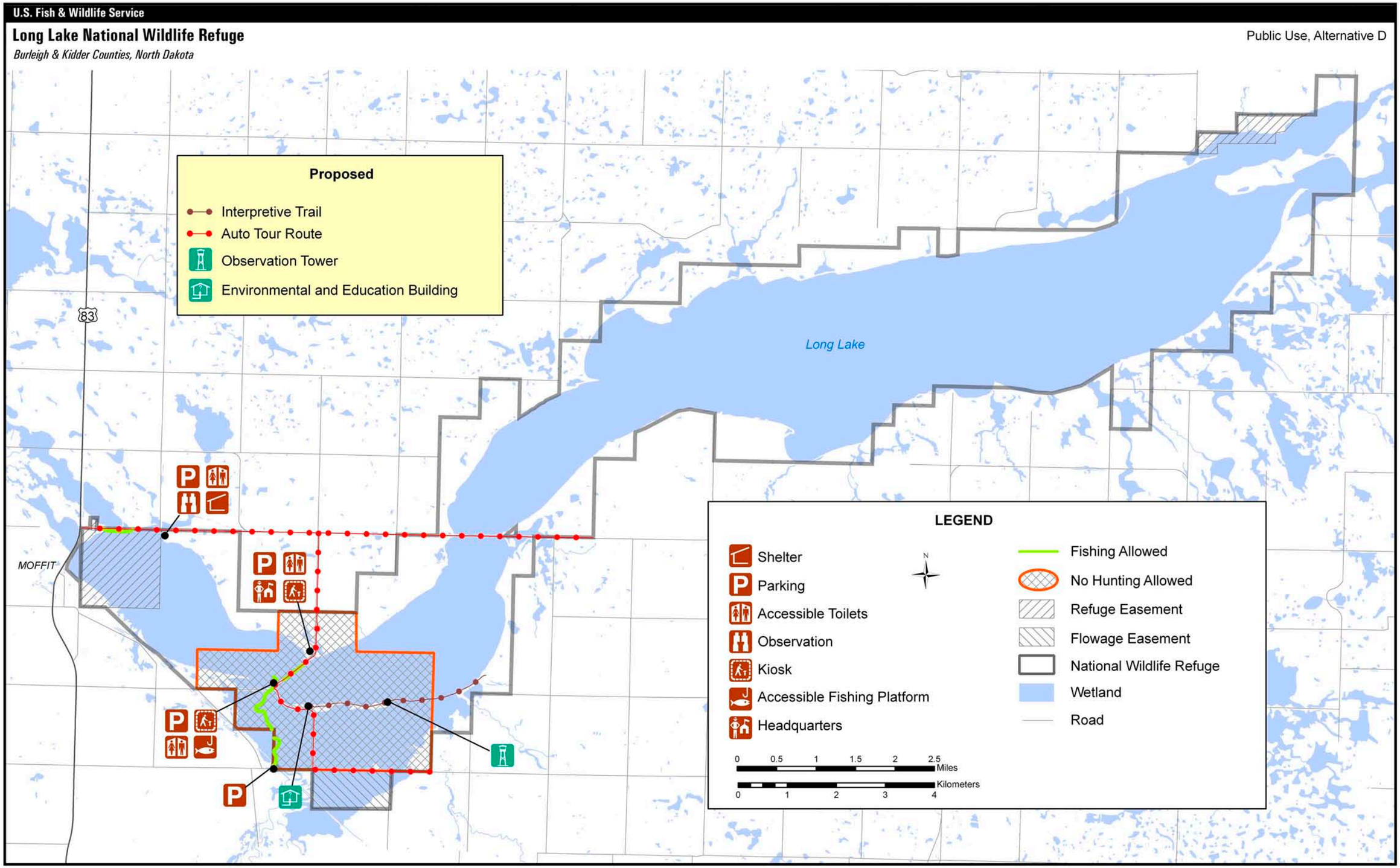


Figure 10: Public use, alternative D

Table 1. Comparison of alternatives

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Habitat and Wildlife				
Developed Wetlands (with WCS - water control structures)	Continue managing water levels through WCSs to prevent or lessen the severity of botulism outbreaks at Long Lake NWR and to produce foods and habitats for migrating waterfowl elsewhere in the complex.	Remove all WCSs from the complex to allow the lakes and wetlands to revert to their natural hydrological regimes to avoid future degradation and restore their natural structure, function, and longevity.	Explore opportunities to increase management of water levels through enhancing existing and/or constructing new WCSs to target habitats for resource-specific needs, including botulism outbreak management.	Explore opportunities to manage water, by developing new WCSs and/or removing existing ones to manage habitats for target wildlife species.
Undeveloped Wetlands (without WCS)	Continue nonmanagement of undeveloped wetlands.	Restore "natural" wetland conditions by removing nonwetland substrate and dredging out siltation and fill.	Enhance specific drainages and/or natural wetland basins to target the habitat needs of specific species or narrow group of birds within a classification (i.e., waterfowl, shorebirds, or marsh birds); Could involve dredging out basins to restore wetland habitat.	Enhance specific drainages and/or natural wetland basins to target the habitat requirements of a guild of species representing a broad spectrum native to the area (i.e. northern pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, and ferruginous hawk); Could involve dredging out basins to restore wetland habitat.
Nonnative Trees and Shrubs	Continue to manage on an "as needed" basis. Management includes removal of volunteer trees and shrubs from grasslands; Continue to remove sentinel tress that serve as raptor perches from grassland nesting habitat.	Remove all nonnative trees and shrubs on all lands in the complex.	Manage nonnative trees and shrubs on a tract-by-tract basis allowing actions that provide benefit for a specific wildlife species or narrow group of birds within a classification (i.e., waterfowl, shorebirds, upland birds, game mammals, etc.) This would allow maintaining, augmenting, and/or removing existing trees and shrubs.	Manage nonnative trees and shrubs in a manner which provides the greatest overall benefit to the guild or select group of indicator species (i.e. northern pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, ferruginous hawk).

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Native Upland Habitats (including woody species)	Current management includes grazing, prescribed burning, spraying, clipping, reseeding natives, and biological agents to manage native (unbroken) grasslands and tamegrass fields, and restoring and managing native grass seedings in optimum condition for nesting waterfowl and other migratory birds. Balance of native uplands and tame uplands.	Encourage natural processes of native grasslands and target invigorating native plants (composition and diversity); Management of all nonnative uplands would target native plant reestablishment and/or restoration. Maintain native and restored habitats in as "natural" or native condition as possible.	Identify specific habitat requirements of a specific species or narrow group of birds within a specific classification (i.e. waterfowl, or shorebirds, or marshbirds) and target blocks of land to restore and manage for the specific habitat necessary to address those requirements.	Identify the broad habitat requirements of a guild of species representing a broad spectrum native to the area (e.g. northern pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, ferruginous hawk) and target restoration and management of all lands to provide habitat necessary to address the requirements representing indicator species across the guild.
Disturbed Upland Habitats	Target converting disturbed uplands to native grass (six to eight species of grasses native to the area with varieties suited to the latitude). Target approximately 250–300 acres per year for restoration. Eventual restoration of forbs into these fields is planned.	Convert disturbed uplands to a diverse native-grass forb mixture representative of the historical vegetation composition on a given site.	Focus on the habitat requirements of a specific species or narrow group of birds within a specific classification. Uplands could potentially remain cropland, tamegrass, or be restored to native grass.	Focus on the habitat requirements of a guild of species representing a broad spectrum native to the area. Ongoing efforts to restore native grasses and forbs with a diversity of height, density, and structure.

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Predator Management	Maintain current level of predator management—removing solitary trees from nesting areas and issuing trapping permits for predators.	Reduce fragmentation of habitats to restore natural predator/prey relationships; Remove unnatural sites such as trees, rock piles, culverts, etc. Allow trapping and removal of individual predators to targets a more natural balance regarding species composition and population levels.	Intensify management practices to reduce direct causes of predation upon the nesting success of a specific group of ground-nesting birds (i.e. township-level block removal of mammalian predators from high-density waterfowl nesting areas—red/yellow thunderstorm areas; Remove shelterbelts/tree plantings from nesting areas, manage rookeries/islands, etc.	Intensify management practices to reduce direct causes of predation upon the nesting success of multiple of ground-nesting birds (i.e. township-level block removal of mammalian predators from high-density waterfowl nesting areas — red/yellow thunderstorm areas; Remove shelterbelts/tree plantings from nesting areas, manage rookeries/islands, etc.
Wildlife Disease	Continue direct approach to address outbreaks; Remove all carcasses from an affected wetland as soon as the outbreak is discovered; Closely monitor.	Employ active response employed only if an outbreak on Service land posed human health threat.	Same as A; In addition, evaluate effectiveness of management; Employ adaptive management.	Same as A. In addition, evaluate effectiveness of management Employ adaptive management.

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Public Use, Education and Interpretation				
Hunting	Continue to allow hunting of deer and late-season upland game birds. 15% of Long Lake NWR remains closed to all hunting, with the exception of archery deer. Florence Lake NWR is closed to all hunting. Slade NWR and all WPAs are open to deer hunting (all State seasons). WPAs are open to all other types of hunting consistent with state regulations. Access is limited to foot traffic on all lands except on a few WPAs where motorized vehicle trails are identified	Structured to achieve wildlife population objectives; May require refuge-specific permits for firearms deer hunting on certain tracts (Long Lake NWR and Slade NWR). Liberalize hunting regulations (open seasons and season lengths) to reduce nonnative game species where compatible. Allow Furbearer hunting to reduce nest predator populations to acceptable levels. Access same as A, with the possibility that some access trails would be closed.	Maximize public uses where compatible. Open portions of all refuges to hunting of deer, upland game, furbearers, and waterfowl. Explore potential for improved access and additional opportunities for youth, the physically challenged, etc., along with potential for improving facilities to augment such programs.	Explore opportunities for increased hunting (as long as they are compatibility with wildlife population objectives). Examine hunting issues of various types and address through regulatory changes, if warranted.
Fishing	Maintain fishing program at existing levels. At Long Lake NWR bank fishing is allowed from two areas creek—along the north side of B dike, and the south side of A Dike. Boats would continue to be allowed on long Lake Creek. Allowed on WPAs (gamefish known on two WPAs), no efforts to introduce fish to others. Boats allowed in support of fishing, access limited to lift in/lift out or public R-O-Ws or designated access route.	Same as alternative A except boats would not be allowed on refuge waters.	Promote improved access, where compatible, on Long Lake NWR; Improve fisheries in large wetlands on WPAs and refuges, where compatible with other objectives, and improve facilities to support fishing programs. Allow boats and develop access where fishing programs deemed compatible.	Complete a fishery resource status survey throughout all fee lands in the complex; Increase fishing opportunities where sustainable fisheries are documented and compatible. Develop access and facilities to support fishing. Allow boat use to support fishing.

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Environmental Education and Interpretation	Sustain environmental education and interpretation programs at existing levels. This includes hosting annual events (Lines for Little Ones, Jakes Day, etc.) as well as being opportunistic in on- and off-site educational programs. Maintain displays and exhibits at the refuge office, along with brochures, signs and public-use facilities in various areas.	In addition to paralleling aspects of alternative A (detailed in previous cell), strive for a more natural (primitive) environmental education and interpretation experience, minimizing off-road and trail impacts and reducing signage to a minimum level.	Expand current level and quality of opportunities and facilities to reach a wide array of target audiences. Focus on Slade NWR and Long Lake NWR. Convert the historical office/shop into an environmental education facility. Increase overlooks, observation tower, trails, interpretive panels and displays, and pamphlets used to facilitate programs. Expand WPA programs and facilities.	Expand current level and quality of opportunities and facilities to reach a wide array of target audiences. Focus on Slade NWR and Long Lake NWR. Convert the historical office/shop into an environmental education facility. Increase overlooks, observation tower, trails, interpretive panels and displays, and pamphlets used to facilitate programs. Expand WPA programs and facilities.
Wildlife Observation and Photography	Promote at current levels. Maintain Long Lake NWR's sharp-tailed grouse blinds. Continue to update bird lists. Continue to offer opportunities to use portable blinds through issuance of SUPs.	Same as alternative A.	Continue actions of alternative A and expand the number of permanent and temporary blinds. Prepare and distribute a comprehensive wildlife species list pamphlet (i.e. birds, mammals, reptiles, amphibians); Construct an observation deck overlooking unit 2. Develop an auto tour route and interpretive pamphlet using existing roads around Long Lake.	Same as alternative C.

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Trapping	Maintain program at existing level. Continue to issue SUPs on all refuges. Target experienced trappers to assist in management of nest predator populations and populations of mammals that cause damage to infrastructure. Regard trapping on the refuges as a management program, not a recreational one. On WPAs, trapping is a recreational program authorized by legislation.	Same as alternative A	Promote trapping as a recreational opportunity on the refuges, where and when compatible; Continue to regulate through SUPs because trapping is an economic activity. There would be no change in the status of trapping on WPAs.	Same as alternatives A and B

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Research, Inventory and Monitoring				
Wildlife and Habitats	Maintain the current levels of monitoring. Current research includes: 1) annual surveys of various bird groups, including breeding and migrant shorebirds and waterfowl, grassland passerines, sharp-tailed grouse, pheasants on certain complex lands; 2) monitoring of waterfowl and colonial waterbird nesting efforts; 3) small mammal inventory; vegetation monitoring with baseline mapping and belt transect monitoring of management effects, and; 4) various cooperative research efforts (e.g., CWD monitoring, botulism monitoring, dove banding).	Parallels alternative A and promotes new efforts including: 1) monitoring for improved success of native grass seedings (composition/structure suited to wildlife goals); 2) management effectiveness targeting Kentucky bluegrass and smooth brome; 3) management effectiveness in controlling invasive noxious weeds; 4) water quality parameters of Long Lake and affects on vegetation/ invertebrates/ trust wildlife; 5) increased vegetation monitoring in response to management; 6) affects of increased visitation on various wildlife groups(wildlife response to human disturbance).	Parallels alternative A and promotes new efforts including: 1) monitoring for improved success of native grass seedings (composition/structure suited to wildlife goals); 2) management effectiveness targeting Kentucky bluegrass and smooth brome; 3) management effectiveness in controlling invasive noxious weeds; 4) water quality parameters of Long Lake and affects on vegetation/ invertebrates/ trust wildlife; 5) increased vegetation monitoring in response to management.	Parallels alternative A is same as alternative B.
Socioeconomics	Current lack of knowledge about the experiences that the visiting public has at the complex would continue, as there would be no systematic and meaningful way to obtain and use information.	Search for ways to obtain information on the visiting public's experiences (both qualitative and quantitative) in the complex.	Same as alternative B plus develop means to collect and analyze information on visitors' expectations and needs.	Same as alternative C

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Cultural Resources				
Documentation and Protection	Require staff to document and protect existing resources and resources (as they are found or discovered) from vandalism, theft, and destruction. Continue to maintain and preserve sites with historical significance.	Promote staff to identify document, and evaluate cultural resources that exist within fee lands throughout the complex. Intensively inventory all areas with high potential for archaeological sites (based on site sensitivity model)—inventory moderate potential areas based on random sampling. Document and evaluate all known sites for eligibility for the National Register. Test excavate a selection of fee title lands with existing archaeological sites to obtain subsurface information that would be used to evaluate the depositional context for the sites.	Same as alternate B	Same as alternates B and C

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Refuge Operations				
Staffing	Maintain staffing at existing levels (currently 8.8 full-time employees) as follows: refuge manager (GS-13) deputy/wetland manager (GS-12) refuge operation specialist (GS-12) refuge biologist (GS-11) ORP (GS-9) administrative officer (.8 FTE GS-7) range technician (fire GS-6) maintenance worker (NWR WG-8) maintenance worker (WMDWG-8)	Expand program substantially to target a "natural process" management strategy. In addition to the staffing listed in alternative A, the following would be positions needed: refuge operations specialist (Slade GS-9) biological tech (GS-7) fire management officer (GS-11) wildlife biologist (WMD GS-11) maintenance worker (WG-6)	Expand program substantially to target an "intensive management" strategy. In addition to the staffing described in alternatives A and B, the following positions would be needed: administrative clerk (GS-4) park ranger (GS-9) administrative officer (GS-6) biological technician (GS-7) biological technician (GS-7) ORP (GS-9)	Expand program substantially to target a "modified management" strategy. In addition to the staffing described in alternatives A and B, the following position would be needed: ORP (GS-9)
Operations and Maintenance	Continues current levels, including the maintenance of equipment, vehicles, and real property in good working condition to achieve management goals. Staff would continue to operate with current funding and resources.	Requires increased operations and maintenance support for restoration and rehabilitation of altered habitats and ecosystems. Requires increased staff, equipment, and funding.	Requires increased operations and maintenance support for: intensive management of habitats; increased public use; increased outreach; additional WCSs; increased management to maintain restored habitats; increased predator management, increased compatible wildlife-dependent recreational uses.	Requires increased operations and maintenance support for: intensive management of habitats, increased public use, increased outreach, increased habitat restoration, additional WCSs and/or removal of WCSs, increased management to maintain restored habitats, increased predator management, increased compatible wildlife-dependent recreational uses.

Infrastructure		Maintain infrastructure at current levels. Long Lake NWR has the following: office, shop, fire cache building, pole shed, boat storage building, two permanent residences, temporary quarters, historical office/shop, water management facilities: dikes & WCS, units 1, 2, 3 unit 2 marsh G-12 G-19 G-19A Slade NWR, WCS, two primary dikes Various dikes WCS on WPAs Primary facilities WCS and channel at Basaraba WPA WCS and dike - Rath WPA WCS and dike Schiermeister WPA.	Breech or render the water control facilities nonfunctional to restore the natural hydrology to impounded areas. Remove nonnative woody vegetation, intensify reestablishment of natives on disturbed uplands, and increase the management of existing native uplands. Requires additional infrastructure e.g., expanded office space, additional vehicle/equipment storage facilities) to accomplish objectives.	Develop water control facilities to manage more intensively new and/or existing impoundments to meet more effectively the habitat requirements of a species or narrow group of birds within a classification. Requires additional staff, expanded office, and cold storage. The expanded public use, environmental education, and interpretation programs which would require additional infrastructure.	Develop and/or remove water control facilities to manage more effectively new and/or existing impoundments targeting a guild of species representative to the area. Requires additional staff, expanded office, and cold storage. The expanded public use, environmental education, and interpretation programs which would require additional infrastructure. Targeting more intensive management practices would require additional infrastructure to support goals and objectives.

	Alternative A (no action)	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group-level Intensive Management)	Alternative D (Target Species Group-level Modified Management proposed action)
Partnerships				
Partnership Development and Maintenance	Maintain current partnerships to address resource information needs, protect and enhance habitat (both public and private), and promote public use, environmental education, and outreach. Continue to promote partnerships with local landowners through management, grassland and wetland easement acquisition, weed initiatives, and outreach. Continue to promote partnerships with government agencies and NGOs. Maintain partnerships with local wildlife clubs supporting educational events (e.g., JAKES Day and Lines for Little Ones) and foster partnerships with local communities for resource protection (MOUs w/ rural fire districts). Promote continued grant development with partners seeking funding to accomplish mutual goals.	Expand partnerships to address resource information needs related to restoration of altered habitats and ecosystems. Continue work with government agencies at all levels to explore new avenues to accomplish the goals of the "natural processes" alternative. Develop targeted private-land partnerships to protect and enhance threatened habitats. Develop partnerships with local communities to inform the public of available programs (i.e. easement, private lands, environmental education) and important refuge events.	Expand partnerships to address resource information needs for certain species or narrow group (i.e. waterfowl, shorebirds, marshbirds, etc.) requirements. Continue work with government agencies at all levels to explore new avenues to accomplish the goals of the "intensive management" alternative. Develop targeted private land partnerships to protect and enhance habitats targeting a species or narrow group within the complex. Develop partnerships with local communities in order to inform the public of available programs (i.e. easement, private lands, environmental education) and important refuge events.	Expand partnerships to address resource information needs for a guild or broad group of species representative to the area (i.e. northern pintail, sharp-tailed sparrow, marbled godwit, sharp-tailed grouse, ferruginous hawk, etc.) requirements. Continue work with government agencies at all levels to explore new avenues to accomplish the goals of the "modified management" alternative. Develop targeted private land partnerships to protect and enhance habitats targeting a guild or broad group of species representative to lands within the complex. Develop partnerships with local communities in order to inform the public of available programs (i.e. easement, private lands, environmental education) and important refuge events.

Chapter 4. Affected Environment

The complex includes three refuges and 79 waterfowl production areas scattered throughout Burleigh, Emmons, and Kidder counties, located in the south-central part of the State. Long Lake NWR serves as the complex's headquarters and largest parcel of land. The refuge is situated in the partially buried valley of the ancestral Cannonball River and is part of the Missouri Coteau physiographic region and the Collapsed Glacial Outwash ecoregion.

This ecoregion's topographic variation is the result of gravel and sand deposited by glacial melt-water and precipitation runoff over stagnant ice, and it is characterized by many large, alkaline lakes. The refuge consists of gently rolling native uplands, tamegrass fields, scattered tree plantings, and numerous temporary, seasonal, and semi-permanent natural wetlands, in addition to a 16,000-acre impoundment. Refuge wildlife consists of a wide variety of wetland- and grassland-dependent species, as well as a lesser number of arboreal species. This chapter describes the complex's environmental resources that may be affected by the implementation of the CCP.

The complex's other fee-title lands are located in the Coteau Slope physiographic region (25 WPAs) and the Missouri Coteau physiographic region (two refuges, 54 WPAs). In addition to the Collapsed Glacial Outwash ecoregion (two refuges, 43 WPAs), fee-title lands are also located in the Missouri Coteau Slope (nine WPAs), Missouri Coteau (26 WPAs), and River Breaks (one WPA) ecoregions. The northeastern one-third of the complex is comprised of the Missouri Coteau ecoregion, which has a higher density of wetlands, fewer streams, and more varied topography than the Missouri Coteau Slope ecoregion that lies to the south and west. The River Breaks ecoregion makes up only the western-most portion of the complex and consists of broken terraces and uplands that descend to the Missouri River and its major tributaries. Although the frequency of occurrence and density of certain wildlife species does vary somewhat between the complex's two physiographic regions and four ecoregions, the same principal wildlife species occur across all Service lands throughout the complex.

The area included in the complex exhibits a negative precipitation:evaporation ratio and therefore, is considered semi-arid (Rau et al. 1962, Kume and Hansen 1965) and is characterized by relatively short, hot summers and relatively long, cold winters (Kantrud et al. 1989). Temperature fluctuates both seasonally and daily. Summer temperatures occasionally climb above 100 °F, while winter temperatures may drop to -30°F, with wind chills as low as -100°F. The annual average number of days with maximum and minimum temperatures of ≥90°F and ≤32°F, respectively, is 25 and 73. The growing season, defined as the long-term average number of consecutive days that the minimum temperature does not fall below 32°F, ranges from 99–47, which correlates well with an average frost-free period of 120 days reported for the central portion of the State (Winter et al. 1984). Average annual total precipitation is 16 inches, of which 73 percent occurs from May to September. During the summer, most rainfall is associated with thunderstorms (average of 25–30 days/year; Shjeflo 1968). In contrast, average monthly precipitation during winter is only 0.95 inches and occurs mostly as snow.

Geology and Soils

Surface bedrock composition in Burleigh and Kidder counties is somewhat similar, with the former having a slightly more diverse composition than the later. Surface bedrock across the two-county area includes the Late Cretaceous Pierre (marine shale), Fox Hills (marine sandstone), and Hell Creek (sandstone, mudstone, siltstone, lignite, carbonaceous shale) formations, as well as the Tertiary Paleocene Fort Union Group consisting of the Ludlow (continental sandstone, lignite, and shale), Cannonball (marine sandstone, siltstone, shale, and limestone), and Tongue river (continental sandstone, claystone, siltstone, shale, limestone, and lignite) formations (Kume and Hansen 1965).

Glacial till material that overlies the bedrock in Burleigh and Kidder counties is similar with respect to physical characteristics (Rau et al. 1962, Kume and Hansen 1965). In Kidder County, most of the till has reddish-yellow spots caused by oxidation of iron oxide and a white mottling caused by concentration of calcium carbonate (Rau et al. 1962). Burleigh County till is oxidized to depths of 20–30

feet and exhibits a mottled appearance due to calcium carbonate concentrations. Additionally, free pebbles are typically encrusted with caliche and particles of shale and lignite are common (Kume and Hansen 1965). Conversely, glaciofluvial sediments in both counties are comprised primarily of stratified sands and gravel that range in size from fine sand to pebbles, whereas glaciolacustringe sediments primarily consist of clays and silts.

The principal parent materials of soils on Long Lake NWR, Slade NWR, and Florence Lake NWR are glacial outwash, glacial till, and sediments of glaciofluvial and glaciolacustrine origin. Soils on these three refuges belong to more than 20 series and nine subgroups (Stout et al. 1974, Seelig and Gulsvig 1988). The 20 soils series form 10 associations (i.e., areas with a proportional pattern of soils that normally consist of one or more major soils and at least one minor soil) that make up the terrestrial land base of the refuges. Of these, the dominant associations on all three refuges are loams and sands derived from glacial outwash and till that are generally deep, medium to moderately coarse in texture, range in available water capacity from very low to high, and are susceptible to erosion by either water or wind (Stout et al. 1974, Seelig and Gulsvig 1988). The soils that underlie Long Lake NWR's uplands are clays and sands, compared to a sand-silt mix on Slade NWR, and sandy loam underlain by gravel on Florence Lake NWR. Nearly all soil associations found throughout the three refuges can be characterized as nearly level to rolling or gently rolling.

Water Resources

Surface Water

The Long Lake Creek watershed is the primary source of supply for Long Lake NWR. This watershed has a contributing area of approximately 460 square miles. Annual evaporation in the area is 33 to 40 inches and average annual precipitation is approximately 16 inches. This yields a negative precipitation: evaporation ratio in areas administered by the complex and a subsequent semiarid designation. Water levels in Refuge impoundments are greatly dependent on spring runoff.

A series of dikes with control structures impound approximately 15,000 acres of wetlands in three water management units when at capacity. These impoundments have a maximum depth of six feet and an average depth of less than three feet. Gaging stations operated by USGS monitored flows into the Refuge from Long Lake Creek south of the refuge boundary and out of the refuge in the overflow channel for a relatively short period of time. Because there are a number of other small tributaries that provide other surface water supplies which are ungaged, there has never been an accurate accounting of water supplies other than to determine that the Long Lake Creek Watershed contributes approximately 68 percent of the water for Long Lake.

Long Lake captures surface water from several minor tributaries and watersheds during periods of runoff in impoundments referred to as unit 2 Marsh, G-12, G-19, and G-19a. Other water management units have been developed on WPAs and satellite refuges where tributaries and watersheds allow for the capture of runoff. These impoundments function as small artificial freshwater wetlands. Overwhelmingly, surface waters occurring under the jurisdiction of the complex exist as natural, undeveloped wetland basins.

Background

Prior to being established as a refuge in 1932, Long Lake was a relatively shallow (elevation ranges from 1,710 feet–1,716 feet above MSL), alkaline lake that exhibited dynamic water level fluctuations, based on variable seasonal and annual surface water inputs (e.g., rainfall, snowmelt runoff). Although speculative, during years of low inflow, surface water likely was not discharged from the lake and was lost only by evaporation and transpiration (Laubhan et al. 2006). However, in years of high inflows, surface waters breached a natural sill and water was discharged downstream.

Although the valley encompassing Long Lake NWR retains many historic features, the area has been modified by both ongoing natural processes and anthropogenic forces. Perhaps the greatest change that has impacted the NWR is hydrologic alteration aimed at reducing the occurrence of botulism. In the mid–1930s the Civilian Conservation Corps (CCC) built three earthen dikes (denoted as A, B, and C) in order to improve the water management capability of Long Lake. At their present level (1,720ft above MSL), these dikes have raised the full pool level more than three feet above its historic elevation, creating three separate management units (denoted as unit I, unit II, and unit III) which make up the >17,000 acre

impoundment (acreage includes nonrefuge portions of Long Lake).

Groundwater
Essentially all water in this region is derived from precipitation; however, a portion of this water either enters the ground through direct or indirect percolation or is transported along the ground surface to topographically lower areas. For example, many river and stream valleys function to collect excess surface water that cannot be absorbed into soils at local scales. In general, groundwater is abundant in both Burleigh and Kidder counties (Rau et al. 1962, Kume and Hansen 1965,); however, the amount of groundwater recharge that occurs varies locally and depends on numerous factors, including topography, climatic variables (e.g., precipitation and temperature patterns), and soil characteristics (e.g., available water capacity). In general, groundwater recharge tends to be greatest during periods of major precipitation that result in large amounts of surface runoff (Randich and Hatchett 1966).

Additionally, since the mid-1990s, the acreage of planted potatoes has increased dramatically in certain parts of the State, including Kidder County. For example, in 1995, 1,300 acres of potatoes were planted in Kidder County. By 2000, this acreage had increased to 7,500 acres (USDA 2002). Along with these increases in potato production have come an equally large increase in irrigation (100 percent of all Kidder county potato fields have been irrigated since 1995; USDA 2002). Consequently, irrigation systems have been installed in the uplands directly adjacent to wetlands protected by easements. In 2001 Euliss et al. (2003) conducted a study to determine the impact of ground-water pumping on a single protected (easement) wetland in Kidder County. Although Euliss et al. (2003) were not able to observe a reduction in the length of time that the easement wetland contained water in 2001 that could be directly related to pumping of groundwater (likely due to the relatively small amount of pumping that occurred in 2001 and the difficulty in separating pumping-induced drawdowns from natural drawdowns observed in control [reference] wetlands), they did document altered wetland hydrology during irrigation events. During pumping the treatment wetland changes from a ground-water flow-through wetland to a "recharge" wetland. Pumping in the treatment wetland also altered the chemical characteristics (e.g., salinity) of the treatment wetland. In summary, Euliss et al (2003) recommend that if the goal of purchasing wetland easements is to protect the unique biotic and abiotic characteristics of these wetlands for the benefit of waterfowl and other wildlife species then actions that alter the natural hydrological characteristics (i.e., pumping for agricultural irrigation) should be avoided whenever possible.

Wetlands
Wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (Cowardin et al. 1979). It is estimated that the contiguous United States contained 221 million acres of wetlands just 200 years ago (Dahl1990). By the mid-1970s only 46 percent of the original acreage remained (Tiner 1984). Wetlands now cover about five percent of the landscape of the lower 48 states. Wetlands are extremely productive and important to both migratory and resident wildlife. They serve as breeding and nesting habitat for migratory birds and as wintering habitat for many species of resident wildlife. Humans also benefit from wetlands as these habitats improve water quality and quantity, reduce flooding effects, and provide areas for recreation.

Wetlands are classified using a number of attributes including vegetation, water regimes (the length of time water occupies a specific area), and water chemistry. Prairie potholes are described using the following nontidal water regime modifiers (Cowardin et al 1979):

- Temporarily flooded—surface water is present for brief periods during the growing season. The water table usually lies below the soil surface most of the season, so plants that grow in both uplands and wetlands are characteristic.
- Seasonally flooded—surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the surface.
- Semi-permanently flooded—surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.
- Permanently flooded—water covers the land throughout the year in nearly all

years. Vegetation is composed of obligate hydrophytes, such as cattails.

Even though drainage and other wetland-decimating factors have taken their toll, wetlands are still a prominent feature of the landscape within the complex. Wetlands within the complex occur in a diverse distribution of sizes, types, locations, and associations. The National Wetland Inventory (NWI) has identified 396,105 wetland acres in the wetland management district.

The chemistry of surface waters in wetlands tends to be dynamic because of complex interactions among numerous factors, including the position of the wetland in relation to groundwater flow systems, chemical composition of groundwater, surrounding land uses, and climate (LaBaugh et al. 1987, Swanson et al. 1988, Winter 2004).

The gradient from fresh to hypersaline water is a continuum, and any divisions are arbitrary (Euliss et al. 2004). In addition, salinity levels can fluctuate widely within and among seasons (Stewart and Kantrud 1972). In general, however, surface water in temporary and seasonal wetland basins is usually fresh or slightly brackish (~ <0.8 mS/cm), whereas semi-permanently flooded basins are often brackish (~ 2.0–15 mS/cm), but can range from fresh to subsaline (~ >15 mS/cm) (Stewart and Kantrud 1971).

Although the general effect of increased salinity in any zone of wetland vegetation is a decrease in species diversity, it is difficult to establish meaningful salinity tolerances for individual species in their natural habitats because of the complex interaction of abiotic factors. However, general estimates of the tolerance of many emergent and aquatic plant species to salinity are available (Kantrud et al. 1989).

Water Rights

The following section is a summary of water rights associated with complex lands:

Long Lake NWR holds water rights filed February 17, 1936, claiming 47,955 acre-feet of storage and an additional seasonal use of 51,100 acre-feet. This water right covers water stored and seasonal use to an elevation of 1713.5 feet above MSL.

Long Lake NWR also holds Perfected Water Right # 5549P priority date June 1, 1942, for an additional 21,993 acre-feet of storage and 2,410 acre-feet of annual use from surface water of Long Lake Creek a tributary of Apple Creek. This water right covers the additional water stored and seasonal use to an elevation of 1,716 feet above MSL, the elevation in which facilities were raised during construction of refuge impoundments, which occurred in 1942.

G-19 dam on Long Lake NWR holds a water right/permit # 4628 allocating 70 acre-feet, of which 53 acre-feet will be used to offset evaporative losses. The permit was granted with an exception to the one-time fill rule.

G-19a dam on Long Lake NWR holds a water right/permit # 4249 allocating 88.5 acre-feet, of which 48 acre-feet will be used to offset evaporative losses. The permit was granted with an exception to the one-time fill rule.

G-12 dam on Long Lake NWR holds water right/permit # 4505 allocating 252 acre-feet, 129 acre-feet for storage and 123 acre-feet to offset evaporative losses. The permit was granted with an exception to the one-time fill rule.

Unit 2 marsh on Long Lake NWR holds water right/permit # 3812 allocating 410 acre-feet of storage and 629 acre-feet of seasonal use.
Lake George NWR holds water right dated August 30, 1937, for 773 acre-feet of storage and 468 acre-feet of seasonal use.

Sunburst Lake NWR holds a water right dated September 25, 1964, perfected permit # 1243 for 33 acre-feet of storage and 49.5 acre-feet of storage of seasonal use for a total of 82.5 acre-feet of storage. (Horsehead Creek watershed).

Sunburst Lake NWR holds water rights dated September 1, 1934, for 65.8 acre-feet of storage with additional 47.1 acre-feet for seasonal use (Horsehead Creek watershed).

Slade NWR holds water right # 1259P dated December 21, 1942, for storage to elevation 1,724 feet above MSL with additional 291 acre-feet seasonal use (tributaries to Lake Isabel).

Slade NWR holds water right # 1260P dated December 21, 1942, for storage to normal elevation with additional 1695 acre-feet seasonal use (tributaries to Lake Isabel).

Appert Lake NWR holds water rights dated September 1, 1934, for 365 acre-feet of storage with

additional 309 acre-feet of seasonal use (Long Lake Creek/Missouri River watershed).

Springwater NWR holds water rights dated September 1, 1934, for 64 acre-feet of storage with additional 48 acre-feet of seasonal use. (Clear Creek watershed).

Canfield Lake NWR holds water rights dated September 1, 1934, for 872 acre-feet of storage with additional 654 acre-feet of seasonal use (Apple Creek/Missouri River watershed).

Hutchinson Lake NWR holds water rights dated August 30, 1937, for 90 acre-feet of storage with additional 90 acre-feet of seasonal use (Missouri River watershed).

Florence Lake NWR holds water rights dated September 1, 1934, for 300 acre-feet of storage with additional 300 acre-feet of seasonal use (Missouri River watershed).

Rath WPA holds water rights permit # 4665 dated October 28, 1992, for 157 acre-feet out of which 108.6 acre-feet is for seasonal use (Apple Creek watershed).

The Long Lake WMD holds 1,036 wetland easement contracts protecting 102,646 acres of naturally occurring wetlands.

Vegetation Communities

Wetlands and Associated Vegetative Communities

Wetlands throughout the complex provide both resting cover and food resources for migratory birds. Substantial emergent and submergent acquatic vegetation occurs in freshwater wetlands. Sago pondweed, coontail, and duckweed occur in the deeper, more permanently flooded zones, while cattail, bulrush, burreed, and smartweed grow in shallow areas that may go dry due to a drawdown. Salinity is a limiting factor for wetland plants in individual wetlands scattered throughout the complex. As salinity increases, it limits the growth of certain wetland plants as levels approach and/or exceed an individual species' tolerance level.

Most palustrine basins exhibit concentric zones of vegetation that are dominated by different plant species (Kantrud et al. 1989). The terms commonly used in reference to these zones are, in decreasing order of water permanency, deep marsh, shallow marsh, and wet meadow (Kantrud et al. 1989). The water regime in a deep marsh zone is usually semi-permanent. Dominant plants include cattail, bulrush, submersed or floating plants, and submersed vascular plants, but this zone also may be devoid of vegetation if bottom sediments are unconsolidated. Shallow marsh zones are usually dominated by emergent grasses, sedges, and some forbs, but submersed or floating vascular plants also may occur. Wet meadow zones also are typically dominated by grasses, rushes, and sedges, whereas submersed or floating plants are absent.

Management of wetlands in the complex where facilities have been developed simulates natural (i.e., historic) wet/dry cycles by raising and lowering water levels to meet specific management objectives. This encourages emergent and submergent acquatic vegetation growth, increases invertebrate biomass, improves water clarity, breaks down and cycles accumulated nutrients in bottom sediments, and augments control of common carp. Extensive mudflats are created when wetlands are in the initial drawdown phase. Mudflats provide optimal feeding opportunities for migrating shorebirds, wading birds, and other waterbirds.

The wetland easement program has provided perpetual protection for 102,646 acres of wetlands on private lands in the wetland management district. This has secured a landscape-level habitat base for migratory birds. While normal farming practices may have essentially erased some of the smaller, temporary, and seasonal wetland basins, most of the habitat that has been protected remains intact. Improved GIS technology and landscape modeling have guided the effort to protect essential wetlands to priority areas where those measures have potential to influence migratory bird resources the most (see figures 11, 12, and 13; Long Lake NWR, Florence NWR, and Slade NWR habitat maps at the end of this chapter).

Uplands and Associated Vegetative Communities

Upland vegetation is essential in order to provide nesting habitat for migratory and resident bird species. Upland habitats also provide necessary habitat requirements for resident wildlife throughout the year. The grassland easement program has provided perpetual protection for 41,181 acres of privately owned grassland in the wetland management district. The program is in its infancy and continues to expand the acreage

protected annually. While these lands are often not in optimum condition, they provide a secure landscape-level habitat base. Conversely, fee-title lands sometimes offer an opportunity to provide habitat, which is in optimal condition. The complex currently uses a variety of management techniques to maintain and enhance upland habitat conditions on fee-title uplands including the use of prescribed fire, grazing, haying, native grass seeding, and invasive species management.

During the 1930s, large fields formerly planted to crops were planted with nonnative grasses including smooth brome, crested wheatgrass, and Kentucky bluegrass species to minimize soil erosion.

In the early 1970s, habitat management techniques were developed to provide dense nesting cover for waterfowl. Several areas on the refuge were planted to grass species such as tall and intermediate wheatgrass, sweet clover, and alfalfa. These fields initially provided good cover for nesting birds; however, over time they deteriorated and were prone to invasion by Canada thistle and other problem species (e.g., smooth brome). The complex has begun the process of restoring these grasslands to native grasses and forbs. The native grass restoration process generally involves cropping the field for three or more years to eliminate exotic cool season grass seeds and rhizomes, control Canada thistle and other noxious weeds, and prepare a seed bed for planting native grass seed.

Uplands were historically comprised of warm-season grasses characteristic of the short-grass prairie to the west, and the cool- and warm-season grasses characteristic of the tall-grass prairie to the east (Samson et al. 1998); thus, the area represented a zone of ecotonal mixing that included a diversity of short-, intermediate-, and tall-grass species (Bragg and Steuter 1996). Vegetation composition at regional and local levels was determined by numerous interrelated factors, including elevation, topography, climate, soil characteristics, herbivory, and fire (Hanson and Whitman 1938, Coupland 1950). Based primarily on vegetation and topography, the mixed-grass prairie in the State has been classified into nine major types (Hanson and Whitman 1938). Species typical of the mixed-grass prairie in the State include western wheatgrass, blue grama, prairie junegrass, needle and thread, sandberg bluegrass, little bluestem, needleleaf sedge, and threadleaf sedge (Whitman 1941, Kantrud and Kologiski 1982).

However, even within a classification, local variation exists. For example, in xeric areas the blue grama-needle and thread-threadleaf sedge association also includes western wheatgrass, prairie junegrass, and needleleaf sedge as less important dominant grasses, as well as about 12 dominant forbs (e.g., lotus milkvetch, narrowleaf goosefoot, scarlet beeblossom, flatspine stickseed, stiffstem flax, spiny phlox, woolly plantain; Hanson and Whitman 1938, Coupland 1992). In contrast, more mesic areas in the same association supported more slender wheatgrass, fendler threeawn, sideoats grama, little bluestem, porcupine grass, green needlegrass, and sun sedge, whereas dominant forbs included tarragon, prairie sagewort, white sagebrush, blacksamson echinacea, and white milkwort (Sarvis 1920). Further, grasses in the genus Bouteloua, Stipa, and Carex are dominant on sandy loams and fine sandy loams that typically occur on topographically high areas. In contrast, species such as inland saltgrass, Nuttall's alkaligrass, and foxtail barley tend to occur more often in depressional areas with silt loams and silty clay loams characterized by increased soil moisture and high concentrations of carbonates and soluble salts (Hanson and Whitman 1938).

Shrub and Tree Plantings (Shelterbelts)
The complex has scattered tree rows, shelterbelts and block plantings of shrubs and trees. By Service policy, trees are no longer planted except for shelterbelts that are allowed near refuge housing, buildings and the headquarters to provide protection from the wind. As time and funding allow, current management direction targets removing the shrub and tree plantings and restoring these areas to perennial grass cover.

Native Shrubs and Trees
Buffaloberry, chokecherry, Juneberry, and other low-growing native shrubs occur sporadically in native uplands, primarily in coulees and/or drainages where aspect and relief combine to provide microclimates for these woody species to develop and thrive.

Western snowberry and silverbrush are native shrubs that sometimes dominate native grassland areas and can become management problem/considerations when fire and/or grazing are excluded or not applied at regular intervals.

Riparian areas and wetland fringes hold native trees including green ash and cottonwood. Rare landforms have allowed aspen and other low shrubs to develop and extend their range south into some areas in the northern part of the wetland management district.

Management objectives target maintaining native shrubs and trees within an acceptable composition range, where they are allowed to thrive within the microclimates and/or normal native range site, but not to expand and/or dominate range site locations where grasses would otherwise be the normal composition under historical burning/grazing regimes.

Wildlife

Mammals

Representative species for the complex include the coyote, red fox, white-tailed jackrabbit, deer mouse, badger, raccoon, mink, muskrat, white-tailed deer, thirteen-lined ground squirrel, striped skunk, long-tailed weasel, masked shrew, and meadow vole. The complex staff anticipates that 34 mammal species likely occur regularly or periodically on complex lands (Appendix G). A checklist of State mammals (Wiehe and Cassel 1978) lists 10 species (including four bats, one mouse, two voles) with a statewide distribution that have not been documented by complex staff on Service lands in the complex. Undoubtedly, the limited amount of Service-owned land in Burleigh, Kidder, and Emmons counties does not provide habitat sufficient to support some of these 10 species (i.e., bobcat, river otter, hoary bat).

In addition to this area's common mammal species, there are occasionally confirmed sightings of moose, elk, and pronghorns on, or adjacent to, Service lands in the complex. Additionally, the complex staff has received unconfirmed reports of mountain lions and gray wolves on Service lands within the complex.

In 2002, the small mammal population on Long Lake NWR was systematically inventoried. The inventory was conducted to determine the species composition and abundance of small mammals in both upland- and wetland-edge habitats. Large- and medium-sized mammals (e.g., deer, rabbits, skunks) and bats were not sampled. Live trapping was conducted at 16 different study fields throughout the refuge from late June to late September. Ten different mammal species were captured. The deer mouse was the most frequently captured species, with 38.34 captures (C) per 100 trap nights (TN), followed by the masked shrew (2.68 C/100 TN), northern short-tailed shrew (1.87 C/100 TN), and thirteen-lined ground squirrel (1.06 C/100 TN), respectively.

Reptiles and Amphibians

The complex staff expects that eight reptiles and amphibians likely occur regularly or periodically on complex lands (appendix G). Hoberg and Gause (1991) provide range distributions for all State amphibians and reptiles.

From 2001 to 2003, complex staff worked with the Service's ecological services division to capture juvenile (metamorph) northern leopard frogs on Sisco-Fallgatter and Schiermeister WPAs, in Emmons County. These frogs were examined for potential malformations. The impetus for this work stemmed from the heightened nationwide concern over amphibian malformations that began when a group of Minnesota junior high school students discovered numerous malformed frogs in a local wetland in 1995 (Meteyer 2000). In 2001, complex staff collected 180 leopard frog metamorphs from the two Emmons County WPAs. Two frogs from Schiermeister and one frog from Sisco-Fallgatter were determined to be malformed via radiology. Two of these three malformations were classified as asynchronous metamorphosis (involving the mouth and tail), whereas the third was classified as having polymelia of a forelimb (an extra forelimb). The following year, 127 leopard frog metamorphs were collected at Scheirmiester WPA, with no malformations observed. In 2003, 231 leopard frog metamorphs were collected at the two Emmons County WPAs. Two specimens from Schiermeister were considered abnormal (hind foot on both) and forwarded to the University of Wisconsin-LaCrosse for further examination. Final results are unavailable as of this writing.

Birds

More than 314 species of birds have been documented throughout the complex (appendix G). The Long Lake NWR Bird List (May 2002) contains 289 species that had been recorded on or immediately adjacent to the refuge, as of 2001. The bird list includes 18 accidentals (species seen once or only a few times because the refuge is outside of their normal range. There are 118 species that breed on Long Lake NWR. The importance of Long Lake NWR to the avian community is illustrated, in part, by the fact that it was designated both a

Globally Important Bird Area (GIBA) and as a regional shorebird site in the Western Hemisphere Shorebird Reserve Network (WHSRN) in 2002. Additionally, the diversity of birdlife in the complex has resulted in national recognition of both Kidder County (Konrad 1996a) and Long Lake NWR (Konrad 1996b) as two of the top ten birding "hot spots" in the nation.

Twenty-three species of waterfowl are considered either common or uncommon species throughout the complex, with several other waterfowl species being occasional visitors (i.e., greater scaup, American black duck, red-breasted merganser, white-winged scoter. Seventeen waterfowl species breed in the complex. The five most abundant breeding duck species are the mallard, blue-winged teal, gadwall, northern shoveler, and northern pintail. When habitat conditions are favorable, breeding duck densities exceed 100 pairs per square mile in several portions of the complex, especially in Kidder and northeastern Burleigh counties. The Service began conducting annual breeding waterfowl population surveys throughout the Dakotas and northeastern Montana in 1987, focusing on 13 duck species that are the primary breeding species in the PPR. The number of breeding pairs of these species that use both Service and private lands in the complex has ranged from 8,865 in 1990 to 544,017 in 1997, whereas recruitment rates have ranged from 0.40 in 1990 to 0.82 in 1997. A minimum recruitment rate of 0.49 is needed to maintain a duck species' population (Service 1996). Based on survey data, a strong positive relationship exists between wetland condition (i.e., wet area, number of wet ponds) and both breeding pairs and duck recruitment.

Since 2000, the complex staff has investigated upland waterfowl nesting success at both Long Lake NWR and on select WPAs in the complex. In 2001, portions of five WPAs (Wahl, Bernhardt, Basaraba, Rath, North Crimmins) that had breeding duck pair densities exceeding 80 pairs per square mile and surrounding landscapes that had a high degree (>60 percent) of perennial grass cover, were searched using the chain drag method (Klett et al. 1986). Each site was searched either two or three times and 106 nests were found across 350 acres. Nest success was 26.05 percent (Mayfield 1961) across all sites and ranged from 4.2 percent to 38.8 percent at individual sites. In 2002, the complex staff surveyed nesting activity on seven Long Lake NWR management units. Each site was searched three times and 79 nests were found across 415 acres. Nest success was 3 percent (Mayfield 1961) across all sites and ranged from 0.4 percent to 17.8 percent at individual sites. Nest success rates ranging from 15–20 percent (Mayfield 1961) are thought to be a minimum requirement for population stability of the five most abundant breeding duck species in the complex (Cowardin et al. 1985, Klett et al. 1988).

During the fall migration, the average, waterfowl numbers at Long Lake NWR peak at 25,000 ducks and 35,000 geese; however, in some years, fall refuge populations of both duck and geese exceed 100,000 each. Migrant populations of Canada geese, cackling geese, white-fronted geese, snow geese, and tundra swans are joined on the refuge by an average of 10,000 sandhill cranes. The refuge serves as a principle staging area for members of the mid-continent population of sandhill cranes, and their numbers exceed 25,000 individuals on the refuge in some years.

Long Lake NWR's designation as a WHSRN site is due to the documented abundance of shorebirds (>20,000 annually) that utilize the refuge at some time of the year, as either a migratory stopover or breeding area. Twenty-five species of shorebirds are considered either common or uncommon species throughout the complex, with several other species being occasional visitors (e.g., black-bellied plover, western sandpiper, Hudsonian godwit, buff-breasted sandpiper). Nine shorebird species are regular breeders throughout the complex.

Since 2001, shorebird surveys have been conducted on two survey routes at Long Lake NWR, following Manomet Center for Conservation Sciences International Shorebird Survey (ISS) protocol.

From 2001 to 2003, 28 shorebird species were recorded annually on the refuge during formal surveys. Based on ISS data, the most abundant spring migrants at the refuge include the Wilson's phalarope and marbled godwit; whereas the most abundant fall migrants include the Wilson's phalarope, long-billed and short-billed dowitchers, American avocets, and killdeer. Both refuge shorebird diversity and abundance has varied seasonally and annually since ISS began. Abundance has ranged from 17,685 in spring 2004 to 1,551 in spring 2003, whereas Simpson's Diversity Index (Simpson 1949; range=0.0 [low] to 1.0 [high]) values have varied from a seasonal low of 0.4978 to an annual high of 0.8218. The substantial variation in shorebird abundance likely is related to wetland

conditions at scales greater than the refuge. During years when numerous prairie wetlands are flooded and the water level in Long Lake is high (i.e., spring 2003), relatively few shorebirds use the refuge. Conversely, substantially more shorebirds use the refuge during years of minimal spring runoff (i.e., spring 2004) because preferred habitat on the surrounding landscape is mostly dry and Long Lake provides a wealth of suitable shorebird habitat. The landscape that surrounds Long Lake NWR, which includes numerous other Service lands, is also of tremendous importance to a host of shorebird species, for a multitude of reasons. For example, a portion of the Collapsed Glacial Outwash ecoregion within the complex has recently been designated as a priority fall migration staging area as part of the Marbled Godwit Conservation Plan (Melcher et al. 2005). Twenty-five WPAs and two refuges are included within the boundaries of this conservation area.

The importance of Service lands in the complex to colonial nesting waterbirds was recently investigated. In 2003, the complex staff conducted an extensive survey of waterbird colonies on fee-title lands throughout the complex to determine the distribution and estimate the abundance of breeding colonial waterbirds, and also develop a monitoring protocol that can be followed in subsequent years with reduced effort. An aerial survey of all wetland basins (n = 864) on fee title lands in the complex was completed and each wetland was assigned to one of three categories (high probability [HPC], moderate probability [MPC], and low probability [LPC], based on the likelihood that it would support one or more waterbird colonies that year. Category assignments were based on a combination of habitat conditions, including: 1) wetland cover type (Steward and Kantrud 1971); 2) hydrologic regime and basin size, and; 3) special features (e.g., islands, dead trees in wetlands). All HPC wetlands (n = 68) were ground surveyed for colonies, whereas only 50 percent of the MPC wetlands (n = 83) and 5 percent of the LPC wetlands (n=32) were ground surveyed. When a waterbird colony was located, species composition was determined, nests were tallied, the perimeter of the colony was delineated, and general habitat variables were measured. Forty colonies were located on 16 WPAs and two refuges during the survey, including 31 (77.5 percent) marsh colonies, eight (20 percent) ground/island colonies, and one (2.5 percent) tree/shrub colony. Seven WPAs and one refuge contained multiple, ranging from two to nine, colonies. Twenty-four (60.0 percent) of the 40 colonies consisted of only one species, 11 (27.5 percent) contained two species, three (7.5 percent contained three species, and two (5.0 percent) contained between five and eight species. Fourteen separate waterbird species were recorded and only the double-crested cormorant utilized multiple colony types. The number of total breeding pairs of each species detected during the survey ranged from three (snowy egret) to 310 (California gull). Thirty-eight colonies were located on HPC wetlands, whereas only two (5 percent) were located on MPC wetlands and no colonies were located on LPC wetlands. The apparent success of the wetland stratification scheme provided a breeding colonial waterbird population estimate for the complex that had a low variance and provided an accurate estimate of use of Service lands during 2003.

Service lands throughout the complex hold substantial importance for grassland-nesting passerines, especially given the current rate of grassland conversion to cropland throughout the Dakotas. From 2001 to 2004, the complex staff surveyed the relative abundance and species composition of this bird group at 50 randomly selected 328-foot (100-meter) radius points at Long Lake NWR. Relative abundance (mean number of breeding pairs/point), estimated mean pairs per 247 acres (100 hectares), and frequency of occurrence (percentage of points at which a species was detected) were calculated for all species. The number of grassland-nesting passerine species detected from 2001 to 2004 ranged from 10–14, whereas the number of breeding grassland-nesting passerine pairs ranged from 258 in 2003 to 378 in 2004. Ten grassland-nesting passerine species were detected at survey points during all 4 years (table 2), three (Baird's sparrow, Nelson's sharp-tailed sparrow, Sprague's pipit) were detected during two years, and the vesper sparrow and lark bunting were detected during only one year. The species with the four highest mean frequencies of occurrence across all four survey years were the bobolink, clay-colored sparrow, red-winged blackbird, and grasshopper sparrow, respectively.

In 2005, the diversity of grassland-nesting passerines was surveyed at Florence Lake NWR and Slade NWR, using area search methodology (Ralph et al. 1993). Surveys were conducted in three different vegetative community types (native prairie, old cropland, seeded natives) at each refuge. Each 7.4-acre (3-hectare) search plot was surveyed three separate times during the summer,

for 20 minutes per survey. Grassland passerine abundance at Florence Lake NWR was similar on the native prairie and seeded native plots, with nine breeding pairs detected in each. The grasshopper sparrow was the most abundant species at the native sod plot, whereas the bobolink was the most abundant species at the seeded native plot. Grassland passerine use of the tamegrass plot at Florence Lake NWR was considerably less that the other two plots, with only three breeding pairs (two savannah sparrow, one grasshopper sparrow) detected. Conversely, at Slade NWR, grassland passerine abundance was similar in all three plots, but was highest in the tamegrass plot (nine breeding pairs). The red-winged blackbird was the most abundant species in the tamegrass plot. Eight grassland passerine pairs were detected in the Slade NWR seeded native plot, with the bobolink, clay-colored sparrow, and grasshopper sparrow sharing the greatest abundance. In the native prairie plot, seven grassland passerine pairs were tallied; the grasshopper sparrow was the most abundant.

The sharp-tailed grouse is a native gamebird species that is abundant both on Long Lake NWR and other Service lands throughout the complex. Each spring the male of this polygamous species engages in communal breeding displays at leks, where they defend their territories. Upland areas on Long Lake NWR and more importantly, private lands immediately adjacent to Long Lake NWR that are annually grazed, serve as host sites for several leks each year. The complex staff attempts to survey sharp-tailed grouse attendance at these leks each April. The first formal sharp-tailed grouse survey at Long Lake NWR that was completed in cooperation with the NDGF was conducted in 1981, although informal refuge surveys were completed in prior years. With the exception of 1994, counts have been conducted at the refuge annually since 1981. Throughout the years, sharp-tailed grouse have been documented on as many as 25 different leks, either on, or immediately adjacent to, the refuge. From 1981 to 2005, the number of observed active leks has ranged from 6 to 17 each year and averaged 12.75 (SE±0.590). Given the presumed 1:1 sex ratio of males to females (Ammann 1957, Connelly et al. 1998) and the much more reliable lek detection rate of males, often total numbers of males only are reported. Total males in the Long Lake NWR survey area have varied widely (36–247), based on a variety of factors, but the mean total is 160.38 (SE±12.403), across all years.

Fish

The complex staff anticipates that seven species of fish occur in Service-owned wetlands in the complex (Appendix G). Although systematic fishery inventories have not been completed on Service lands within the complex, wetland habitat capable of supporting populations of certain fish species is present, at least during nondrought periods, on several tracts throughout the complex.

Great blue herons, double-crested cormorants, American bitterns, black-crowned night-herons, and grebes frequently forage for fish in Long Lake NWR waters. Additionally, several gull species take advantage of plentiful winter-killed common carp on Long Lake during ice-out in some years.

Threatened and Endangered Species

There are four federally listed threatened and endangered species that have been observed on Service lands within the complex. The endangered least tern has been documented on Long Lake NWR, but this is an anomaly, as the majority of this species' habitat use in the State centers on the Missouri River. Conversely, the threatened piping plover and bald eagle and the endangered whooping crane regularly use various WPAs and refuges in the complex.

The piping plover breeds on the shoreline of the large, alkaline lakes that are common throughout the northeastern one-third of the complex. In the summer of 2002, the Service's Ecological Services Division designated eleven different tracts of land, of which at least portions are owned by the Service and administered by the complex, as Piping Plover Critical Habitat. These Critical Habitat areas consist of Long Lake NWR, three Kidder County WPAs, and seven Burleigh County WPAs. The complex staff annually surveys Long Lake NWR and WPAs that are known piping plover breeding areas.

Additionally, since 2002, staff has erected predator exclosures (Melvin et al. 1992) over most observed piping plover nests in an effort to increase nest success. They have also conducted vegetation removal practices on portions of Long Lake NWR, to enhance traditional breeding areas.

Table 2. Relative abundance, estimated breeding pairs per 247 acres, and frequency of occurrence for 15 grassland/wetland edge-nesting passerines on Long Lake National Wildlife Refuge Complex, 2001-2004

SPECIES	*RELATIVE ABUNDANCE*[1]				*ESTIMATED PAIRS / 247ac*				*FREQUENCY OF OCCURRENCE*			
	2001	*2002*	*2003*	*2004*	*2001*	*2002*	*2003*	*2004*	*2001*	*2002*	*2003*	*2004*
Baird's sparrow	0.02 (0.020)	0.00	0.00	0.02 (0.020)	0.6	0.00	0.00	0.6	2	0	0	2
bobolink	1.72 (0.179)	1.34 (0.182)	1.26 (0.151)	1.68 (0.255)	54.8	42.7	40.1	53.5	80	66	74	66
chestnut-collared longspur	0.02 (0.020)	0.04 (0.028)	0.02 (0.020)	0.06 (0.034)	0.6	1.3	0.6	1.9	2	4	2	6
clay-colored sparrow	0.94 (0.172)	0.92 (0.169)	0.86 (0.146)	1.00 (0.185)	29.9	29.3	27.4	31.9	50	48	54	56
common yellowthroat	0.34 (0.093)	0.32 (0.088)	0.22 (0.066)	0.62 (0.117)	10.8	10.2	7.0	19.7	26	24	20	44
grasshopper sparrow	0.36 (0.109)	0.68 (0.126)	0.88 (0.136)	1.66 (0.224)	11.5	21.7	28.0	52.9	22	40	58	66
lark bunting	0.00	0.00	0.00	0.02 (0.020)	0.00	0.00	0.00	0.6	0	0	0	2
Le Conte's sparrow	0.04 (0.028)	0.12 (0.028)	0.02 (0.020)	0.02 (0.020)	1.3	3.8	0.6	0.6	4	10	2	2
Nelson's sharp-tailed sparrow	0.04 (0.028)	0.00	0.00	0.04 (0.027)	1.3	0.00	0.00	1.3	4	0	0	4
red-winged blackbird	1.06 (0.224)	1.14 (0.249)	0.78 (0.141)	1.06 (0.224)	33.8	36.3	24.8	33.8	44	46	50	46
Savannah sparrow	0.54 (0.125)	0.34 (0.084)	0.38 (0.099)	0.50 (0.132)	17.2	10.8	12.1	15.9	34	28	26	28
sedge wren	1.18 (0.203)	0.56 (0.157)	0.26 (0.114)	0.30 (0.096)	37.6	17.8	8.3	9.6	56	26	12	24
Sprague's pipit	0.02 (0.020)	0.00	0.00	0.02 (0.020)	0.6	0.00	0.00	0.6	2	0	0	2
vesper sparrow	0.00	0.00	0.04 (0.028)	0.00	0.00	0.00	1.3	0.00	0	0	4	0
western meadowlark	0.30 (0.082)	0.06 (0.034)	0.44 (0.082)	0.57 (0.100)	9.6	1.9	14.0	18.2	24	6	40	46

[1]Number in parentheses is standard error (±SE).

The bald eagle is a relatively common migrant during the spring and fall migrations. Bald eagle observations on the complex's refuges and WPAs can usually be tied to large concentrations of migrant waterfowl. The peregrine falcon, which was delisted in 1999, is not as common as the bald eagle, within the complex, but it uses Service habitats during a similar timeframe and in a similar fashion.

Long Lake NWR is a key stopover site for whooping cranes migrating through the Central Flyway to their breeding area in the Northwest Territories in the spring and their wintering area on Aransas NWR in the fall (Beyersbergen et al. 2004). Since 2000, there have been at least eight confirmed observations (all during the fall) of whooping cranes using Long Lake NWR. Additionally, during recent years, whooping cranes have been documented on WPAs in the complex (e.g., Seventh Day Adventist, spring 2003). The complex biologist serves as the Service's key whooping crane contact for State observations. Additionally, complex staff follows guidelines presented in the Whooping Crane Contingency Plan (Service 2001) to minimize risks to whooping cranes that utilize lands within the complex's boundaries during the fall.

Although there has not been confirmed documentation of federally endangered gray wolves in Burleigh, Emmons, or Kidder counties in recent history, the complex staff does occasionally receive unconfirmed gray wolf reports from the public.

The Dakota skipper is a prairie-obligate butterfly that became a candidate for listing on the federal Endangered Species List in 2002. To date, this species has not been documented in Burleigh, Emmons, or Kidder counties, but there is potential for it to occur on Service lands in these locations. The complex staff classified the degree of Dakota skipper habitat potential that presently exists on Service lands within the complex, according to guidelines in a Service Conservation Strategy for Dakota skippers in North Dakota and South Dakota (Murphy 2005). It was determined that only a single fire-management unit on one tract of land (Schiermeister WPA) presently has habitat characteristics (i.e., size, vegetative species composition) that indicate possible Dakota skipper occurrence. Upland habitat management of this WPA unit will follow guidelines presented in the Service Conservation Strategy (Murphy 2005).

The State does not have an official threatened and endangered species list. However, in 2004, the NDGF designated its 100 Species of Conservation Priority (birds, mammals, reptiles, amphibians, fish, freshwater mussels) as part of its Comprehensive Wildlife Conservation Strategy. The Species of Conservation Priority that are known to occur in the complex are listed in Appendix J.

Cultural Resources

Prehistoric Resources

On April 4, 2005, RMC Consultants, Inc. under contract with the Service completed a Cultural Resource Overview and Site Sensitivity Analysis for the complex in the south-central portion of the State. The goal of that overview was to provide a tool for the Service to assist in preparation of a CCP and EA with regards to management of cultural resources. The objective of the study was to characterize the distribution of known cultural resources in the study area, create a sensitivity model for prehistoric and historic archaeological site location in the study area, and develop recommendations for the management of cultural resources within the study area.

Four surveys have been carried out on Long Lake NWR in response to various small development projects. A cultural resources inventory of a township road in the refuge in 1981 resulted in the recording of a single prehistoric archaeological site (Peterson 1981). A cultural resources inventory of approximately six acres for a tour road in 1992 resulted in no cultural resources being recorded (Lewis 1992). Cultural resources inventories of four borrow areas and two peninsula cutoffs totaling 74 acres at Long Lake NWR in 2001 (Olson 2001) resulted in the recording of a prehistoric site lead (32KDX69) at Pintail Point. A subsequent inventory of approximately twenty-one acres for the proposed borrow area on Pintail Point recorded the lead as prehistoric archaeological site 32KD82 (Morrison 2001).

Six sites have been recorded in the WPAs lying within the Long Lake WMD during two inventories. Of the six sites recorded, five (32BL95, 32BL96, 32BL98, 32BL99, 32BL100) were recorded during a survey of the East Lost Lake WDA by the University of North Dakota in 1990 (Driscoll et al 1991). Three of the sites are prehistoric archaeological sites (32BL95, 32BL96, 32BL100). More information is needed on two of the sites (32BL95, 32BL100) before an evaluation of their

significance and management recommendations can be made. No further work is recommended on the third site (32BL96). The other two sites (32BL98, 32BL99) recorded during the inventory are historic archaeological sites at which no further work is recommended.

Five unique, Depression-era structures and a shelter have been documented and evaluated at Long Lake NWR (Speulda and Lewis 2003)

Analysis of the prehistoric and historic cultural resources within Long Lake WMD revealed a total of 407 recorded sites of which 197 were prehistoric sites and 221 were historic sites (the sum of the prehistoric and historic sites exceeds the overall site total by 11 because there are 11 sites that have both prehistoric archaeological and historical archaeological components). Two sites were located at Long Lake NWR.

Open archaeological sites are the most predominant prehistoric site type that has been recorded in both the Coteau Slope and the Missouri Coteau physiographic regions. Open camps are the second most numerous prehistoric site type followed by open lithic scatters. A few graves have been recorded in the Coteau Slope but none have been recorded in the Missouri Coteau.

Farmsteads are the most numerous historic site type on the Coteau Slope followed by cemeteries and transportation sites. The site data is heavily skewed towards sites located along the Missouri River and thus within the Coteau Slope physiographic region. In Long Lake WMD, 376 sites have been recorded in the Coteau Slope physiographic region compared to only 33 sites recorded in the Missouri Coteau.

Based on the site sensitivity analysis conducted by RMC Consultants Inc., inventories for refuges are prioritized below:

1. Canfield Lake NWR and Long Lake NWR
2. Lake George NWR
3. Florence Lake NWR
4. Slade NWR

The priority order for conducting tract inventories in the wetland management district are prioritized below:

1. Kurtz WPA
2. Wahl WPA
3. Braun WPA

Other waterfowl production areas (and one WDA) should be inventoried in order of their average site sensitivity as appears in figure 44 of the April 4, 2005, Cultural Resource Overview and Site Sensitivity Analysis, which lists each tract in order of priority.

All known sites within waterfowl production areas (and one WDA) should be documented and evaluated for eligibility to the National Register of Historic Places. Six sites have been recorded within Long Lake WMD. All but two have been evaluated as not eligible. Those two sites are on East Lost Lake WDA and both sites are prehistoric and archaeological sites. It is recommended that these sites be evaluated through a program of test excavations.

Special Management Areas

Long Lake NWR has been designated as a WHSRN site of regional significance because of its importance to shorebirds. It has also been designated as a GIBA by the American Bird Conservancy.

A number of colonial-nesting waterbird colonies are distributed throughout the complex. These areas are important for recruitment for the following migratory bird species:

- Black-crowned night-heron
- Black tern
- California gull
- Cattle egret
- Clark's grebe
- Common tern
- Double-crested cormorant
- Eared grebe
- Forster's tern
- Franklin's gull
- Red-necked grebe
- Snowy egret
- Western grebe
- White-faced ibis

Eleven tracts of land within the complex have been designated as critical habitat for piping plovers. Five unique Depression-era structures and a shelter have been documented on Long Lake NWR.

Visitor Services

The Improvement Act emphasizes the importance of compatible wildlife-dependent recreation. The Act identifies these six priority public uses: hunting, fishing, wildlife observation, wildlife

photography, environmental education, and interpretation.

Hunting
Centuries ago, Long Lake was considered a prominent landmark to the Plains Indians and early European settlers who camped and hunted waterfowl and other game species along its shores. With bison extirpated from the landscape, and Long Lake under federal ownership, certain hunting restrictions now apply.

Because the principle purpose of the complex is to provide habitat for migratory birds, hunting waterfowl and other migratory birds is prohibited. A map showing areas open to hunting and regulatory text is available for Long Lake NWR.

Most of Long Lake NWR is open to upland bird (i.e., ring-necked pheasant, sharp-tailed grouse, gray partridge) hunting. To reduce hunting-group conflicts and migratory bird disturbance, this season does not open until late November. Long Lake NWR also offers archery, rifle, and muzzleloader deer hunting. Additionally, Slade NWR is only open to deer hunting and Florence Lake NWR is closed to all hunting.

All WPAs in the wetland management district are open to hunting for a variety of game, including migratory birds. Only federally approved non toxic shot is permitted on WPAs. All other State regulations apply on WPAs.

Fishing
Nationally, refuges receive approximately seven million angling visits annually. Long Lake NWR is one of the 270 refuges where anglers can enjoy their sport.

Fishing is permitted year-round on Long Lake NWR in designated areas. Fishing is only allowed on unit 1 of Long Lake and Long Lake Creek. Available species include northern pike, black bullhead, common carp, and occasionally walleye and yellow perch. Fishing is usually best at the mouth of the creek where it enters Long Lake. The lake itself is shallow and generally does not support gamefish, except when water flows into the lake at high levels. These high flows improve water quality and potentially allow fish to survive for several years. However, decreased water quality and winter killscan rapidly erase fish populations.

Canoes and small boats are restricted to Long Lake Creek. Boats may be used on the creek from May 1 through September 30 only. Shallow depths restrict motors to small outboards (maximum of 25 horsepower) and to electric motors. No boat ramps are available, limiting boat access to "lift in, lift out."

Currently, fishing facilities include an accessible dock, and accessible rest room, table, and informational kiosk, all located just south of the refuge headquarters on Long Lake Creek.

Fishing is prohibited on both Slade NWR and Florence Lake NWR. WPAs offer marginal fishing opportunities. Certain climatic conditions (i.e., periods of deluge) create periodic fish (e.g., yellow perch, northern pike) populations and therefore, public fishing opportunities on some WPAs. On WPAs there are no fishing facilities for anglers, and vehicle access is limited to designated trails.

State regulations apply to fishing on Long Lake NWR and WPAs.

Wildlife Observation and Photography
Long Lake NWR provides outstanding opportunities for viewing wildlife. It offers optimum viewing for waterfowl, marshbirds, and shorebirds from April through early June and from late August through October. Seasonal highlights include sharp-tailed grouse and western grebe courtship dancing in the spring shorebird migration in the spring and fall, daily movements of thousands of sandhill cranes each fall, and winter activities of various bird and mammal species. Many wildlife species can be observed from public roads on the refuge. The Butte Viewing Area offers a commanding view of the surrounding countryside. Public viewing blinds are available, by reservation in the spring to observe the sharp-tailed grouse on their leks. Bird watchers and photographers can also be authorized by the refuge manager to hike in and place temporary observation blinds within the refuge.

Environmental Education and Interpretation
Currently, a small visitor center is located in the administrative headquarters at Long Lake NWR. This visitor center includes two exhibits and a variety of informational pamphlets about the Service, the Refuge System, the complex, and other natural resources-related information. These pamphlets are available in the office entry foyer during and after business hours. There is a kiosk

located in front of the headquarters that contains information about prairie wetlands and wildlife species found throughout the complex. Refuge staff provides educational talks and tours for schools and other groups, upon request. The complex's environmental education and outreach program expands beyond the boundaries of the complex. The staff is involved in local, regional, and statewide programs.

Trapping

The complex staff developed a Predator Management Plan in 1993. This plan authorized predator control, performed by personnel and their authorized agents, outside the normal trapping season. It authorized public trapping on refuges administered under the complex, through issuance of SUPs to permittees for trapping during the State trapping season. Trapping targets predator management and infrastructure maintenance objectives.

Recreational trapping is available on all WPAs in the wetland management districts in accordance with State trapping regulations.

Fire and Grazing History

Historically, grasslands in the northern Great Plains coevolved with various disturbance regimes such as fire and large-mammal grazing. Whether lightning-induced or deliberately set by Native Americans, historical fires have influenced the composition of the plant communities on complex lands. A handful of fire-tolerant shrubs such as chokecherry, American plum, and leadplant were present, while other fire-sensitive woody species were restricted to areas that were protected from fire. The plant community was dominated by a number of grass and forb species.

It is believed that the historical wildfire frequency for the mixed-grass prairie was 5–7 years although little information is available on the occurrence of wildfire during the early years of the refuge. Potential exists for fairly large wildfires to occur; however, this has generally not been the case. Local fire departments and area ranchers aggressively suppress wildfire. It is also complex policy to control all wildfires occurring on Service lands.

The complex staff now uses prescribed fire to simulate the historical influence wildfire had on the plant communities. Wildfires help manage invading cool-season grasses, open up shorelines, and provide areas of attractive green browse for migrant waterfowl.

Most prescribed fires occur in the spring through early summer period or in early fall to allow for some vegetative recovery before winter. These times of year present opportunities to complete prescribed burns necessary to manage invading cool-season grasses and to open up shorelines and provide areas of attractive green browse areas for migrant waterfowl. Historically, wildfires likely would also have occurred during the summer and fall. During the last 15 years, however, prescribed fire has been increasingly used, and refuge staff now completes 10–20 prescribed burns each year covering 1,500 to 3,000 acres.

Grazing also greatly influences the structure and composition of grassland communities. Herbivores such as bison, elk, deer, pronghorn, and black-tailed prairie dog interact with soils, plants, other animals, and other processes to produce unique successional patterns in the northern Great Plains landscape at multiple scales.

Most plant species have growing points located at or near the ground surface, which allows the plant to be clipped off without killing it. Some contain bitter or toxic substances that cause animals to avoid grazing on them. Some species have spines to cause injury to grazing animal's mouths. Small mammals and deer presently graze on plants in the complex; however, it is believed that the historic impact from large grazing mammals (e.g., bison) was significant.

It is likely that herds of bison historically spent a considerable amount of time grazing native mixed-grass prairie found throughout the complex. Their grazing, trampling, trailing, and related activities likely had a significant impact on the development and maintenance of certain plant communities.

Free-ranging bison and elk are no longer present within the complex. Instead, staff works with local ranchers to mimic natural disturbances through livestock grazing. Grazing is generally conducted during the spring and early summer and again in the fall in upland habitats to stress exotic cool-season grasses and favor native grasses and forbs. Specific timing of grazing is also used to stress invading noxious weeds and is prescribed seasonally during periods when specific plants are most palatable to livestock.

Wetland grazing reduces accumulations of organic litter at the surface. A large amount of organic litter often favors invasive species such as Canada thistle. Grazing can also be used as part of an IPM program. The complex staff has determined that cattle will actively graze Canada thistle early in the growing season. Follow-up treatments also tend to be easier to complete and are more effective after grazing. Combination prescribed burning and grazing is a practice used to reduce the accumulation of organic litter. A fire creates a "flush" growth of new vegetation, which is grazed to extend treatment of problem plants such as Kentucky bluegrass and smooth brome. Noxious weeds including Canada thistle, absinth wormwood, and leafy spurge can be managed in a similar fashion. To date, this management strategy has been employed occasionally; however, the application shows promise for more frequent use in the future.

Socioeconomics

Socioeconomics

North Dakota is an important agricultural state, especially as a producer of wheat, much of which finds its way onto the world market. Many segments of the economy are affected by agriculture; for example, a substantial wholesale trade is involved in moving grain and livestock to market. Farm numbers have continued to decline since the 1980s, posing a threat to the vitality of the State's rural lifestyle. Since 1970, 43 of the State's 53 counties have lost population, and for 23 of these the population decline accelerated in the 1990s. The exodus has been aggravated by prolonged drought conditions, which in 2002 helped reduce wheat production (representing a quarter of the State's total agricultural revenues) by 24 percent and disrupted cattle production. It was slightly affected by the national recession and slowdown of 2001 and 2002. By December 2002, State unemployment which had risen to 3.6 percent in October had fallen back to 3.0 percent.

Growth industries include petroleum and the mining of coal, chiefly lignite; It has more coal resources than any other state. Manufacturing is concentrated largely on farm products and machinery.

Its gross state product in 2001 was $19 billion, smallest among the 50 states, to which general services contributed $3.7 billion; trade, $3.5 billion; government, $3 billion; financial services, $2.8 billion; transportation and public utilities, $1.9 billion, and construction, $896 million. The public sector in 2001 constituted 15.7 percent of gross state product, the ninth-highest among the states.

The State's farm marketing totaled $2.98 billion in 2001. Typically, it is the number one producer of hard spring wheat, durum wheat, sunflowers, barley, oats, flax, all dry, edible beans, and pinto beans. In 2002, the State led the Nation in spring wheat, durum wheat, barley, dry edible beans, sunflowers, and was second in the nation in overall wheat production.

The total number of farms has declined over the years as the average size of farming operations has increased. In 2002, the State had approximately 30,000 farms and ranches occupying 39.4 million acres (16 million hectares) and producing 216.6 million bushels of wheat, 57.0 million bushels of barley, 1.71 billion pounds of sunflowers, 12.7 million bushels of oats, 10.6 hundredweight of dry edible beans, 114.4 million bushels of corn, 4.8 million tons of sugar beets, and 23.5 million hundredweight of potatoes. The average farm was 1,313 acres (531 hectares) in size.

The State's farms and ranches had an estimated 1.9 million cattle and calves, valued at $1.58 billion in 2003. During 2002, there were around 154,000 hogs and pigs, worth $11.4 million. Its farmers produced nearly 9.1 million pounds (4.1 million kilograms) of sheep and lambs, which brought in $5.8 million in gross income in 2001, and nearly 42 million pounds (19.1 million kilograms) of turkey were produced in that same year.

The value of nonfuel minerals produced in the State in 2001 was estimated at about $39 million, up about 12 percent from 2000. Construction sand and gravel accounted for more than 70 percent of the value ($27.6 million) of the State's nonfuel mineral output, from a production of 10.6 million metric tons. Recovered elemental sulfur is the second most important mineral produced in the State, in terms of value. Sulfur and other byproducts such as krypton, xenon, anhydrous ammonia, and liquid nitrogen are recovered during natural gas processing at five plants in the western part of the State. Lapidary and collectible materials such as petrified wood, agates, jasper, and flint are also found in the State.

In 1997, the State had 1,963 wholesale establishments, with sales of $9.5 billion. The

leading wholesale lines by sales volume were farm-product raw materials, machinery, equipment, and supplies (especially farm machinery), groceries and related products, and petroleum and petroleum products. The State's 4,810 retail establishments recorded $6.4 billion in sales during 1997. Exports of State origin totaled $750 million in 1998, ranked 45th of all states.

By number of employees, the leading manufacturing industries in the State in 1997 were food and food products; industrial machinery and equipment; printing and publishing; electronic and other electric equipment; transportation equipment; and fabricated metal products. Value of shipments of manufactures in 1997 were estimated at over $5.2 billion, exhibiting the 9th fastest growth in shipments between 1992 and 1997. Earnings of persons employed in the State increased from $9.1 billion in 1997 to $10.2 in 1998, an increase of 11.5 percent. The largest industries in 1998 were services, 26.2 percent of earnings; State and local government, 12.4 percent; and retail trade, 10.5 percent. Of the industries that accounted for at least 5 percent of earnings in 1998, the slowest growing from 1997 to 1998 was construction (6.9 percent of earnings in 1998), which increased 1.9 percent; the fastest was durable goods manufacturing (5.1 percent of earnings in 1998), which increased 11.9 percent.

According to Bureau of Labor Statistics (BLS) provisional estimates, in July 2003 the seasonally adjusted civilian labor force in the State numbered 350,500, with approximately 12,600 workers unemployed, yielding an unemployment rate of 3.6 percent, compared to the national average of 6.2 percent for the same period. Since the beginning of the BLS data series in 1978, the highest unemployment rate recorded was 6.7 percent in May 1986. The historical low was 2.3 percent in October 1997. In 2001, an estimated 4.7 percent of the labor force was employed in construction; 7.3 percent in manufacturing; 5.2 percent in transportation, communications, and public utilities; 20.3 percent in trade; 4.7 percent in finance, insurance, and real estate; 23.6 percent in services; 17.9 percent in government; and 8.5 percent in agriculture.

The U.S. Department of Labor reported that in 2002, 24,000 of the State's 291,000 employed wage and salary workers were members of unions. This represented 8.1 percent of those so employed, up from 7.5 percent in 2001 but down from 9.1 percent in 1998. The national average is 13.2 percent. In all, 28,000 workers (9.8 percent) were represented by unions. In addition to union members, this category includes workers who report no union affiliation but whose jobs are covered by a union contract. The State is one of 22 states with a right-to-work law. (www.city-state.com)

Refer to tables 3, 4 and 5 at the end of this chapter for more detailed information on population, demographics, employment, and income in the State and the counties outlying the refuge complex.

Air Quality

The National Ambient Air Quality Standards include maximum allowable pollution levels for particulate matter, ozone, sulfur dioxide, nitrogen dioxide, lead, and carbon dioxide. Particulate matter is a measure of microscopic liquid or solid particles in the air that is respirable in the lungs.

Air quality in the area of the complex is considered good, with no nearby manufacturing sites or major air pollution sources. Carbon from automobiles and diesel engines; prescribed fire activities throughout the complex, and dust associated with wind-blown sand and dirt from the roadways and fields contribute to particulate matter.

Table 3. Population*

	Population in 2000	*Estimated Population in 2004*	*Change in Population 2000–2004 (%)*	*Native American Population in 2000 (%)*	*African American Population in 2000 (%)*	*White Population in 2000 (%)*	*Hispanics or Latinos in 2000 (%)*	*All Other Races Combined in 2000 (%)*
United States	281,421,906	293,665,404	+4.3	0.9	12.3	75.1	12.5	9.2
North Dakota	642,200	634,366	-1.2	4.9	0.6	92.4	1.2	1.0
Burleigh County	69,416	72,585	+4.6	3.3	0.3	95.0	0.7	0.6
Emmons County	4,331	3,913	-9.7	0.1	data not available	99.1	1.2	0.7
Kidder County	2,753	2,563	-6.9	0.1	0.2	99.5	0.6	0.1

*The total percentage for the population based on racial backgrounds may appear to be more or less than 100 percent. This is due to the fact that Hispanics/Latinos may fall under different categories because their self-identity may be based on language and heritage rather than race or color alone.

Table 4. Demographics and Income

	Land Area (square miles)	*Persons per Square Mile in 2000*	*Households in 2000*	*Home Ownership Rate in 2000 (%)*	*Median Value of Owner-Occupied Housing in 2000 ($)*	*Median Household Income in 1999 ($)*	*Per Capita Money Income in 1999 ($)*	*Persons Below Poverty Line in 1999 (%)*
United States	3,537,438	79.6	105,480,101	66.2	119,600	41,994	21,587	12.4
North Dakota	68,976	9.3	257,152	66.6	74,400	34,604	17,769	11.9
Burleigh County	1,633	42.5	27,670	68.0	98,900	41,309	20,436	7.8
Emmons County	1,510	2.9	1,786	83.4	37,000	26,119	14,604	20.1
Kidder County	1,351	2.0	1,158	81.7	33,400	25,389	14,270	19.8

Table 5. Income and Employment*

County	*Per Capital Personal Income (PCPI)*	*Total Personal Income (TPI)*	*Components of Total Personal Income (TPI)*	*Earnings by Place of Work*
Burleigh County	In 2004 PCPI was $32,729. This PCPI ranked 4th in the State and was 111% of the State average ($29,494) and 99% of the national average ($33,050). The 2004 PCPI reflected an increase of 6.0% from 2003. The 2003–2004 State change was 2.3% and the national change was 5.0%. In 1994 the PCPI was $20,593 and ranked 8th in the State. The 1994–2004 average annual growth rate of PCPI was 4.7%. The average annual growth rate for the State was 4.5% and for the nation was 4.1%.	In 2004 TPI was $2,374,950. This TPI ranked 2nd in the State and accounted for 12.7% of the State total. In 1994 the TPI was $1,331,097 and ranked 3rd in the State. The 2004 TPI reflected an increase of 7.2% from 2003. The 2003–2004 State change was 2.8% and the national change was 6.0%. The 1994–2004 average annual growth rate of TPI was 6.0%. The average annual growth rate for the State was 4.4% and for the nation was 5.2%.	In 2004 net earnings accounted for 71.2% of TPI (compared with 69.5 in 1994); dividends, interest, and rent were 15.7% (compared with 17.7 in 1994); and personal current transfer receipts were 13.1% (compared with 12.9 in 1994). From 2003–2004 net earnings increased 8.1%; dividends, interest, and rent increased 4.0%; and personal current transfer receipts increased 6.5%. From 1994–2004 net earnings increased on average 6.2% each year; dividends, interest, and rent increased on average 4.7%; and personal current transfer receipts increased on average 6.1%.	Earnings of persons employed in Burleigh increased from $1,884,445 in 2003 to $2,047,484 in 2004, an increase of 8.7%. The 2003–2004 State change was 3.1% and the national change was 6.3%. The average annual growth rate from the 1994 estimate of $1,110,565 to the 2004 estimate was 6.3%. The average annual growth rate for the state was 4.7% and for the nation was 5.5%.
Emmons County	In 2004 PCPI was $24,175. This PCPI ranked 41st in the State and was 82% of the State average, $29,494, and 73% of the national average, $33,050. The 2004 PCPI reflected an increase of 0.5% from 2003. The 2003–2004 State change was 2.3% and the national change was 5.0%. In 1994 the PCPI of Emmons was $14,450 and ranked 47th in the State. The 1994–2004 average annual growth rate of PCPI was 5.3%. The average annual growth rate for the State was 4.5% and for the nation was 4.1%.	In 2004 TPI was $95,006. This TPI ranked 31st in the State and accounted for 0.5% of the State total. In 1994 the TPI of Emmons was $66,224 and ranked 33rd in the State. The 2004 TPI reflected a decrease of 1.6% from 2003. The 2003–2004 State change was 2.8% and the national change was 6.0%. The 1994–2004 average annual growth rate of TPI was 3.7%. The average annual growth rate for the State was 4.4% and for the nation was 5.2%.	In 2004 net earnings accounted for 50.3% of TPI (compared with 53.1% in 1994); dividends, interest, and rent were 26.1% (compared with 24.2% in 1994); and personal current transfer receipts were 23.6% (compared with 22.6 in 1994). From 2003–2004 net earnings decreased 5.6%; dividends, interest, and rent increased 1.0%; and personal current transfer receipts increased 4.9%. From 1994–2004 net earnings increased on average 3.1% each year; dividends, interest, and rent increased on average 4.4%; and personal current transfer receipts increased on average 4.1%.	Earnings of persons employed in Emmons decreased from $55,200 in 2003 to $52,837 in 2004, a decrease of 4.3%. The 2003–2004 State change was 3.1% and the national change was 6.3%. The average annual growth rate from the 1994 estimate of $38,479 to the 2004 estimate was 3.2%. The average annual growth rate for the State was 4.7% and for the nation was 5.5%.

Table 5. Income and Employment*

County	*Per Capital Personal Income (PCPI)*	*Total Personal Income (TPI)*	*Components of Total Personal Income (TPI)*	*Earnings by Place of Work*
Kidder County	In 2004 PCPI was $26,186. This PCPI ranked 31st in the State and was 89% of the State average, $29,494, and 79% of the national average, $33,050. The 2004 PCPI reflected an increase of 6.4% from 2003. The 2003 TPI includes net earnings by place of residence; dividends, interest, and rent; and personal current transfer receipts received by the residents of Kidder. 2004 State change was 2.3% and the national change was 5.0%. In 1994 the PCPI of Kidder was $14,697 and ranked 45th in the State. The 1994-2004 average annual growth rate of PCPI was 5.9%. The average annual growth rate for the state was 4.5% and for the nation was 4.1%.	In 2004 TPI was $67,035. This TPI ranked 39th in the State and accounted for 0.4% of the State total. In 1994 the TPI was $45,383 and ranked 45th in the State. The 2004 TPI reflected an increase of 5.0% from 2003. The 2003–2004 State change was 2.8% and the national change was 6.0%. The 1994–2004 average annual growth rate of TPI was 4.0%. The average annual growth rate for the State was 4.4% and for the nation was 5.2%.	In 2004 net earnings accounted for 58.1% of TPI (compared with 52.7% in 1994); dividends, interest, and rent were 19.9% (compared with 24.4% in 1994); and personal current transfer receipts were 22.1% (compared with 23.0% in 1994). From 2003–2004 net earnings increased 7.0%; dividends, interest, and rent increased 1.0%; and personal current transfer receipts increased 3.5%. From 1994–2004 net earnings increased on average 5.0% each year; dividends, interest, and rent increased on average 1.9%; and personal current transfer receipts increased on average 3.6%.	Earnings of persons employed in Kidder increased from $35,611 in 2003 to $38,107 in 2004, an increase of 7.0%. The 2003–2004 State change was 3.1% and the national change was 6.3%. The average annual growth rate from the 1994 estimate of $24,373 to the 2004 estimate was 4.6%. The average annual growth rate for the State was 4.7% and for the nation was 5.5%.

*All income estimates, with the exception of PCPI, are in thousands of dollars, not adjusted for inflation. Total personal income includes net earnings by place of residence; dividends, interest, and rent; and personal current transfer receipts received by the residents of that county.

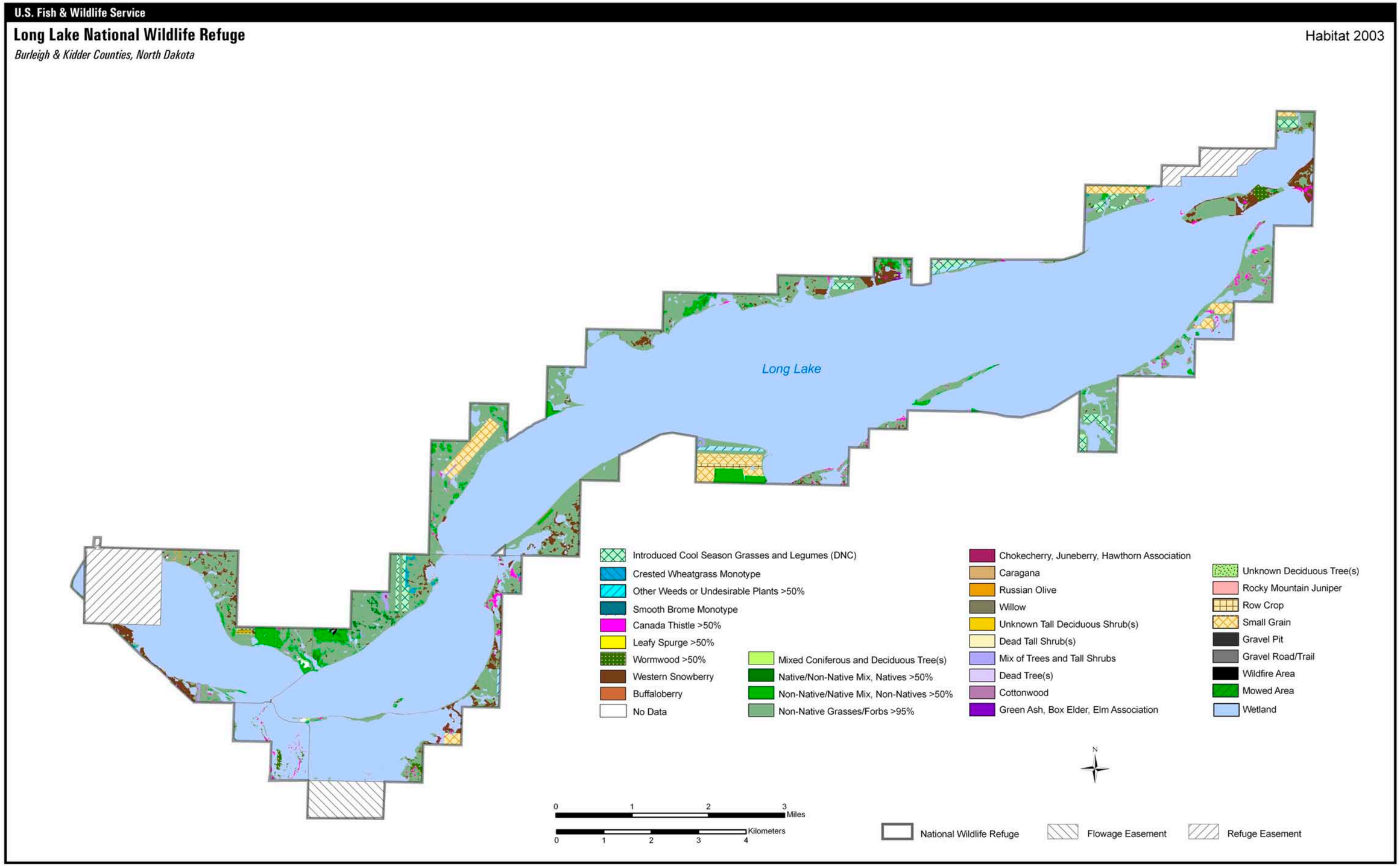


Figure 11: Long Lake National Wildlife Refuge Habitat (2003)

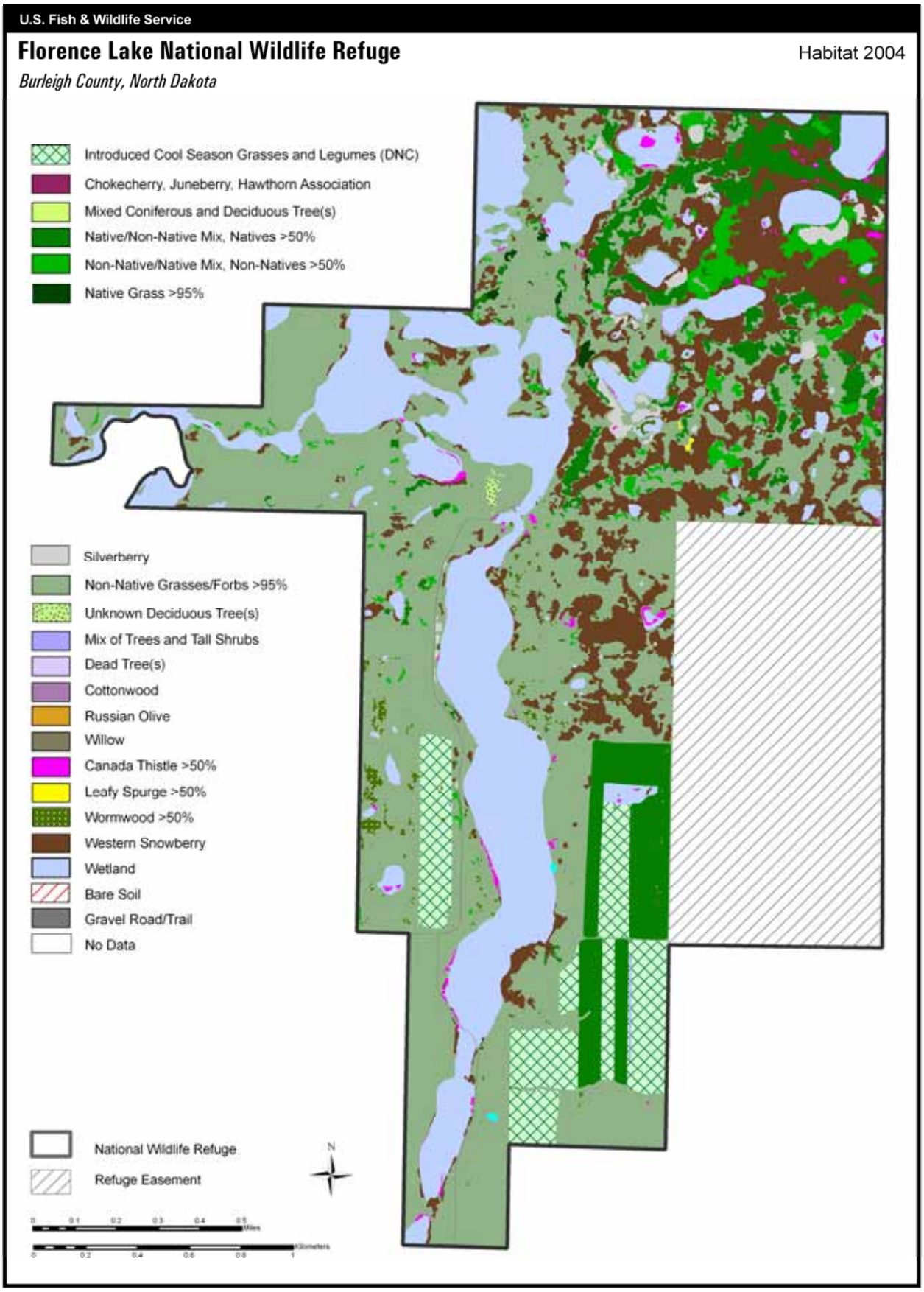


Figure 12: Florence Lake National Wildlife Refuge Habitat

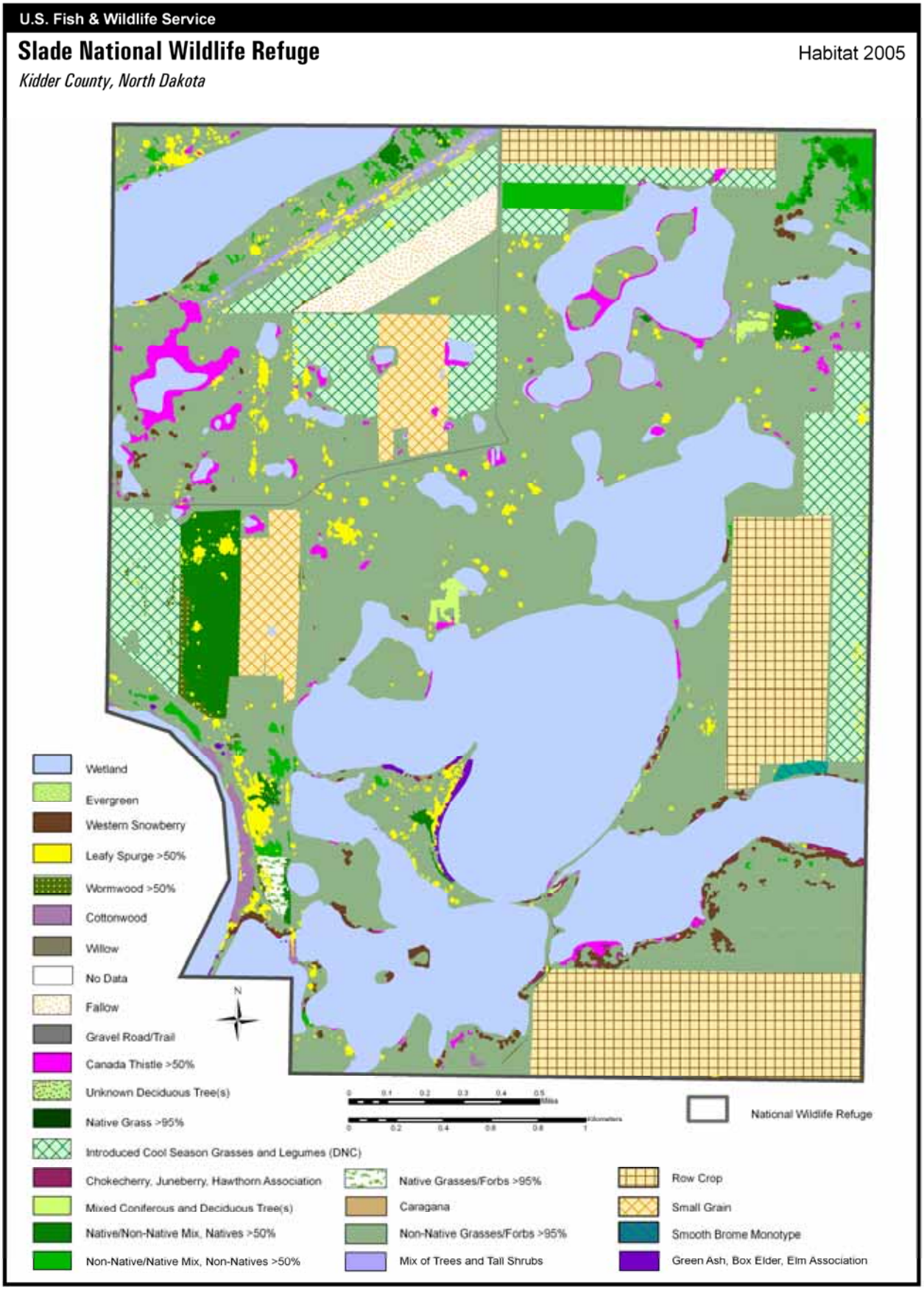


Figure 13: Slade National Wildlife Refuge Habitat

Chapter 5. Environmental Consequences

This chapter discusses environmental consequences, which may result from carrying out the actions of each of the four alternatives. For a better understanding of why these effects may occur, refer to chapters 3 and 4. A description of resource conditions and interactions can be found in Chapter 4: Affected Environment. Chapter 3 (Alternatives) presents management objectives and strategies for each alternative, which could create the consequences described here.

This chapter discusses the effects of each alternative. The issues addressed were identified during the public scoping process as primary areas of concern to the public. For a more comprehensive list of impacts to each resource see tables 6.1-6.6 at the end of this chapter.

Effects Common to all Alternatives

All alternatives would have the same impacts related to air quality, environmental justice, and socioeconomics, as described below.

Air Quality

No adverse effects on air quality are expected. Short-term effects on air quality from prescribed burning on the refuge should not vary significantly among any of the alternatives.

Environmental Justice

None of the alternatives considered would pose adverse environmental effects on minority or low-income populations. There is no fee to enter the refuges; they are open to everyone.

Socioeconomic Impacts

Economic impacts are typically measured in terms of numbers of jobs lost or gained and the associated result on income. None of the alternatives would significantly impact the economics of the local area.

Summary of Effects by Alternative

The following section and tables provide an analysis of effects resulting from the four alternatives.

ALTERNATIVE A—No Action

Wildlife and Habitat Management

Developed Wetlands

Continuing the current water management regime would reduce the potential for a botulism outbreak and dramatically lessen the severity of one, if it occurred. While other resource benefits may occur as a result of this management, they are not the primary target of water management planning and annual operations.

In the smaller Long Lake NWR impoundments, which are independent of Long Lake proper, the Service anticipates a positive impact on one or more of the following: waterfowl production, shorebird migration, waterfowl and sandhill crane migration, and production of wetland plant and animal foods.

Impoundments in the wetland management districts would continue to be managed in drawdown to simulate natural cycles of wetlands, and would therefore maintain high levels of productivity.

Wetlands without Water Control Structures

Since these wetlands are dependent on climactic conditions (i.e., periods of drought and deluge) it is not possible to tell what impacts would occur.

The Service's management of these wetlands will continue to consists of 1) maintaining perennial grass cover around their perimeters to minimize negative anthropogenic impacts (i.e., sedimentation); 2) allowing prescribed fire and permit grazing to consume wetland vegetation for the purpose of either nutrient recycling or noxious weed control, and; 3) actively managing noxious weed infestations (e.g., Canada thistle) in dry wetland basins or wetland edge areas.

Native Upland Habitats (including woody species)

As a result of this alternative the refuge would see a decrease in the number of invasive native and nonnative plants (including exotic plants) and shrubs and an increase in the growth of native plant species.

This effort would affect approximately 2,500 acres per year, altogether.

Disturbed Upland Habitats
Converting disturbed upland habitat to a cleaner, more natural habitat would increase the ability of migratory birds to use it as a nesting habitat

Nonnative Trees and Shrubs
The removal of volunteer trees and shrubs from grassland areas to retain the native, early-successional character of mixed-grass prairie would benefit grassland-dependent migratory birds (e.g., Baird's sparrow, marbled godwit, northern pintail). Additionally, the removal of select sentinel trees that serve as perches for various raptors (e.g., great horned owl, red-tailed hawk) would continue to have a positive impact on both migratory bird-nesting habitats and migratory concentration areas.

Predator Management
Maintaining the current level of predator management would allow the Service to continue targeting predators which harm wildlife, infrastructure and cause predation problems for adjacent landowners.

The Service's partnership with trappers does not have as great an impact on predators as is ideal because trappers are interested in predators only during periods when their fur is of value; however, this generally occurs in fall and winter when removal of predators is less effective in managing their populations than during the nesting season.

Wildlife Disease
Under this alternative, the Service's aggressive approach to monitoring and managing disease outbreaks, along with its water management agenda, would greatly lessen the possibility of disease outbreaks and dramatically lessen their severity, if they occur.

Public Use, Education, and Interpretation

Hunting
The hunting program on Service lands in the complex would continue to be valued as one of the six priority public uses and would provide hunters with ample opportunity to hunt without compromising Refuge System mission and goals.

Fishing
The fishing program on Service lands in the complex would continue to be valued as one of the six priority public uses and would provide fishermen/women with ample opportunity to fish without compromising Refuge System mission and goals.

Environmental Education and Interpretation
The environmental education and interpretation program on Service lands in the complex would continue to be valued as priority public uses and would provide visitors with ample opportunity to learn about the refuges.

Wildlife Observation and Photography
Wildlife observation and photography on Service lands in the complex would continue to be valued as priority public uses and will provide visitors with ample opportunity to learn about the refuges.

Trapping
This alternative would maintain the trapping program at its existing level and would, therefore, provide limited assistance to predator management.

Research and Monitoring

Wildlife and Habitat
By maintaining the current level of monitoring, inventory, and research, Service staff would continue to be able to use available information and sound science to make informed management decisions.

Socioeconomics
Under this alternative, research and monitoring of current socioeconomic conditions at the complex and in the communities surrounding the complex would continue to be negligible and would result in missed opportunities to educate the public on the purposes of the complex, the mission of the Refuge System, or to create new opportunities for partnerships, friends groups, and volunteers to the complex.

Cultural Resources
The Service would continue to place a high priority on documenting and protecting new cultural resources as they are found. Staff would also protect existing known resources from vandalism, theft, and destruction. Sites with historical significance would continue to be properly maintained and preserved.

Refuge Operations

Staffing
This alternative maintains staffing at existing levels (currently 8.8 FTEs). See table 1 for current staffing.

Operations and Maintenance
This alternative would continue with the current level of operations and maintenance, including the maintenance of equipment and vehicles in good working conditions to achieve management goals. Staff would continue to operate with available funding and resources.

Infrastructure
This alternative maintains infrastructure at current levels. For complete list of assets see table 1.

Partnerships
Existing partnerships allow complex staff to accomplish much more than they could in the absence of partnerships. Partnerships enable complex staff improved capabilities with respect to: 1) land acquisition; 2) research, monitoring, and inventory efforts; 3) outreach and public use activities, and; 4) habitat management activities.

ALTERNATIVE B—Natural Processes Management

Wildlife and Habitat Management

Developed Wetlands
The water management actions of alternative B would potentially result in a reduction in the degree that Long Lake's hydrology is altered; This, in turn, should increase the overall longevity of the system with regard strengthening its ability to provide suitable habitat for a variety of wetland-dependent wildlife and also improve other crucial wetland functions (e.g., groundwater recharge, nutrient cycling). Measurable changes to the system should be seen in decreased salinity, sedimentation, and dissolved solid accrual. A reduced ability to support fish would benefit Long Lake with respect to the reduction or elimination of turbidity problems caused by exotic roughfish (i.e., common carp).

There are also potential negative impacts to developed wetlands. The lower water levels and lack of management capability that will result from the removal of WCSs on Long Lake would decrease the Service's ability to manage botulism outbreaks. The removal of WCS on Long Lake NWR and throughout the wetland management district would also reduce the Service's creative ability to managing the habitat for specific bird groups (e.g., shorebirds), as well as result in reduced acreage of managed semi-permanent wetlands. Another result of this management would be a reduced flood attenuation ability of the system.

Performing these actions would not only require an initial funding increase, but also may also require the acquisition of outlet and discharge permits. It is expected that the frequency with which Long Lake experiences drought conditions would increase, due to the Service's lack of ability to impound water. Lack of water storage capabilities would also impact what is currently a marginal fishery at Long Lake. A reduced ability to support fish would benefit Long Lake with respect to the reduction or elimination of turbidity problems caused by exotic roughfish (i.e., common carp). Finally, the lower mean water levels on Long Lake would result in an earlier mean freeze-up date, effectively changing Long Lake's capacity as a stopover and/or staging area for fall migrating waterfowl.

In addition to paralleling the activities outlined in alternative A, this alternative will explore the option of removing nonwetland substrate (via dredging) from wetlands that the Service determines to be heavily impacted by sedimentation.

Wetlands without Water Control Structures
Through these actions there is potential to increase wetland productivity (i.e., invertebrate and plant diversity), as well as improve overall wetland function (e.g., groundwater recharge, nutrient cycling, flood attenuation). Ultimately, these actions would help reverse or stall a trend of degradation and promote long-term system sustainability. Because of the increased wetland productivity that is possible through the implementation of these actions, it would be possible to support a greater diversity of wetland-dependent wildlife. Increased funding would be necessary to complete the dredging activities outlined in this alternative.

Native Upland Habitats (including woody species)
There is potential to increase acreage of native grasses and forbs, which would result in a corresponding decrease in acreage of nonnative grasses and forbs. The coverage of invasive native low shrubs (i.e., western snowberry, silverberry) would also be limited. Once some degree of success

is achieved, it is likely that, through continued management, the degree of future invasion would be minimized. A corresponding positive vegetative response would result in an improved breeding habitat condition for most native grassland-dependent species in the south-central portion of the State. This would increase nest densities and nest success for bird species. Potential would exist for less favorable breeding habitat conditions for certain species (e.g., clay-colored sparrow, exotic bird species). Because this alternative lacks structural criteria (e.g., height-density) for certain wildlife species or groups, its objectives (species composition-based) would likely be more achievable. Increased funding would be necessary to cover restoration and maintenance costs.

Disturbed Upland Habitats
There is potential to convert areas that are presently dominated by nonnative grasses and forbs to a native grass and forb-dominated vegetative community. Crop fields and DNC fields would be phased out and eventually eliminated from uplands within the complex. Once some degree of success is achieved it is likely that, through continued management, the degree of future invasion would be minimized. Additionally, habitat fragmentation would be reduced, as well at overall acreage of noxious weed species (e.g., leafy spurge, Canada thistle, absinth wormwood). Accomplishment of the above actions with a corresponding positive vegetative response would result in an improved breeding habitat condition for most native grassland-dependent species in the south-central part of the State. This would increase nest success and nest densities for bird species. Potential would exist for less favorable breeding habitat condition for certain species. Because this alternative lacks structural criteria (e.g., height-density) for certain wildlife species or groups, its objectives (species composition-based) are likely more achievable.

Nonnative Trees and Shrubs
The reduction of nonnative trees and shrubs would lead to a reduced invasion of nonnative flora. Breeding habitat would be improved for grassland-dependent bird species, including improved recruitment and overall abundance. Additionally, this management would promote more balanced predator/prey relationships through reduced predation rates (due to less fragmented habitats) and less favorable year-round habitat for certain problematic nest predators (e.g., skunk, raccoon). Negative effects would include degraded habitat conditions for arboreal bird species (e.g., yellow warbler, black-billed cuckoo, willow flycatcher), as well as for the winter habitat of resident-bird species (e.g., ring-necked pheasant, sharp-tailed grouse). Elimination of nonnative tree and shrub plantings would also reduce the edge habitat favored by parasitic brown-headed cowbirds.

With regard to public use, these management activities could cause reduced hunting opportunities for deer and pheasants due to the loss of tree/shrub habitat. Therefore, any activities that involve the removal of trees (native or nonnative) are often controversial. Additionally, increased funding would be necessary to conduct these intensive management activities.

Predator Management
The actions in this alternative would promote improved breeding habitat conditions for grassland-nesting bird species (e.g., Baird's sparrow, northern pintail, marbled godwit), including improved recruitment and increased abundance. Trapping would result in a decreased in nest predators (e.g., skunks, red fox, raccoon), but could also result in artificially high populations of small mammals (e.g., shrew, vole) due to the removal of mid-sized predators. Removal of trees would result in less favorable habitat conditions for certain wildlife species (i.e., breeding arboreal birds, wintering deer and resident bird species). Increased funding would be necessary to conduct trapping and habitat restoration activities.

Wildlife Disease
The actions in this alternative could potentially cause an increased severity, longevity, and frequency of various disease outbreaks, resulting in reduced net recruitment and population size of various waterbird species (e.g., northern pintail, Wilson's phalarope, Franklin's gull). Lack of an active disease response could also send a negative message to the public (e.g., a passerby who notices concentrations of dead waterfowl in a Service-owned wetland along a roadway for an extended period of time). Conversely, lack of disease response would reduce time constraints on complex staff, as well as reduce annual funding needs.

Priority Population Issues
The above actions will potentially result in improved habitat and protection conditions for these priority wildlife species. The re-directed survey effort for piping plovers will help us locate

Service wetlands that were previously unknown to harbor breeding piping plovers, with a limited amount of effort. Piping plover habitat enhancement and nest protection efforts will potentially increase overall piping plover recruitment on lands in the complex. The enhanced protection efforts for fall migrant whooping cranes that utilize Service lands will reduce overall disturbance and the likelihood of accidental shootings. Initiation of systematic Dakota skipper surveys on priority lands in the complex, as well as an assessment of habitat conditions with respect to Dakota skipper habitat requirements will give us a better indication of whether this candidate species does occur on Service lands within the complex. The implementation of management guidelines will ensure that our upland management activities are not negatively affecting Dakota skippers on lands we determine to have suitable habitat.

Public Use, Education and Interpretation

Hunting
The actions in this alternative would potentially decrease hunting opportunities for certain species (e.g., white-tailed deer), and potentially increase hunting opportunities for other species (e.g., ring-necked pheasant, gray partridge, coyote). Possible liberalized season frameworks for certain species (e.g., ring-necked pheasants) might conflict with other hunting seasons (e.g., archery deer), as well as other wildlife management objectives (e.g., sanctuary for staging waterfowl). Implementation of a predator hunting season could potentially improve recruitment rates for waterfowl and other breeding bird species, depending on predator harvest levels. However, a predator hunting season, as well as other expanded hunting seasons would necessitate an increased law enforcement presence. Reduced trail access could impede hunters with limited mobility, but would also result in an improved hunt quality for many hunters due to restricted motor vehicle use.

Fishing
The elimination of boating would result in reduced disturbance to waterbirds and other wetland-dependent wildlife. However, it would also reduce the opportunity to participate in one of the six priority public-use activities.

Environmental Education and Interpretation
This alternative would result in an improved public understanding of the south-central portion of the State's natural history, wildlife biology, the history and qualities of complex lands, and the mission of the Refuge System. This alternative would also provide a more natural experience for visitors. It would limit the amount of habitat impact caused by public-use activities and subsequently would avoid most compatibility concerns associated with facility and/or program development.

Wildlife Observation and Photography
Same as alternative A.

Trapping
Same as alternative A.

Research and Monitoring

Wildlife and Habitat
The Service would improve its understanding of upland management (e.g., burning, grazing, haying) effects on vegetative composition and structure throughout complex. It would also understand better how wetland management activities on Long Lake NWR affect the system's hydrology, water chemistry, and overall productivity.

Additionally, because this alternative would increase the extent of land being monitored for upland vegetation change (i.e., permanent belt transect establishment), it would result in an improved understanding of wildlife response to the Service's management activities. This, in turn, would correspond to better management decisions that target specific wildlife objectives. The end result would be improved habitat throughout the complex and a better ability to maintain and improve recruitment of various wildlife populations. Additionally, the Service would gain a better understanding of how human disturbance affects various wildlife groups. This would give the Service the opportunity to adjust public-use activities for the benefit of targeted wildlife species.

Socioeconomics
The availability and analysis of data on public uses and their wildlife-dependent recreational expenditures would allow complex staff to estimate the impact of its actions on local, municipal, and State economies and thus be able to garner support for the Refuge System. Furthermore, the data analysis would allow the Service to tailor public uses and facilities to meet the public's needs and expectations. This in turn could result in increased public participation in the complex and support for the mission of the Refuge System.

Cultural Resources
The Service would improve its knowledge of the locations and types of cultural resources on complex lands. This improved knowledge would give the Service the ability to preserve and restore various cultural resources. This alternative has the potential to improve certain aspects of the complex's habitat management, because areas of cultural concern will be identified. Additionally, this alternative increases the likelihood for more involved management schemes to protect cultural resources while accomplishing habitat management. A funding increase would accompany the actions in this alternative, to complete the inventory and cover excavation costs.

Refuge Operations

Staffing
Increased staffing would give the Service the ability to accomplish the goals and objectives of this alternative's management plans.

Operations and Maintenance
The increased resources that are requested in this alternative would allow the Service to accomplish the goals and objectives of this alternative. Increased funding for staffing, equipment, and supplies would be necessary under this alternative.

Infrastructure
The additional infrastructure that is requested in this alternative would allow the Service to accomplish the goals and objectives associated with other elements (e.g., wildlife and habitat management, public use, education and interpretation, research and monitoring) of this alternative. Increased funding for the construction of new infrastructure and the purchase of equipment and supplies would be necessary to meet the goals of this alternative.

Partnerships
Expanded partnerships would increase the Service's ability to restore altered ecosystems and habitats. It would also result in improved relationships with a greater number of private landowners, government agencies, and nongovernmental organizations. However, the increased partner load would create increased time constraints on complex staff. Additionally, the potential exists to alienate partners who have other ideas or motives that do not parallel the goals and objectives of this alternative.

Increased funding will be necessary in order to complete the new programs associated with the additional partnerships.

ALTERNATIVE C—Single Wildlife Group-level Intensive Management

Wildlife and Habitat Management

Developed Wetlands
Increased water management capabilities on Long Lake will improve the Service's ability to prevent and manage botulism outbreaks. It would also improve its ability to provide ideal habitat for a particular wildlife group (e.g., waterfowl). This includes the use of drawdowns to increase wetland productivity on portions of Long Lake and managed wetlands throughout the wetland management district. Additionally, Long Lake's flood attenuation capabilities have the potential to be enhanced through these actions. Performing these actions would not only require a long-term funding increase, but could also require the acquisition of permits related to water discharge and/or construction. These actions would likely give the Service tremendous flexibility with regard to dealing with periods of drought at Long Lake. Similarly, the Service would have a great deal of flexibility in managing Long Lake's fishery, including associated turbidity problems. Finally, the increased ability to maintain high water levels on Long Lake would result in flexibility related to fall freeze-up date, depending on the wildlife group that is steering water management.

Conversely, where intensive wetland management (i.e., impoundments) continues, or is further developed at Long Lake NWR, the Service expects continued and possibly accelerated alteration of the hydrology of Long Lake, which raises concerns about system sustainability.

Wetlands without Water Control Structures
There is potential to increase wetland productivity (i.e., invertebrate and plant diversity) through various management actions (i.e., drawdowns, dredging). Because of the increased wetland productivity and increased management flexibility that is possible through the implementation of these actions, it would be possible to provide ideal habitat for a specific wildlife group (e.g., shorebirds).

On wetlands that are managed via WCSs, however, there is potential for altered hydrology, which may lead to a reduction in system sustainability, in the

form of increased sedimentation, conductivity, and dissolved solids accrual. Conversely, on those wetlands selected for dredging, the Service could see a reversed trend of degradation, and improved wetland function and sustainability.
Increased funding would be necessary for dredging activities, construction of WCSs and associated infrastructure, as well as annual operation and periodic maintenance.

Native Upland Habitats (including woody species)
The actions in this alternative would target improved breeding conditions for a specific wildlife group (e.g., grassland passerines). Through these actions there is potential to increase acreage of native grasses and forbs, which would result in a corresponding decrease in acreage of nonnative grasses and forbs. However, there is also potential to promote any productive habitat type if it benefits the target wildlife group. Therefore, if the target wildlife group's most suitable habitat consists of nonnative vegetation, little would be done to preserve native tracts. Potential exists for less favorable breeding-habitat condition for certain species that are not a part of the target wildlife group. Under this alternative, vegetative structure (i.e., height-density, litter depth) would be taken into consideration, in addition to species composition, when setting objectives for a particular wildlife group.

Increased funding would be necessary to cover the costs of intensive habitat management.

Disturbed Upland Habitats
This alternative's actions would target improved breeding conditions for a specific wildlife group (e.g., waterfowl). Through these actions there is potential to increase acreage of native grasses and forbs, or conversely increase the acreage of nonnative cover types (e.g., cropland, DNC) depending on the target-species group. Potential exists for less favorable breeding habitat conditions for certain species that are not a part of the target wildlife group. Consequences include possible increased fragmentation, noxious weed acreage, and invisibility of lands managed by the complex. Additionally, certain management practices may not maximize the land to its fullest wildlife potential. Under this alternative, vegetative structure (i.e., height-density, litter depth) would be taken into consideration, in addition to species composition, when setting objectives for a particular wildlife group. Increased funding would be necessary to cover restoration and maintenance costs.

Nonnative Trees and Shrubs
Habitat changes could occur in two completely different directions depending on the target wildlife group (e.g., waterfowl). If nonnative trees and shrubs are removed the amount of contiguous grassland habitat would be increased, and the reduction of nonnative microclimates would lead to less overall invasion of nonnative flora. Breeding habitat would be improved for grassland-dependent bird species, including improved recruitment and overall abundance. Habitat conditions for arboreal bird species (e.g., yellow warbler, black-billed cuckoo, willow flycatcher) would be degraded, as well as winter habitat for resident bird species (e.g., ring-necked pheasant, sharp-tailed grouse). Elimination of nonnative tree and shrub plantings would also reduce the edge habitat favored by parasitic brown-headed cowbirds. Additionally, this management would promote more balanced predator/prey relationships through reduced predation rates (due to less fragmented habitats) and less favorable year-round habitat for certain problematic nest predators (e.g., skunk, raccoon).

With regard to public use, these management activities could cause reduced hunting opportunities for deer and pheasants due to the loss of tree/shrub habitat. Therefore, any activities that involve the removal of trees (native or nonnative) are often controversial.

Additionally, increased funding would be necessary to conduct these intensive management activities.

Conversely, if the habitat needs of the focus wildlife group warrant that existing trees and shrubs are left intact and possible additions of more trees and shrubs would be beneficial, then an entirely different suite of habitat, wildlife, and public-use impacts would prevail. Through additional shrub plantings, suitable habitat areas would be increased for breeding arboreal birds, as well as several resident wildlife species (e.g., white-tailed deer, ring-necked pheasants) during the winter. Additional plantings of nonnative trees and shrubs would reduce the acreage of native flora, as well as increase the degree site fragmentation and invisibility adjacent to new plantings. Amount of edge habitat would be increased, promoting the occurrence of parasitic brown-headed cowbirds. Additionally, the number and overall acreage of microclimates suitable for problem nest predators

would be increased, further exacerbating the problem of high nest predation rates. Breeding habitat conditions would be degraded for several bird groups (e.g., grassland passerines, upland nesting shorebirds, waterfowl).

With regard to public use, these management activities provide additional hunting areas for deer and pheasants due to the increase of tree/shrub habitat. Conversely, the birding community would likely see a loss in bird species diversity and diminished birdwatching experience.

Additionally, increased funding would be necessary to conduct tree and shrub planting.

Predator Management
The actions in this alternative would promote improved breeding habitat conditions for a particular group of ground and over-water nesting birds, including improved recruitment and increased abundance. Trapping would result in a decreased abundance of nest predators (e.g., skunks, red fox, raccoon), but may also result in artificially high populations of small mammals (e.g., shrew, vole) due to the removal of mid-sized predators. Removal of trees would result in less favorable habitat conditions for certain wildlife species (i.e., breeding arboreal birds, wintering deer and resident bird species). Additionally, the "large-block" trapping component of this alternative would include partner (e.g., Delta Waterfowl Foundation) and private landowner involvement and would hold the potential for improved Service/private landowner relations throughout portions of the complex. Increased funding would be necessary to conduct "large-block" intensive trapping and habitat management activities.

Wildlife Disease
With respect to botulism, the actions in this alternative could potentially reduce the severity, longevity, and frequency of outbreaks, resulting in an increased net recruitment and population size of various waterbird species (e.g., northern pintail, Wilson's phalarope, Franklin's gull) as compared to the no- action alternative.

The complex staff's present disease response plan would be evaluated and, if necessary, improved. Increased funding to conduct research would initially be necessary, with the possibility of a long-term reduction in complex staff time and funding needs, depending on research results and management implications. Also, if research conclusions recommend a "no action" response to botulism outbreaks, a negative message might indirectly be sent to the public (e.g., a passerby who notices concentrations of dead waterfowl in a Service-owned wetland for an extended period of time). Research conclusions would also likely result in improved use of staff time and funding.

Priority Population Issues
Same as alternative B.

Public Use, Education, and Interpretation

Hunting
The expanded hunting opportunities would potentially conflict with other recreational uses (e.g., birdwatching, photography) and/or wildlife management objectives. Additionally, the increased vehicle access proposed in this alternative would potentially reduce the quality of the experience for other hunters. Certain complex visitors might feel that the presence of hunting structures (i.e., blinds, stands) detracts from the naturalness of complex lands. The expansion of hunting areas and season would require an increased law enforcement presence. Increased funding would be necessary to pay for the increase law enforcement, to conduct special hunting programs (e.g., physically challenged hunts), improve existing and/or develop new roads/trails and hunting structure construction.

Fishing
Increased boat traffic would lead to greater disturbance to waterbirds and other wetland-dependent wildlife. The increase in fishing activity throughout the complex would also result in potential habitat degradation (e.g., littering, injection of motor fuels into water) and a need for increased law enforcement. Stocking of fish would create potential competition for the invertebrate resource between stocked fish and waterbirds. Conversely, this alternative would result in an increased opportunity to participate in one of the six priority public uses. A substantial increase in funding would be necessary for construction of boat ramps and access routes, docks, interpretive signage and materials, and an increased law enforcement presence.

Environmental Education and Interpretation
The public would gain an improved understanding of this area's (south-central North Dakota) natural history, wildlife biology, the history and qualities of

complex lands, and the mission of the Refuge System. The Service would have the ability to host larger, more diverse groups of visitors due to new facilities. Wildlife observation opportunities would be improved at Long Lake NWR through an auto tour route, observation deck, and new and improved educational/interpretive materials. These changes would give the complex the potential to generate greater support for future complex and Refuge System programs.

Actions outlined in this alternative would increase the potential for conflicts and disturbance to wildlife, due to increased human activity and facilities at Long Lake NWR, Slade NWR, and Small WPA. Increased funding would be needed for facility and program development, as well as possible increased operations and staffing costs.

Wildlife Observation and Photography
The improved wildlife observation opportunities at Long Lake NWR would increase the potential for conflicts and disturbance to wildlife, due to increased human activity and facilities at Long Lake NWR. Increased funding would be needed for construction of new facilities, maintenance of these facilities, and possible staff increased necessary for maintenance of these facilities and operation of the increased wildlife viewing program at Long Lake NWR.

Trapping
Same as alternative A.

Research and Monitoring

Wildlife and Habitat
The complex staff will improve its understanding of upland management's (e.g., burning, grazing, haying) effects on vegetative composition and structure throughout the complex. They will also understand better how wetland management activities on Long Lake NWR affect the system's hydrology, water chemistry, and overall productivity.

Additionally, this alternative would increase the extent of land in the complex that is being monitored for upland vegetation change (i.e., permanent belt transect establishment). Ultimately, this alternative would result in an improved understanding of wildlife responses to management activities, would allow for better management decisions that target specific wildlife objectives. The result would be improved habitat throughout the complex and a better ability for staff to maintain and improve recruitment of various wildlife populations.

With this alternative increased funding would be necessary to support research costs and additional staff.

Socioeconomics
Same as alternative B.

Cultural Resources
The actions in this alternative would improve complex staff's knowledge of the locations and types of cultural resources on complex lands. This improved knowledge would give the Service the ability to preserve and restore various cultural resources. This alternative has the potential to improve certain aspects of the Service's habitat management because areas of cultural concern would be identified. Additionally, this alternative increases the likelihood for more involved management schemes to protect cultural resources while accomplishing habitat management. A funding increase would accompany the actions in this alternative, in order to complete the inventory and cover testy excavation costs.

Refuge Operations

Staffing
The increased staffing that is requested in this alternative would provide the Service with the ability to accomplish the goals and objectives associated with other elements (e.g., wildlife and habitat management, public use, education, and interpretation, research and monitoring) of this alternative. Increased operational and maintenance funding would be necessary under this alternative.

Operations and Maintenance
The increased resources that are requested in this alternative would provide the Service with the ability to accomplish the goals and objectives associated with other elements (e.g., wildlife and habitat management, public use, education, and interpretation, research and monitoring) of this alternative. Increased funding for staffing, equipment, supplies (e.g., fuel, native grass seed) would be necessary under this alternative.

Infrastructure
The additional infrastructure that is requested in this alternative would provide staff the ability to accomplish the goals and objectives associated with

other elements (e.g., wildlife and habitat management, public use, education, and interpretation, research and monitoring) of this alternative. Increased funding for the construction of new infrastructure, including equipment, supplies, and additional staff, would be necessary.

Partnerships
Expanded partnerships would increase the Service's ability to provide quality habitat for a specific wildlife group (e.g., shorebirds), improve public-use opportunities within the complex, and promote additional compatible activities. It would also result in improved relationships with a greater number of private landowners, government agencies, and nongovernmental organizations. However, the increased partner load would create increased time constraints on complex staff. Because of its single-wildlife species group focus, this alternative would potentially "split" partners, possibly alienating those who have other ideas or motives that do not parallel the goals and objectives of this alternative.
Conversely, the approach of this alternative holds increased potential to attract partners that are interested in a single wildlife group (e.g., Delta Waterfowl, Pheasants Forever). Increased funding would be necessary in order to complete the new programs associated with the additional partnerships. Furthermore, because of this alternative's strong public use interest, there is potential to involve the public in refuge operations through the utilization of a friends' group.

ALTERNATIVE D—Target Species Group-level Modified Management (Proposed Action)

Wildlife and Habitat Management

Developed Wetlands
Where intensive wetland management (i.e., WCSs) continues or is further developed at Long Lake NWR, the Service expects continued and possibly accelerated alteration of the hydrology of these wetlands, which raises issues about system sustainability. Conversely, where WCSs are removed, the Service expects some level of reduction in hydrologic alteration. Through increased development of our water management capabilities on Long Lake the Service expects to be able to better manage against botulism outbreaks, as well as have a better ability to provide ideal habitat for multiple wildlife groups (e.g., waterfowl, shorebird, colonial waterbirds). This includes the use of drawdowns to increase wetland productivity on portions of Long Lake and managed wetlands throughout the wetland management district. Additionally, Long Lake's flood attenuation capabilities have the potential to be enhanced through this alternative's actions. Performing the actions outlined in this alternative would not only require an long-term funding increase, but may also require the acquisition of permits related to water discharge and/or construction. The actions in this alternative would likely give complex staff tremendous flexibility with regard to dealing with periods of drought at Long Lake. Similarly, staff will have a great deal of flexibility in managing Long Lake's fishery, including associated turbidity problems. Finally, the increased ability to maintain high water levels on Long Lake would result in flexibility related to fall freeze-up date, depending on the wildlife group that is steering the Service's water management.

Wetlands without Water Control Structures
Where intensive wetland management (i.e., WCSs) continues or is further developed at Long Lake NWR, the Service expects continued and possibly accelerated alteration of the hydrology of these wetlands, which raises issues about system sustainability. Conversely, where WCSs are removed, the Service expects some level of reduction in hydrologic alteration. Through increased development water management capabilities on Long Lake, the Service expects to be able to better manage against botulism outbreaks, as well as have a better ability to provide ideal habitat for multiple wildlife groups (e.g., waterfowl, shorebird, colonial waterbirds). This includes the use of drawdowns to increase wetland productivity on portions of Long Lake and managed wetlands throughout the district. Additionally, Long Lake's flood attenuation capabilities have the potential to be enhanced through this alternative's actions. Performing the actions outlined in this alternative would not only require a long-term funding increase, but may also require the acquisition of permits related to water discharge and/or construction. The actions in this alternative would likely give complex staff tremendous flexibility with regard to dealing with periods of drought at Long Lake. Similarly, staff would have a great deal of flexibility in managing Long Lake's fishery, including associated turbidity problems. Finally, the increased ability to maintain high water levels on Long Lake would result in flexibility related to fall freeze-up date, depending on the wildlife group that is steering the Service's water management.

Through these actions, there is potential to increase wetland productivity (i.e., invertebrate and plant diversity) through various management actions (i.e., drawdowns, dredging). Because of the increased wetland productivity and increased management flexibility that is possible through the implementation of these actions, it would be possible to provide ideal habitat for multiple wildlife groups (e.g., shorebirds, wading birds, waterfowl). However, on wetlands that the Service selects to be managed via WCSs, there is potential for altered hydrology, which may lead to a reduction in system sustainability, in the form of increased sedimentation, conductivity, and dissolved solids accrual. Conversely, on those wetlands selected for dredging, the Service may see a reversed trend of degradation, and improved wetland function and sustainability. Increased funding would be necessary for dredging activities, construction of WCSs and associated infrastructure, as well as annual operation and periodic maintenance costs.

Native Upland Habitats (including woody species)
Through these actions there is potential to increase acreage of native grasses and forbs, which would result in a corresponding decrease in acreage of nonnative grasses and forbs. This alternative would also limit the coverage of invasive native low shrubs (i.e., western snowberry, silverberry). Once some degree of success is achieved regarding the above impacts, it is likely that, through continued management, the degree of future invasion would be minimized to a certain degree. Accomplishment of the above actions with a corresponding positive vegetative response would result in an improved breeding habitat condition for the wildlife groups represented by our selected indicator species. This relates ultimately to increased nest success and nest densities for these wildlife groups. Potential does exist for less favorable breeding habitat condition for certain species (e.g., clay-colored sparrow, exotic bird species). These actions would provide somewhat of a structural mosaic on the landscape.

Disturbed Upland Habitats
Through these actions there is potential to increase acreage of native grasses and forbs, which would result in a corresponding decrease in acreage of nonnative grasses and forbs. Once some degree of success is achieved regarding the above impacts, it is likely that, through continued management, the degree of future invasion would be minimized to a certain extent. Additionally, habitat fragmentation and noxious weed acreage would both be reduced. Accomplishment of the above actions with a corresponding positive vegetative response would result in an improved breeding habitat condition for wildlife groups represented by our selected indicator species. Ultimately, this relates to increased nest success and nest densities for the various bird groups. These actions would provide somewhat of a structural mosaic on the landscape and ultimately allow for more efficient management.

Nonnative Trees and Shrubs
Habitat changes incurred through the implementation of the actions outlined in this alternative could go in two completely different directions depending on the target wildlife group (e.g., waterfowl).

If nonnative trees and shrubs are removed the amount of contiguous grassland habitat would be increased, and the reduction of nonnative microclimates would lead to less overall invasion of nonnative flora. Breeding habitat would be improved for grassland-dependant bird species, including improved recruitment and overall abundance. Habitat conditions for arboreal bird species (e.g., yellow warbler, black-billed cuckoo, willow flycatcher) would be degraded, as well as winter habitat for resident bird species (e.g., ring-necked pheasant, sharp-tailed grouse). Elimination of nonnative tree and shrub plantings would also reduce the edge habitat favored by parasitic brown-headed cowbirds. Additionally, this management would promote more balanced predator/prey relationships through reduced predation rates (due to less fragmented habitats) and less favorable year-round habitat for certain problematic nest predators (e.g., skunk, raccoon).

With regard to public use, these management activities could cause reduced hunting opportunities for deer and pheasants due to the loss of tree/shrub habitat. Therefore, any activities that involve the removal of trees (native or nonnative) are often controversial. Additionally, increased funding would be necessary to conduct these intensive management activities.

Conversely, if the habitat needs of the focus wildlife group warrants that existing trees/shrubs are left intact and possible additions of more trees/shrubs would be beneficial, then an entirely different sweet of habitat, wildlife, and public use impacts would prevail, as compared to those listed above. Through

additional shrub plantings, suitable habitat areas would be increased for breeding arboreal birds, as well as several resident wildlife species (e.g., white-tailed deer, ring-necked pheasants) during the winter. Additional plantings of nonnative trees and shrubs would reduce the acreage of native flora, as well as increase the degree of site fragmentation and invisibility adjacent to new plantings. Amount of edge habitat would be increased, promoting the occurrence of parasitic brown-headed cowbirds. Additionally, the number and overall acreage of microclimates suitable for problem nest predators would be increased, further exacerbating the problem of high nest predation rates. Breeding habitat conditions would be degraded for several bird groups (e.g., grassland passerines, upland nesting shorebirds and waterfowl). With regard to public use, these management activities provide increased additional hunting areas for deer and pheasants due to the increase of tree/shrub habitat. Conversely, the birding community would likely see a loss in bird species diversity and diminished birdwatching experience. Additionally, increased funding would be necessary to conduct tree and shrub planting.

Predator Management
The actions in this alternative would promote improved breeding habitat conditions for a suite of indicator species that represent multiple groups of ground/overwater nesting birds, including improved recruitment and increased abundance. Trapping would result in a decreased abundance of nest predators (e.g., skunks, red fox, raccoon), but may also result in artificially high populations of small mammals (e.g., shrew, vole) due to the removal of mid-sized predators. Removal of trees would result in less favorable habitat conditions for certain wildlife species (i.e., breeding arboreal birds, wintering deer and resident bird species). Landscape fragmentation would be reduced through the replanting of grass cover in areas where trees were previously removed, as well as acquisition of additional lands. Additionally, the "large-block" trapping component of this alternative would include partner (e.g., Delta Waterfowl Foundation) and private landowner involvement and would hold the potential for improved Service/private landowner relations throughout portions of complex. Increased funding would be necessary to conduct "large-block" intensive trapping and habitat restoration activities.

Wildlife Disease
Same as alternative C.

Priority Population Issues
Same as alternative B.

Public Use, Education and Interpretation

Hunting
There is potential to increase recreational opportunities through new hunting areas and seasons. There is also potential, after critical evaluation, to adjust certain hunting season dates and open/closed areas on refuges. This would be done to alleviate unacceptable human disturbance levels to migratory waterfowl using refuges and/or redistribute hunters in high hunter-use areas. Additionally, local breeding-bird recruitment rates could potentially be improved depending on harvest levels during predator hunting seasons. However, increased law enforcement would need to accompany any increase in hunting opportunity. So, increased funds would be needed for increased law enforcement officer support, as well as improved signage and interpretive materials.

Fishing
Implementing this alternative would result in increased disturbance to waterbirds and other wetland-dependant wildlife due a potential increase in boat traffic. The increase in fishing activity throughout complex would also result in potential habitat degradation (e.g., littering, injection of motor fuels into water) and a need for increased law enforcement. The fishery resource inventory would provide us with an improved understanding of current fisheries on Service-owned lands within complex, as well as our ability to sustain them. This alternative would result in increased opportunity to participate in one of the six priority public use activities. A substantial increase in funding would be necessary for completion of the fishery inventory, construction of boat ramps and access routes, docks, interpretive signage and materials, and an increased law enforcement presence.

Environmental Education and Interpretation
Same as alternative C.

Wildlife Observation and Photography
Same as alternative C.

Trapping
Same as alternative A.

Research and Monitoring

Wildlife and Habitat
Same as alternative B.

Socioeconomics:
Same as alternatives B and C.

Cultural Resources
Same as alternative B.

Refuge Operations

Staffing
The increased staffing that is requested in this alternative would give complex staff the ability to accomplish the goals and objectives associated with other elements (e.g., wildlife and habitat management, public use, education, and interpretation, research and monitoring) of this alternative. Increased operational and maintenance funding would be necessary under this alternative.

Operations and Maintenance
The increased resources that are requested in this alternative would give complex staff the ability to accomplish the goals and objectives associated with other elements (e.g., wildlife and habitat management, public use, education, and interpretation, research and monitoring) of this alternative. Increased funding for staffing, equipment, supplies (e.g., fuel, native grass seed) would be necessary under this alternative.

Infrastructure
Same as alternative C

Partnerships
The expanded partnerships would increase the Service's ability to provide quality habitats for multiple wildlife groups and improve public-use opportunities. It would also result in improved relationships with a greater number of private landowners, government agencies, and nongovernmental organizations. Because of its multiple-wildlife group approach, this alternative holds potential to group partners with a wide variety of interests, leading to increased funds and an increased likelihood that the goals and objectives of this alternative are achieved.

CUMULATIVE IMPACTS

Cumulative impacts result from incremental effects of the proposed action when these are added to the actions of the past, present and future. These cumulative impacts can be the result of individually minor impacts, which can become significant when added over time.

The implementation of the proposed action (Alternative 4) would reduce the likelihood for cumulative impacts because of the incremental approach in which habitat and wildlife management and other programs would be carried out.

The new approach of the proposed action would emphasize a more ecologically-oriented, habitat-based management. This approach would alleviate some of the possible impacts that might have been caused by target-species management.

NEPA requires mitigation measures when the environmental analysis process detects possible significant impacts to habitat, wildlife, or the human environment.

All the activities proposed under alternative D are not expected, nor intended, to produce significant levels of environmental impacts that would require mitigation measures. Nevertheless, the CCP contains the following measures to preclude significant environmental impacts from occurring:

- Federally listed species will be protected from intentional or unintended impacts by having activities banned where these species occur.
- Hunting safety regulations will be closely coordinated with, and enforced by, personnel from the complex and NDGF personnel.
- All proposed activities will be regulated to lessen potential impacts to wildlife and plant species, especially during the sensitive reproductive cycles.
- Protocols will be established to help in determining goal achievement levels, possible unforeseen resource impacts, and adaptive management actions to ensure wildlife and habitat resources, as well as the human environment, are preserved.

The CCP can be revised and amended 5 years after implementation, using adaptive management techniques, to correct unforeseen impacts.

Table 6. Summary of impacts by alternatives on wildlife and habitat management

	Alternative A *(Current Management no action)*	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group level Intensive Management)	Alternative D (Target Species Group level Modified Management *proposed action)*
Wetlands With Water Control Structures (WCS)				
Hydrology Impacts	The hydrology of Long Lake has been altered due to water impoundment by WCSs, resulting in increases in sedimentation, conductivity, and salinification, as well as in accrual of dissolved solids in the waters of the lake. This will continue to affect the long-term sustainability of the wetland system, yielding a gradual reduction in resource support capabilities.	Reduction in the degree that Long Lake's hydrology is altered. Driving force to address potential system sustain ability issues with assumption that natural hydrology over long term will provide appropriate habitats in natural condition.	Further alteration of hydrology combined with potential to address current hydrological issues. Driving force to target habitat needs of specific species or narrow group of birds within a classification (i.e. waterfowl, shorebirds, or marsh birds).	Further alteration of hydrology combined with potential to address current hydrological issues. Driving force to target habitat needs of a guild of species representing a broad spectrum native to the area (i.e. pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, and ferruginous hawk).
Botulism Impacts	General ability to manage most of the time.	Potential decreased ability to manage.	Potential increased ability to manage.	Increased ability to manage.
Wildlife Output	Outputs undermined by management to address botulism driven water management practices.	Outputs undermined by management to address potential system sustain ability issues.	Increased capability to provide ideal habitats for specific bird specie(s) or birds within a narrow group (i.e. waterfowl, etc.).	Increased capability to provide habitats which provide the needs of multiple groups or guild(s).
Funding Impacts	Neither increased or Decreased need.	Initial increased funding need, thereafter, potentially less funding needed to manage.	Increased funding need (cost of construction, annual recurring management costs).	Increased funding need (cost of construction, annual recurring management costs).
Flood Attenuatio	Ability to buffer flooding during moderate runoff.	Loss of flood attenuation capability.	Flexibility to manage portions for flood attenuation depending upon the prescribed management needs of targeted specie(s).	Flexibility to manage portions for flood attenuation depending upon the prescribed management needs of guild(s) targeted.
Water Permits / Rights	Perfected water rights for water stored and used.	Potential to lose water rights. May require discharge permits/construction permits. Potential humps below in drainage which would limit release of water.	May require discharge permits/construction permits depending upon the development prescribed.	May require discharge permits/construction permits depending upon the development prescribed.

Table 6. Summary of impacts by alternatives on wildlife and habitat management

	Alternative A *(Current Management no action)*	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group level Intensive Management)	Alternative D (Target Species Group level Modified Management *proposed action)*
Timing of Freeze Up for	Seasonal timing in tune with migration needs of trust species 80-90% of years.	Reduced water levels would result in dry or earlier freeze up, resulting in reduction in Refuge benefit for migration habitat	Flexibility retained to manage for deeper water with later freeze up and/or shallow water for earlier freeze up depending on the target specie(s) driving water management.	Flexibility retained to manage for deeper water with later freeze up and/or shallow water for earlier freeze up depending on the selected guild(s) driving water management.
Fish	There is a possibility to sustain a sport fishery at Long Lake during the moderate to high water levels portions of the hydrological cycles. This possibility is diminished by carp-induced water turbidity problems at Long Lake.	Would essentially eliminate fishery and rough fish related turbidity problems.	Flexibility to retain or manage against fish depending on the unit and target specie(s) managed for; address turbidity problems.	Flexibility to retain or manage against fish depending on the unit and target guild(s) managed for; address turbidity problems.
Drought Attenuation	Some ability to capture and store water to attenuate drought conditions - delays natural cycling while maintaining wetlands during drought.	Compromised - no drought attenuation capability.	Flexibility to manage for drought attenuation depending upon the target specie(s) driving water management.	Flexibility to manage for drought attenuation depending upon the target guild(s) driving water management.
Wetlands Without WCS				
Productivity Impacts	Retains the current productivity, characterized by a gradual long-term reduction in productivity due to siltation and reduction of water quality.	Potential to improve the productivity (e.g. invertebrates and plant diversity of palustrine wetlands).	Improved wetland productivity through the use of draw downs on portions of wetlands in the WMD.	improved wetland productivity through the use of draw downs on portions of wetlands in the WMD.
Function/Hydrology/ Sustainability Impacts	Currently wetlands aging at a natural rate, experiencing gradual siltation, eutrophication and water quality deterioration.	Improved overall wetland function (e.g. groundwater recharge, flood attenuation, nutrient cycling). Potential to reverse degradation trend and restore wetland to earlier stage/age condition and lengthen the sustainability of the natural wetlands.	Altered hydrology and possible negative associated effects (e.g. increased sedimentation, conductivity, dissolved solids accrual) of natural wetlands in the WMD, including possible reduced overall sustainability of these wetlands (potentially address the sustainability issue with periodic dredging).	Altered hydrology and possible negative associated effects (e.g. increased sedimentation, conductivity, dissolved solids accrual) of natural wetlands in the WMD, including possible reduced overall sustainability of these wetlands (potentially address the sustainability issue with periodic dredging).
Wildlife Impacts	Maintains current support capability with a gradual decline over time due to aging and deterioration of the wetland condition.	Potential to improve the support capability for a wider diversity of wetland-dependent wildlife.	Potential to provide ideal habitats for specific specie(s) or narrow group of birds within a classification.	Potential to provide ideal habitats for multiple bird groups across a spectrum native to the area (i.e. guilds).

Table 6. Summary of impacts by alternatives on wildlife and habitat management

	Alternative A *(Current Management no action)*	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group level Intensive Management)	Alternative D (Target Species Group level Modified Management *proposed action)*
Funding Impacts	Generally requires similar funding to present levels adjusted for economics annually.	Requires increased funding (dredging).	Increased funding needs (e.g. cost of initial construction, annual operation, periodic maintenance costs).	Increased funding needs (e.g. cost of initial construction, annual operation, periodic maintenance costs).
Native Upland Habitats (including woody species)				
Management direction	Current management includes grazing, prescribed burning, spraying, clipping, re-seeding natives, and biological agents to manage native (unbroken) grasslands and tamegrass fields, and restoring and managing native grass seedings in optimum condition for nesting waterfowl and other migratory birds. Balance of native uplands and tame uplands.	Management would be driven by natural processes theme where management of native (unbroken) grasslands would target invigorating native plants (composition and diversity), management of all nonnative uplands would target native plant re-establishment and/or restoration. Future management would target maintaining native and restored habitats in as "natural" or native condition as possible.	Management would be driven by identifying the specific habitat requirements of a specific specie(s) or narrow group of birds within a specific classification (i.e. waterfowl, or shorebirds, or marshbirds) and targeting blocks of land to restore and manage for the specific habitat necessary to address those requirements.	Management would be driven by identifying the broad habitat requirements of a guild of species representing a broad spectrum native to the area (e.g. Pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, and ferruginous hawk) and targeting restoration and management of all lands to provide habitat necessary to address the requirements representing indicator species across the guild.
Invasives Impacts	Invasives are treated with a variety of management practices.	Targets decrease in the acreage of nonnative, invasive low shrubs. Targets decrease of invasives and invading exotic grasses and forbs, potential for removing source of re-invasion and associated problems. Minimize degree of future degradation of native prairie sites.	Targets decrease of invasives and invading exotic grasses and forbs, potential for removing source of re-invasion and associated problems. Minimize degree of future degradation of native prairie sites.	Targets decrease in the acreage of nonnative, invasive low shrubs. Targets decrease of invasives and invading exotic grasses and forbs, potential for removing source of re-invasion and associated problems. Minimize degree of future degradation of native prairie sites.
Habitat Impacts	Habitat management targets native plant restoration through various management practices.	Increase in the acreage of native grasses and forbs. Decrease in the acreage of nonnative grasses and forbs.	Potential to target any productive habitat including nonnative low shrubs if they serve a targeted specie(s) group.	Increased acreage of native grasses and forbs. Decreased acreage of nonnative grasses and forbs and invasive nonnative low shrubs.

Table 6. Summary of impacts by alternatives on wildlife and habitat management

	Alternative A *(Current Management no action)*	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group level Intensive Management)	Alternative D (Target Species Group level Modified Management *proposed action)*
Wildlife Impacts	Habitat remains in current condition.	Improved breeding habitat condition for most grassland-dependent breeding bird species found in south-central North Dakota. Potential for increased nest success and nest densities of those species. Potential for less favorable breeding habitat condition for a few specific species (i.e. gadwall, clay-colored sparrow, and exotic species).	Improved breeding habitat conditions for a specific specie(s) or wildlife group (e.g. grassland passerines) including improved recruitment and increased abundance. Potential for less favorable breeding habitat condition for other "nonselected" wildlife groups (e.g. waterfowl, shorebirds, native gallinaceous birds).	Improved breeding habitat conditions for a guild of multiple wildlife species representing a broad spectrum native to the area (e.g. Pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, and ferruginous hawk) including improved recruitment and increased abundance. Less favorable breeding habitat condition for a few specific species (e.g. clay-colored sparrow, gadwall).
Funding Impacts	Generally requires similar funding to present levels adjusted for economics annually.	Increased funding need (costs of additional management needs for restoration and maintenance of habitats).	Increased funding need (costs of additional management needs for restoration and maintenance of habitats).	Increased funding need (costs of additional management needs for restoration and maintenance of habitats).
Management Implications /	Continue to manage with current tracking methods.	Less difficult to meet objectives because this alternative lacks a structural criterion for individual wildlife species or groups —it does not target a wildlife output.	More limited structural composition; restricted to what is needed for one wildlife group. Better tracking of progress toward wildlife outputs.	provides more of a structural mosaic and broad habitat spatially, structurally, and temporally addressing overall needs of wildlife characteristic to the area. Better tracking of progress towards wildlife outputs
Disturbed Upland Habitats				
Management direction	Current management targets converting disturbed uplands to native grass (6-8 species of grasses native to the area with varieties suited to the latitude). Approximately 250-300 acres per year are targeted for restoration. Eventual restoration of forbs into these fields is planned.	Management would focus on conversion of disturbed uplands to a diverse native grass forb mixture representative of the historical vegetation composition on a given site.	Management of disturbed uplands would focus on the habitat requirements of a specific specie(s) or narrow group of birds within a specific classification (i.e. waterfowl, shorebirds, passerines). Uplands could potentially remain cropland, tame-grass, or be restored to native grass.	Management of disturbed uplands would focus on the habitat requirements of a guild of species representing a broad spectrum native to the area (i.e. pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, ferruginous hawk). Uplands would focus on ongoing efforts to restore native grass/forbs with a diversity of height, density and structure.

Table 6. Summary of impacts by alternatives on wildlife and habitat management

	Alternative A *(Current Management no action)*	Alternative B (Natural Processes Management)	Alternative C (Single Wildlife Group level Intensive Management)	Alternative D (Target Species Group level Modified Management *proposed action)*
Habitat Composition Impacts	Gradual increase in acreage of native grass/forb seedings. Gradual reduction in cropland and tame-grass. Gradual reduction in fragmentation.	Increased acreage of native grass/forb seedings. Reduced/elimination of cropland, DNC, tame-grass fields. Less fragmentation Reduced invisibility, less noxious weeds.	Potential for increased native grass and forbs depending on what wildlife group we are managing for. Potential for increased acreage of cropland, trees and shrubs, or nonnative grasses depending on what wildlife group we are managing for ncreased invisibility, more noxious weeds. Potential for increased fragmentation. Not maximizing land to fullest wildlife potential.	Increased acreage of native grass/forb seedings. Reduced/elimination of cropland, DNC, tame-grass fields. Less fragmentation. Reduced invisibility, less noxious weeds. Potential to manage land more efficiently.
Wildlife Impacts	Gradual improvement in breeding habitat for grassland-dependent birds. Less favorable habitat conditions for a few specific species.	Improved breeding habitat conditions for most grassland dependent breeding bird species (i.e. increased nest success rates, increased nest density). Less favorable breeding habitat conditions for a few specific species (i.e. clay-colored sparrow, gadwall). Reduced degree of invisibility, potential effects on territories and ranges of specific bird species. Provides habitat for a declining species group (native grassland dependent birds). Less pheasants, less deer	Improved breeding habitat condition for a specific wildlife group (i.e. grassland passerines) including improved recruitment and increased abundance. Potential for less favorable breeding habitat condition for other nonselected wildlife groups (i.e. waterfowl, shorebirds, native gallinaceous birds). If we elect to leave nonnative cover or cropland, increased degree of invisibility, potential effects on territories and ranges of specific bird species, increase noxious weeds.	Improved breeding habitat conditions for a guild of species representing a broad spectrum native to the area (i.e. pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, ferruginous hawk) including increased nest success rates, increased nest density Less favorable breeding habitat conditions for a few specific species (i.e. clay-colored sparrow, gadwall) Reduced degree of invisibility, potential effects on territories and ranges of specific bird species.
Funding Impacts	Generally requires similar funding to present levels adjusted for economics annually.	Increased funding need (cost of additional management activities). Cost:benefit ratio—is it even possible to accomplish due to changes in soil structure, range site alteration?	Increased funding need (cost of additional management activities).	Increased funding need (cost of additional management activities).

Nonnative Trees and Shrubs				
Management direction	Current management is conducted on an "as needed" basis - management includes removal of volunteer trees and shrubs from grasslands, additionally, sentinel tress that serve as raptor perches are removed from grassland nesting habitat.	This alternative would remove all nonnative trees and shrubs on all lands in the complex.	This alternative would manage nonnative trees and shrubs on a tract by tract basis allowing management actions that provide benefit for a specific wildlife species or narrow group of birds within a classification (waterfowl, shorebirds, upland birds, game mammals, etc) This would allow maintaining existing, augmenting and/or removal.	This alternative would manage nonnative trees and shrubs in a manner which provides the greatest overall benefit to the guild or select group of indicator species (i.e. Pintail, sharp-tailed sparrow, Wilson's phalarope, sharp-tailed grouse, ferruginous hawk).
Habitat Impacts	Management would continue as described above.	Decreased acreage of nonnative flora. Reduced areas for nonnatural microclimate relates to less invasive and noxious invasion.	<u>if removed:</u> Reduced winter habitat for some resident species (exotic gallinaceous birds, deer). Increased grassland habitat. Less fragmentation and micro-climate for invading exotics and noxious plants <u>if planting and no removal:</u> Decreased native flora and increased potential for nonnative species invasion into grassland areas. More fragmentation and micro-climate for invading exotics and noxious plants	<u>if removed:</u> Reduced winter habitat for some resident species (exotic gallinaceous birds, deer). Increased grassland habitat. Decreased nonnative flora. Less fragmentation and micro-climate for invading exotics and noxious plants. <u>if planting and no removal:</u> Decreased native flora and increased potential for nonnative species invasion into grassland areas. More fragmentation and micro-climate for invading exotics and noxious plants.

Wildlife Impacts	Continued at present levels	Improved breeding habitat conditions for grassland-dependent bird species; including improved recruitment and increased abundance. Less favorable breeding habitat conditions for arboreal bird species (i.e. yellow warbler, black-billed cuckoo, willow flycatcher). Less favorable winter habitat for some resident species. More balanced predator/prey relationships. Reduced population of parasitic birds (i.e. cowbirds). Restoration for native assemblages.	<u>if removed:</u> Improved breeding habitat condition for a specific wildlife species or narrow group of birds within a classification. Less favorable breeding habitat condition for other wildlife groups (i.e. arboreal birds). <u>if planting and no removal:</u> Increased winter habitat for some resident species (exotic gallinaceous birds, deer) Additional breeding habitat condition for specific wildlife groups (i.e. arboreal birds). Less favorable breeding habitat conditions for certain wildlife groups (e.g. grassland-dependent passerines, shorebirds, waterfowl_ including increased predation rates and lower abundance.	<u>if removed:</u> Improved breeding habitat condition for a variety of grassland-dependent birds (i.e. Baird's sparrow, pintail, marbled godwit) including improved recruitment and increased abundance. Less favorable breeding habitat condition for arboreal birds species (i.e. yellow warbler, black-billed cuckoo, willow flycatcher). <u>if planting and no removal:</u> Increased winter habitat for some resident species (exotic gallinaceous birds, deer). Additional breeding habitat condition for a variety of arboreal bird species (i.e. yellow warbler, black-billed cuckoo, willow flycatcher). Less favorable breeding habitat conditions for grassland-dependent birds including increased predation rates and lower abundance.
Public Use Impacts	Continues opportunities at or near existing levels.	Reduced hunting opportunities (deer, pheasant due to loss of tree/shrub habitat). Controversial due to cutting down of trees.	More/less hunting opportunity for deer pheasants depending on if removed or planting. Potentially more/less abundance of native birds for observation less diversity because of exclusion/reduction of exotics and non traditional species.	More/less hunting opportunity for deer pheasants depending on if removed or planting. Potentially more/less abundance of native birds for observation less diversity because of exclusion/reduction of exotics and non traditional species.
Funding Impacts	Generally requires similar funding to present levels adjusted for economics annually.	Increased funding needs to accomplish management activities.	Increased funding needs to accomplish management activities.	Increased funding needs to accomplish management activities.

Chapter 6. Implementation of the Proposed Action

Introduction

Once the preferred management alternative has been selected and finalized, the CCP has been approved, and the Service has notified the public of its decision, the implementation phase of the CCP begins. Whichever alternative is chosen, the objectives and strategies presented below would be implemented over the next 15 years. The CCP will serve as the primary management document for the complex unless it is formally revised. The Service will implement the final CCP with assistance from partner agencies, organizations, and the public.

Overview of Selection of an Alternative

It is the responsibility of the planning team to recommend a proposed action that best achieves planning unit purposes, vision, and goals; helps fulfill the Refuge System mission; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; addresses the significant issues and mandates; and is consistent with principles of sound fish and wildlife management.

Alternative Description

The Service has chosen alternative D for the complex. This alternative allows for intensive wetland and upland management, where warranted, throughout the complex. Management objectives for various habitat types would be based on habitat preferences of groups of target (indicator) species, which consist of members of various wildlife taxonomic groups (e.g., shorebirds, raptors, waterfowl, wading birds). Management objectives for a particular habitat type (e.g., native prairie) would, therefore, be based on a compromised universal benefit concerning particular needs of multiple wildlife groups on an individual tract of land. Additionally, public use and environmental education and interpretation opportunities would be maximized to the extent compatible with other objectives. Expansion of the complex's research and monitoring, staffing, operations, and infrastructure would likely be required to achieve this alternative's goals and objectives. Partnership opportunities would be maximized and would vary widely.

Goals, Objectives, Strategies, and Rationale

The objectives, strategies, and rationale listed below describe how management of Service lands would be carried out to meet the overall goals for the complex.

Wildlife and Habitat Management Goal

Conserve, restore, and enhance the ecological diversity of the mixed-grass prairie ecosystem (including wetlands, grasslands, and native trees and shrubs) for migratory birds with an emphasis on waterfowl and other grassland- and wetland-dependent species.

Developed Wetlands Sub-Goal (Long Lake Units I, II, and III):

Manage water to minimize the frequency, duration, and intensity of botulism outbreaks, while still providing a mosaic of habitats (e.g., open water, exposed shoreline, emergent vegetation patches) for wetland-dependent birds.

Background

Meeting the first developed wetlands sub-goal will require the complex staff to manage water-levels in a timely and appropriate manner and to address a variety of critical information needs. Ideally, Long Lake will function as a self-sustaining system, prone to only periodic botulism outbreaks, that affords a mosaic of wetland habitat types to a wide-variety of wetland-dependent birds (e.g., waterfowl, shorebirds, wading birds) to satisfy the needs of nesting, molting, and migrant individuals, as well as waterfowl broods and other fledgling waterbirds.

For the developed wetland habitat type, the complex has selected 10 bird species to serve as "target" or "indicator" species, which as a group reflect the quality wetland habitat on Service lands within the complex. These species are the American avocet, American bittern, Baird's sandpiper, Franklin's gull, mallard, piping plover, redhead, sandhill crane, western grebe, and Wilson's phalarope. They were selected for a variety of reasons (see table 7), including that:

- eight species regularly nest on complex lands;

- two species utilize complex lands to a great extent as migratory staging and stopover areas;
- two species are endemic to the Great Plains (Mengel 1970);
- one species is federally threatened;
- six are State species of conservation priority (Hagen et al. 2005);
- two species are birds of conservation concern (Service 2002);
- four species are Service focal species (Service 2005a);
- two are species of high concern under the Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004), and;
- three are species of concern under the United States Shorebird Conservation Plan (Skagen and Thompson 2003).

Developed wetland habitat objectives are geared toward the provision of quality habitats for these species. In addition to the target species, developed wetland habitats found on Service lands within the complex should benefit a much broader group of "secondary" bird species (appendix K), as well as a variety of other nonavian wildlife.

Because structural and floristic habitat preferences (e.g., deep marsh, emergent vegetation, submergent aquatic vegetation, mudflat annuals) of both the target and secondary species vary widely, it is assumed that the needs of all species will not be met on a single wetland, or even a single tract of Service land (e.g., WPA), but rather the needs of the target and secondary species groups will be met by providing a diversity of vegetative structures across multiple tracts of Service land in the complex. Because the numerous waterbird species that use complex lands require varied habitat conditions, it is imperative that the integrity of wetlands of various regimes (e.g., temporary, semipermanent) is protected. This will ensure the presence of wetland complexes that are capable of supporting varied habitats and meeting various waterbird life needs (e.g., vegetated, semipermanent wetlands for brood rearing).

Objective 1: Over the next 15 years contact all individuals who own land within Long Lake NWR's acquisition boundary to gauge their interest in selling these lands to the Service.

Rationale 1:
Due to the artificially elevated pool level of Long Lake and the proposed water-management strategy, water unit III may at times surpass the refuge's present boundary and flood adjacent private land. This private-land flooding has occurred periodically since construction of the three earthen dikes in the 1930s. The majority of the private land that the Service periodically floods is within the refuge's acquisition boundary; therefore, the opportunity exists to purchase these lands in fee, so that they may become part of Long Lake NWR.

Strategy 1:
Project leader makes either personal or written contact (e.g., for nonresident landowners) with all applicable landowners.

Objective 2: Over a 15-year period, predict and manage the annual water level in Long Lake unit III to be either full (1,715 feet above MSL) or, conversely, dry during the summer and fall. Re-evaluate Long Lake's water management strategy, based on acquisition of relevant scientific data at five-year intervals.

Rationale 2:
Long Lake has a long and varied history of botulism. The lake's disease history played a major role in the decision to establish Long Lake NWR in 1932. Botulism mortality estimates were not kept for Long Lake prior to establishment of the refuge, but mortality estimates from 1941–1943 indicated that between 84,500 and 201,000 birds (primarily ducks, gulls, and shorebirds) perished in each of those years. The purpose of the three large earthen dikes that were constructed on Long Lake in the 1930s was to improve water management flexibility and more specifically, separate Long Lake into units to prevent botulism outbreaks (Service 1988). From 1944 to 1959, the water management strategy was to fill unit I to 1,716.0 feet above MSL, unit II to 1,715.5 feet above MSL, and unit III to 1,715 feet above MSL. This strategy was deemed effective for units I and II, but unit III could not be reliably stabilized and frequently went dry.

Table 7. Target species and their associated conservation plan listings.

Species	*N.A. Landbird Conservation Plan*	*Endangered Species List (Service)*	*N.D. Species of Conservation Priority*	*U.S. Shorebird Conservation Plan*	*Focal Species (Service)*	*Northern Prairie and Parkland Conservation Plan*	*Birds of Conservation Concern*[1]
American avocet			Level 2	Species of Concern (Breeding and Migrating)			
American bittern			Level 1			High Concern	BCR 11
Baird-s sandpiper							
Black-crowned night-heron							
Black tern			Level 1		X	High Concern	
Bobolink			Level 2		X		Region 6
Chestnut-collared longspur	Stewardship Species of Regional and Continental Importance		Level 1		X		BCR 11, Region 6, National
Eared grebe						Moderate Concern	
Franklin-s gull			Level 1			High Concern	
Grasshopper sparrow			Level 1		X		
Mallard					X		
Marbled godwit			Level 1	Species of Concern (Breeding and Migrating)	X		BCR 11, Region 6, National
Northern harrier			Level 2				BCR 11, Region 6, National
Piping		Threatened	Level 2	Species of	X		

Table 7. Target species and their associated conservation plan listings.

Species	*N.A. Landbird Conservation Plan*	*Endangered Species List (Service)*	*N.D. Species of Conservation Priority*	*U.S. Shorebird Conservation Plan*	*Focal Species (Service)*	*Northern Prairie and Parkland Conservation Plan*	*Birds of Conservation Concern*[1]
plover				Concern (Breeding and Migrating)			
Redhead			Level 2				
Sandhill crane					X		
Sedge wren			Level 2		X		National
Sharp-tailed grouse	Stewardship Species of Regional and Continental Importance		Level 2				
Upland sandpiper			Level 1	Species of Concern (Breeding and Migrating)	X		BCR 11, Region 6, National
Western grebe						High Concern	
Western meadowlark							
Wilson=s phalarope			Level 1	Species of Concern (Breeding and Migrating)	X		BCR 11, Region 6, National

[1]Three separate categories of Birds of Conservation Concern exist: 1) Bird Conservation Region (e.g., BCR 11), 2) U.S. Fish and Wildlife Service administrative region (e.g., Region 6), and 3) National (USFWS 2002).

Over the next 28-year period (1960–1987), the water management strategy remained unchanged for units I and II, but unit III was maintained as a dry basin, whenever possible. Because natural climatic cycles (i.e., periods of drought and deluge) annually influenced water level fluctuations to varying extents, it was determined that the water management capability of Long Lake was insufficient to support this strategy, despite the fact that unit III was dry during nine of those years. Presently, the Service bases annual water management actions on spring water elevations; if water levels exceed a certain threshold, unit III is flooded to the greatest extent possible; otherwise unit III is kept as dry as possible. The latter action restricts flows (i.e., spring runoff) to units I and II and, therefore, increases the likelihood that the water level in unit I will be sufficient to exceed the artificial sill and provide water to waterfowl production areas downstream (e.g., Adams, YMCA, McKenzie, Victor). In moderate- to low-runoff years, water is more beneficial to wetlands that the Service manages in the drainage west of Long Lake NWR than it is in unit III, where it could promote conditions for botulism outbreaks. However, due to substantial summer rain events or other environmental factors, years will occur where although an attempt is made to dry unit III through evaporative processes, this unit may remain in a shallow water state for the duration of the summer and fall and may, therefore, incur periodic botulism outbreaks. Prior to 2001, facilities did not allow efficient transfer of water from unit II to unit III. The 5 foot x 5 foot gated box WCS in C dike limited the flow and demanded long duration transfer of water into unit III. In 2001 the limitations in water management were lessened with the installation of a five bay, 10 foot x 6 foot box culvert with a stoplog WCS. Timely and efficient water transfer from unit II to unit III is now possible.

These three water management strategies, although somewhat different from one another, all aim to achieve the same thing – either stable, high water levels, or a dry basin (i.e., unit III) that will not attract waterbirds. This thought process is based on a wealth of past research which suggests that botulism outbreaks are associated with shallow, stagnant, saline wetlands with low dissolved oxygen (Wobeser and Bollinger 2002). Several recent studies (Rocke et al. 1999, Rocke and Samuel 1999, Barras and Kadlec 2000) have attempted to identify more accurately factors that promote botulism outbreaks. Their results have identified several factors associated with botulism outbreaks, including: 1) increased water temperature; 2) increased invertebrate abundance; 3) lower oxidation-reduction potential; 4) pH; 5) amount of organic matter in the sediment; 6) salinity above the water-sediment interface, and; 7) high precipitation and increased water flow. However, not all of these seven factors have to occur together for an outbreak to occur (or be prevented) in the complex's wetlands, according to a study by Rocke et al. (1999) on Sacramento NWR. Rocke et al. (1999) did find that outbreak wetlands have significantly lower oxidation-reduction potential than nonoutbreak wetlands.

The success in the complex's water management actions in reducing botulism is not easy to interpret. Prior to initiating water management on Long Lake in 1944, the total estimated avian deaths from botulism between 1937 and 1943 exceeded 375,000, but varied widely each of the seven years. In contrast, the total estimated loss between 1944 and 2005 (62 years) was less than 83,000 birds (range = 0 in 27 years to 18,700; McEnroe 1986, Service 1988, Service unpublished data). These data suggest that our ability to control water levels provided us some ability to reduce the frequency and extent of botulism outbreaks; however, because the aforementioned environmental factors are so varied, poorly understood, and complicated, it is difficult to link directly water management efforts to the extent of botulism on Long Lake.

Additionally, because both past botulism deaths and various environmental factors were not recorded annually on a per unit basis (i.e., units I, II, and III), any conclusions regarding the impact of our water management activities are speculative.

However, because the understanding of factors that influence the likelihood of botulism outbreaks is presently fragmentary and insufficient, they intend to continue to apply the current water management strategy in an attempt to reduce the incidence of botulism on Long Lake, with the understanding that if future research indicates that a change in water management would be beneficial with respect to botulism, management can be adaptive (Walters 1986). Additionally, botulism outbreaks will occur

in some years, despite the best management efforts.

Strategy 2:
If the Service anticipates, in any given year, that on approximately May 1, a water level ≥1,715.5 feet above MSL can be attained in unit III, then water will be released (through removal of stop logs in a water control structure) at C dike into unit III, until it fills to the greatest extent possible. Conversely, if an anticipated May 1 water level in unit III is ≤1,715.5 feet above MSL, flows will be held in units I and II in an effort to dewater (through evaporative processes) unit III and augment water levels in downstream waterfowl production areas.

Objective 3A: Over a one-year period, quantify the imports and exports of water and associated chemical constituents (e.g., sodium, mercury, arsenic, boron) in the three existing Long Lake units, to establish baseline estimates. Also, over a two-year period, determine an appropriate hydrologic and chemical sampling scheme (i.e., frequency, horizontal and vertical stratification, priority chemical constituents) for subsequent years of monitoring Long Lake, through analysis of one year of monitoring data.

Objective 3B: Over a 15-year period, study the relationship between various hydrologic events (e.g., dramatic increase or reduction in water level) and chemical constituent levels (e.g., boron, sodium) to Long Lake botulism outbreaks. The Service will also study the relationship of the concentration of various chemical constituents with observed changes in wetland vegetation or aquatic invertebrate community composition. Further, the Service will evaluate multiple years of monitoring data related to various abiotic components of Long Lake and utilize these data for the detection of any noteworthy trends.

Rationales 3A and 3B:
Understanding how water management actions have altered or will alter water chemistry in the future is critical to ensure the long-term health and sustainability of the Long Lake ecosystem. The composition of plant and invertebrate communities supported in Long Lake is directly related to hydrology and water chemistry and, in turn affects waterfowl habitat. Of major concern in Long Lake, is that current management of water levels maximizes retention of various nutrients (e.g., phosphorous, nitrogen) and elements (e.g., arsenic, boron). Moreover, salinity is likely to increase to levels higher than would occur under natural conditions. Such changes in water chemistry may result in significant shifts in plant and invertebrate communities. For example, salinity can directly inhibit germination and growth of plants (Swanson et al. 1988, Kantrud et al. 1989) and excessive additions of phosphorus can lead to extensive algal blooms that inhibit growth of some submergent aquatic plants (Robel 1961, Kullberg 1974, Swanson et al. 1988). High levels of salinity can also exacerbate boron toxicity in several plant species (Wimmer et al. 2003). Further, suppression of primary production often impacts secondary productivity. For example, salinity can negatively influence invertebrate composition directly by affecting physiology (Williams et al. 1990, Newcombe and MacDonald 1991, Euliss et al. 1999) or indirectly by affecting habitat structure and foods (Krull 1970, Wollheim and Lovvorn 1996). Other examples include documented reports that high concentrations of suspended silt and clay are toxic to zooplankton (Newcombe and MacDonald 1991) and agrichemicals can cause significant mortality of aquatic invertebrates (Borthwick 1988). Overall productivity in both the short- and long-term could be negatively impacted because plant community structure and composition influences use by both invertebrates and vertebrates (e.g., birds; Laubhan and Roelle 2001), whereas both plants and invertebrates play significant roles in nutrient cycling and are integral to components in the food chains of a wide variety of vertebrates (Murkin and Batt 1987).

An unintended outcome of Long Lake's present management strategy (discussed in Objective 2) is that it maximizes the amount of water available for evaporation, which results in the accumulation of salts and other dissolved solids. Prior to its establishment as a refuge, Long Lake was subject to sporadic flows and dynamic water-level fluctuations that influenced concentration of salts and lake water chemistry. During periods of drought, evaporative processes resulted in the accumulation of salts and during wet periods high flows resulted in the removal of salts from the basin. Consequently, installation of dikes and management of water levels in Long Lake have likely altered natural hydrologic conditions that once controlled the range of salt concentrations that occurred during the wet and dry periods that frequent the prairies. This situation has

likely been exacerbated by the development of freshwater impoundments on Long Lake's side drainages (i.e., G-19, Bob Meeks Marsh, G-12, unit II marsh) which restrict freshwater flows into Long Lake.

Information is currently lacking to quantify the extent that human influences have altered levels of nutrients (e.g., phosphorus, nitrogen) and other elements (e.g., mercury, boron, arsenic) on Long Lake. However, because management actions have increased water storage volumes up to three feet above the historic natural sill in three lake units (units I, II, and III), the overall potential for accumulation of various ions, elements, and other dissolved solids is increased. Laubhan et al. (2006) suggest that water management activities on Long Lake have promoted the concentration and bioaccumulation of evaporates in these units. The effects of concentrating various chemical constituents (e.g., nitrogen, arsenic, mercury) on biotic communities are currently unknown; however, it is reasonable to assume that in the near future certain biological thresholds may be breached that will cause a cascading collapse of the wetland ecosystem.

Historically, only limited water-quality information has been collected from Long Lake. For example, in March 1989, Olson and Welsh (1991) documented elevated levels of boron and mercury, as well as high sodium concentrations. Also, data related to temporal changes in Long Lake's wetland vegetation community—and the significance of and cause for any changes—are also scarce. A 1917 plant survey of Long Lake indicated the presence of several species of bulrush, as well as many shallow marsh plants (e.g., prairie cordgrass) and submergent aquatic species (e.g., common bladderwort; Metcalf 1931). Conversely, during an April 2004 site visit to Long Lake NWR, Laubhan et al. (2006) noted that emergent and submergent vegetation along the perimeter of several Long Lake pools was minimal at the locations that were examined, suggesting that resources (e.g., food, cover) were available for waterbirds are at least temporarily reduced. However, an insufficient number of sites were visited to adequately characterize the current composition or extent of wetland vegetation. Further information is needed to make any inferences about the possible change in Long Lake's vegetative community that may be related to changes in the system's hydrology and water chemistry.

Based on the concept of ecological fit, one approach to future management would consist of initiating monitoring programs to track fundamental ecological factors (e.g., water quality) that influence factors higher in the trophic system (e.g., plant germination and growth). This information would provide the means to identify future issues sufficiently early to allow corrective management actions to be implemented when effectiveness is greatest and costs are reduced. Priority Long Lake NWR information needs identified by Laubhan et al. (2006) are tied to three interrelated issues: 1) hydrology; 2) nutrients and water chemistry, and; 3) soils and sediments.

The complex's ultimate interest is to determine whether Long Lake's past and present management has altered the system in such a way that certain biological thresholds have been breached, or will be in the near future, if a change in management is not instituted.

Strategies 3A and 3B:

- Establish gauging stations at both appropriate inflow and outflow sites of Long Lake.
- Initiate a long-term water quality monitoring program in cooperation with the USGS.

Objective 4: Within 10 years of the completion of this CCP, establish a monitoring plan for aquatic macroinvertebrates, and both emergent and submergent aquatic vegetation on Long Lake that will allow for monitoring changes in species diversity of these various biota, at a minimum of 3-year intervals for vegetation and 5-year intervals for aquatic macroinvertebrates.

Rationale 4:
Since Metcalf's (1931) wetland vegetation survey of Long Lake in 1917, little systematic inventory and monitoring has been conducted regarding the lake's flora. The paucity of knowledge is even more striking concerning Long Lake's aquatic macroinvertebrate (hereafter, invertebrate) community.

The vegetative community of a wetland is one of the most significant driving-forces in the make-up of that wetland's other biotic components

(e.g., invertebrates, birds). Wetland vegetation structure and floristic composition is important to nearly all waterbirds from the standpoint of nesting, brood rearing, foraging, and migration stopover habitat (Laubhan and Roelle 2001). The same vegetative factors influence invertebrate community composition (Voigts 1976). Managing for a diversity of wetland flora in a wetland community generally equates to a corresponding diversity of waterbirds. Decreased waterbird use generally equates to decreased heterogeneity of a wetland's floral community. Variability in a wetland's floral community is driven in part by the temporal influence of climate (Euliss et al. 2004), but may also be tied to alterations that affect fundamental processes (e.g., hydrology, water chemistry, sediment dynamics) and might alter system tolerance with respect to the germination and growth of certain wetland plant species (Laubhan et al. 2006).

Metcalf's (1931) survey indicated that abundant emergent plants in Long Lake included cosmopolitan bulrush, tule bulrush and three-square bulrush. The survey also reported common spikerush as being widespread, seaside arrowgrass, common bladderwort, and prairie cordgrass as fairly common, and softstem bulrush as rare. Additionally, past aerial photos of Long Lake indicate that dense stands of emergent vegetation, including many species mentioned in the 1917 survey, have been present in the not-too-distant past. Presently, Long Lake's three principal units (I, II, and III) are largely devoid of emergent vegetation, with only minimal amounts of bulrush and other species scattered along portions of exposed shoreline. Unfortunately, it is unknown whether the general lack of vegetation is a result of multiple high-water years since 1993 (Euliss et al. 2004) or the fact that certain biological thresholds have been exceeded and now preclude the growth of certain wetland plant species. Examples of these possible thresholds include high salinity levels that can directly inhibit germination of plants (Swanson et al. 1988, Kantrud et al. 1989) or exacerbate boron toxicity in several plant species (Wimmer et al. 2003), as well as excessive phosphorus additions that can indirectly inhibit growth of certain submergent plants through excessive algal blooms (Robel 1961, Kullberg 1974, Swanson et al. 1988). Laubhan et al. (2006) suggested that the acquisition of both emergent and submergent wetland plant data and subsequent periodic monitoring on Long Lake is a priority need that may help to illustrate negative consequences of past and present water management actions.

The importance of invertebrates is substantial for a number of avian taxa. Invertebrates are a key food resource for shorebirds (Helmers 1993, Laubhan and Roelle 2001), cranes, grebes, herons, rails, and ibis (Laubhan and Roelle 2001), as well as a number of duck species (Bartonek 1968, Bartonek 1972, Krapu and Swanson 1975, Swanson et al. 1979, Meyer and Swanson 1982, Swanson 1984). According to Skagen and Oman (1996), over 400 genera of invertebrate prey are consumed by 43 species of shorebirds in the western hemisphere alone. A diversity of invertebrates is a critical supporting factor of a wetland-bird community, not only with respect to various bird taxa, but also concerning various foraging guilds (e.g., gleaner, prober) within a specific taxon (e.g., shorebirds). Differences in foraging technique, as well as bill length and body size allow birds to partition themselves and utilize different invertebrate species, in order to avoid overlap in habitat use (Recher 1966, Baker and Baker 1973).

While it is understood that invertebrates, in addition to their obvious role in the feeding ecology of various waterbirds, provide critical food chain support for many other organisms and play substantial roles in overall wetland productivity and nutrient cycling (Murkin and Batt 1987), Rosenberg and Danks (1987) point out that invertebrates of freshwater wetlands are poorly studied and there is a paucity of existing information.

Invertebrates that inhabit prairie wetlands are well suited to cope with the highly dynamic and harsh environmental conditions of this region (Euliss et al. 1999). The invertebrate community of the PPR is comprised mostly of ecological generalists that possess the necessary adaptations to tolerate environmental extremes. However, invertebrates are sensitive to agrichemicals that can accumulate in wetlands (Borthwick 1988, Grue et al. 1989) and there is a strong interest in their use as indicators of wetland and landscape condition in the PPR (Adamus 1996). Therefore, in addition to simply providing a better overall understanding of the invertebrate community through its inventory and monitoring efforts, the Service hopes to determine if critical thresholds are being

exceeded. Invertebrate sampling data could be tied to water-quality data to determine if salinity levels are affecting invertebrate composition directly via physiology (Williams et al. 1990, Newcombe and McDonald 1991, Euliss et al. 1999) or indirectly by affecting habitat structure and foods (Krull 1970, Wollheim and Lovvorn 1996). Eventually, the Service hopes to have an improved understanding of the invertebrates that Long Lake supports across space and time, through the acquisition of initial baseline data and subsequent periodic monitoring.

Strategy 4:

- Randomly sample various vegetative zones (i.e., wet meadow, shallow marsh, deep marsh, open water; Stewart and Kantrud 1971) along transects, using a 2.7 square foot plot frame (Daubenmire 1959). Measure percent cover of different plant species.
- Use vertically oriented funnel traps (Swanson 1978) and benthic corers (Swanson 1983) to randomly sample invertebrate abundance and biomass in all major vegetative zones.

Developed Wetlands sub-goal_(other developed complex wetlands):
Provide quality nesting, brood rearing, and migratory stopover habitats for a diversity of wetland-dependent birds.

Background:
Unit II marsh is a semi-permanent wetland impoundment, approximately 800 acres in size. It was created by Ducks Unlimited in 1995 through the creation of a low, earthen dike and a WCS across a bay on Long Lake unit II. Water levels are generally less than three feet deep and the unit does go completely dry in some years. Generally, when at least 50 percent of the unit holds water it is a magnet for a tremendous diversity of shorebirds, particularly in the month of May and again from July through September. It also provides quality sanctuary for numerous waterfowl broods and in many years harbors several mixed-species colonies of breeding waterbirds, including white-faced ibis, black-crowned night-herons, Franklin's gulls, cattle egrets, Forster's terns, eared grebes, and western grebes. In late summer and early fall this unit affords quality roosting habitat to thousands of migrant Canada geese, ducks, and sandhill cranes. Endangered whooping cranes also occasionally utilize this unit as a roost site.

Six other smaller, managed impoundments exist in the complex. They are located at Long Lake NWR (units G-12, G-19, and G-19a), Slade NWR, Rath WPA, and Schiermeister WPA. These impoundments are generally managed to support breeding and migrating waterfowl and shorebirds. Their relatively shallow depths and periodic flooding and drying nature makes for highly productive systems, with respect to invertebrates and wetland vegetation. Corresponding bird use is generally quite diverse.

Meeting the second developed wetlands sub-goal will require that water-level management is implemented in a timely and appropriate manner by complex staff. Ideally, Long Lake's unit II Marsh and other impoundments on Long Lake NWR and other Service lands in the complex, will afford a mosaic of wetland habitat types to a wide-variety of wetland-dependent birds (e.g., waterfowl, shorebirds, wading birds) to satisfy the needs of nesting, molting, and migrant waterbirds, as well as waterfowl broods and other fledgling waterbirds.

Objective 1A: Provide between 30–70 percent coverage of emergent vegetation on unit II Marsh, on average, over 11 of 15 years.

Objective 1B: Provide a unit II Marsh water depth between 12 inches and 32 inches on approximately May 1 and a water depth between 4 inches and 16 inches on approximately August 15, achievable in at least 8 of 15 years.

Rationales 1A and 1B:
Previous research has indicated that wetlands with an approximate 50:50 ratio of open water and emergent vegetation (i.e., cattails, bulrushes), often termed "hemi-marshes," attract the highest densities and diversities of wetland birds (Weller and Spatcher 1965). Wetland birds which frequent Long Lake NWR that find hemi-marsh conditions favorable include various waterfowl and shorebird species, herons, gulls, terns, blackbirds, grebes, and cranes. All 10 of the complex's target species for developed wetlands regularly use unit II Marsh at various times of the year when hemi-marsh conditions exist. The complex staff anticipates being able to achieve open water to emergent vegetation

ratios close to the 50:50 ratio (i.e., 30:70 ratio, 70:30 ratio) as recommended by Weller and Spatcher (1965), in most years (approximately 11 of 15), through targeted water-level management. Because of the dynamics involved with prairie-wetland conditions over time, in certain years the coverage of emergent vegetation may fall well outside of staff's target range (30–70 percent coverage). During years of extreme drought, cover of emergents may exceed upper-end target of 70 percent, whereas during extremely wet periods, unit II marsh may revert to a more open water state, supporting far less than 30 percent coverage of emergent vegetation.

With respect to water depth, plan to provide depths preferred by a variety of nesting colonial waterbirds, immediately prior to peak nest initiation (approximately May 1-10; Gregory Knutsen, Service, unpublished data), as well as water depths preferred by roosting sandhill cranes, immediately prior to their arrival in late summer (approximately August 15-30; Clark Talkington, Mandan, ND ,unpublished data). Various literature indicates that nest site water depth for colonial nesting waterbirds that breed in the PPR is highly variable, ranging from dry to 130cm for five different species (Laubhan et al. 2006). However, depths ranging from 12–32 inches capture both the mean and median depths for target species, such as the western grebe and Franklin's gull (Nuechterlien 1975, Berger and Gochfeld 1994), as well as a number of other colonial (i.e., black tern, eared grebe, black-crowned night-heron; McAllister 1958, Bryant 1983, Boe 1993, Laubhan et al. 2006) and noncolonial (i.e., pied-billed grebe; Laubhan et al. 2006) waterbirds and over-water nesting waterfowl (i.e., canvasback, redhead; Laubhan et al. 2006) Many thousand sandhill cranes stage at Long Lake NWR each fall, using certain wetlands primarily for roosting and loafing habitat. Sandhill cranes generally prefer to roost in water depths that range from 4–6 inches (Kinzel 2005). However, they will sometimes roost on dry land surrounded by water and conversely in water as deep as 24 inches (Kinzel 2005). In some years evaporative processes will have reduced water levels below 8 inches by mid-August, in which case a late summer addition of water to unit II Marsh will be needed, if possible. In other years, the late summer target depth range will be met passively, through evaporative attrition of water levels from the deeper late spring target depth range. Because do not have the capability to move water out of unit II marsh, some years will occur when, due to wet conditions, water depths will exceed the complex's target depths. Even in years when water-depth targets are not achieved, due to topographic variation, certain areas of the marsh could likely meet habitat requirements. Conversely, during periods of substantial drought, unit II Marsh will be dry and staff will not feasibly be able to add water to it from unit II, due to exceptionally low water levels in that unit and a heightened risk of botulism. Additionally, water-level augmentation to achieve fall water level requirements would help facilitate ideal water levels in the spring for colonial waterbird nest initiation.

The complex staff acknowledges that unit II marsh has had periodic botulism outbreaks since it as creation in 1995; however, because of its relatively small size (in comparison to Long Lake units I, II, and III), unique characteristics, and overall ability to attract a diversity of birds, the staff elects to manage this unit to its fullest potential regarding habitat for a wide variety nesting and migrant waterbirds. Appropriate actions will be taken on this unit if a botulism outbreak does occur.

Strategies 1A and 1B:
Add water to unit II marsh, as needed, via either gravity flow through a WCS or by pumping it from Long Lake unit II. Estimate percent coverage of emergent vegetation through either ocular estimation or GIS area determination using aerial photos taken annually in early July. Measure target water depths at target dates (i.e., May 1, August 15) using multiple staff gauges installed in unit II marsh.

Objective 2:
Capture snowmelt runoff and spring rains to fill wetland basins to between 70 percent and 90 percent capacity on approximately May 1, during 8 out of 10 years. During 2 of 10 years, allow spring flows to exit basins, resulting in basin wet area ≤25 percent capacity.

Rationale 2:
The sharp increase in invertebrate populations when wetlands re-flood following a dry phase is an important reason for artificially flooding and draining wetlands to enhance waterfowl habitat (Cook and Powers 1958; Kadlec and Smith 1992),

and it is the basis for the modern-day practice of moist-soil management (Fredrickson and Taylor 1982). Invertebrates are an essential food source for many species of wetland-dependent animals and play important roles in other wetland functions (e.g., nutrient cycling) and overall wetland productivity (Knutsen and Euliss 2001). The complex's target shorebird species for the developed wetland habitat (i.e., American avocet, Baird's sandpiper, Wilson's phalarope, piping plover) all rely heavily on invertebrates during migration and nesting periods (Helmers 1992). Preferred foraging depths of both the American avocet and Wilson's phalarope overlap (3–8 inches), as do those of the piping plover and Baird's sandpiper (0–2 inches; Helmers 1992). These managed basins should provide suitable foraging habitat for all for of these target shorebird species, as well as several secondary shorebird species, during years when they are filled to between 70–90 percent capacity. Additionally, invertebrates are critical to target waterfowl species (i.e., mallard, redhead) during the breeding season (Bartonek and Hickey 1969, Swanson et al. 1985) and to their young later in the summer. For mallards and several other duck species, diets during the first two weeks of life consist almost entirely of invertebrates (Chura 1961, Perret 1962, Sugden 1973). Breeding and postbreeding foraging microhabitats for redheads generally consist of wetlands <3.3 feet (x meters) deep (Low 1945, Bergman 1973), whereas optimal foraging depths for mallards normally range from dry to <12 inches (x centimeters) (Laubhan et al. 2006). Foraging preferences for both of these species, as well as several other duck species, should be met in these managed basins when they are filled to between 70–90 percent capacity.

In addition to invertebrates, plant community composition is effectively manipulated via growing season drawdowns. Plant species composition, structure, and seed production can all be influenced by drawdowns and more specifically, drawdown intervals (Fredrickson 1991). The complex staff anticipates that, depending on the uncontrollable forces of nature (i.e., periods of drought and deluge), staff will have only moderate control over timing and duration of soil exposure during years that target dewatering of these units. Therefore, the 2 years in which complex staff will attempt to dewater these units will be based upon the perceived moisture conditions (pre-snowmelt). Those years with particularly little snowpack will lend themselves to dewatering these units, whereas years with considerable snowpack lend themselves to capturing water in the basin. Drying out these units will be done to stimulate production of a number of wetland plant species; predominantly those characteristic of the shallow marsh zone of prairie wetlands (e.g., sedges, smartweeds, sloughgrass, beggarticks, spikerush; Stewart and Kantrud 1971) which are often referred to as "moist soil" plants.

Many plant species respond differently to exposed soil at different times of the growing season (Laubhan and Roelle 2001) and due to our limited control on certain managed basins, exposed soil could exist throughout the entire growing season or only at limited, but varied portions of the growing season. Plant response will likely fluctuate among years and basins, providing varied vegetation communities at different areas within the complex. Several authors (Griffith 1948, Hartman 1949, Uhler 1956) have documented value in providing moist soil plant species which are preferred food by a variety of waterfowl. Swanson et al. (1985) illustrated the importance of plant matter, especially species of the grass family (Poaceae), in the overall diet of mallards and Woodin and Swanson (1989) showed a similar importance of plant matter in the diet of redheads.

It is anticipated that water management actions on these developed wetlands will provide a mosaic of highly productive shallow water habitats with breeding season and migration stopover benefits to a number of waterfowl, shorebird, and other waterbird species (e.g., American bittern).

Strategy 2:

- Estimate percent basin full through ocular estimation.
- Remove stop logs from WCSs in order allow spring flows to exit basins unimpeded.

Undeveloped Wetlands Sub-Goal

Conserve, protect, and/or enhance the integrity of wetlands throughout the complex, with respect to waterfowl and other wetland birds.

Background

Both Service-owned and privately owned lands throughout Long Lake's WMD consist of a wide

variety of wetland sizes and regimes (i.e., temporary, seasonal, semi-permanent, permanent; Stewart and Kantrud 1971). The majority of wetlands on both Service and other lands are undeveloped wetlands (i.e., those with no water-level management capabilities). Most undeveloped wetlands are dynamic systems; some are influenced by spring runoff and rainfall only (i.e., temporary and seasonal wetlands), whereas others are also influenced by groundwater interaction (i.e., semi-permanent and permanent wetlands). However, all are at the mercy of nature with respect to temporal fluctuations in water levels, abiotic conditions (e.g., salinity), and biotic communities (e.g., plants, invertebrates). Euliss et al. (2004) stressed the need to consider the changes these prairie wetland systems undergo as a result of normal climatic variation when evaluating biological wetland data or a wetland's expressed condition (e.g., dry, devoid of emergent vegetation, choked with emergent vegetation) at a given point in time. Throughout Long Lake's three-county WMD, differences in wetland density and regime abundance exist in different physiographic regions and ecoregions. Density of depressional palustrine wetlands (prairie potholes) in the wetland management district decreases from northeast to southwest as the Missouri Coteau physiographic region gives way to the Coteau Slope physiographic region. More specifically, densities of temporary, seasonal, and semi-permanent wetlands all are greatest in the Missouri Coteau ecoregion, whereas the greatest density of large, shallow alkali lakes exists in the Collapsed Glacial Outwash ecoregion.

Meeting the undeveloped wetlands sub-goal will require that targeted acquisition, protection, and limited habitat management are conducted by a variety of Service staff. Ideally, the complex will continue to acquire easements on high-risk wetlands in areas of waterbird use, as well as protect the integrity of eased and fee title (i.e., refuge, WPA) wetlands through active enforcement of easement regulations and management against wetland degradation (e.g., sedimentation, noxious weed invasion) on refuges and WPAs.

For the undeveloped wetland habitat type, the complex staff has selected 10 bird species to serve as "target" or "indicator" species, which as a group reflect quality wetland habitat on Service lands. These species are the American avocet, American bittern, Baird's sandpiper, black-crowned night-heron, black tern, eared grebe, Franklin's gull, mallard, marbled godwit, and redhead. They were selected for a variety of reasons, including that:

- nine species regularly nest on complex lands;
- one species utilizes complex lands to a great extent as a migratory stopover area,
- two species are endemic to the Great Plains (Mengel 1970);
- six are North Dakota Species of Conservation Priority (Hagen et al. 2005)
- two species are Birds of Conservation Concern (Service 2002);
- three are Service Focal Species (Service 2005a);
- three are Species of High Concern under the Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004)
- two are Species of Concern under the United States Shorebird Conservation Plan (Skagen and Thompson 2003).

Undeveloped wetland habitat objectives in this CCP are geared toward the provision of quality habitats for these species. In addition to the target species, undeveloped wetland habitats found on Service lands within the complex should benefit a much broader group of "secondary" bird species (table 7), as well as a variety of other nonavian wildlife.

Because structural and floristic habitat preferences (e.g., shallow marsh vegetation, wet meadow vegetation, submergent vegetation) of both the target and secondary species vary widely, it is assumed that the needs of all species will not be met on a single wetland or even a single tract of Service land (e.g., WPA), but rather the needs of the target and secondary species groups will be met by providing a diversity of vegetative structures across multiple tracts of Service land in the complex.

Objective 1: Over a 15-year period, secure protected status on ≥2,000 wetland acres, with efforts focused on currently unprotected temporary and seasonal basins that are partially or totally embedded in cropland, and that occur in areas that support ≥25 breeding duck pairs per square mile.

Rationale 1:
Dahl (1990) estimated that between 7,000,000 and 8,000,000 acres of wetlands existed in the Dakotas in the late 1700s. However, in the late 1800s the first wave farmers or "sodbusters" settled in the PPR. The central and eastern portions of the Dakotas were highly attractive to these settlers because of homesteading and agricultural opportunities. With settlement came agricultural, rural, and urban development, and a corresponding change in the face of the prairie landscape. Since the 1800s, countless acres of wetlands have been drained by farm operators to increase tillable area, eliminate nuisance areas (e.g., areas overrun with weeds), and "square-up" fields (Leitch 1980). The extent of wetland drainage has not necessarily been consistent since pioneer settlement. For example, the post-World War II era ushered in a transition to mechanized farming and increased equipment size, which led to a corresponding increase in wetland drainage (Johnson and Higgins 1997). Madsen (1986) stated that 87 percent of wetland losses in the Dakotas are a result of agricultural development. According to Leitch and Scott (1977), 77 percent of State farmers surveyed in 1975 felt that wetlands were a hindrance to their farm operations. Consequently, as of the 1980s, the State had lost approximately 49 percent of its original wetland area (Dahl 1990).

The prairie potholes of the Dakotas support a wide diversity of wildlife, but they are most famous for their role in waterfowl production. Although the PPR occupies only 10 percent of North America's waterfowl breeding range, it produces approximately 50 percent of the continent's waterfowl population (Kantrud 1983). Complexes of depressional palustrine wetlands scattered throughout the State attract breeding duck pairs, drive nesting and re-nesting intensity, and provide brood habitat (Kantrud 1989). While semi-permanent and permanent wetlands best serve to provide brood rearing habitat and migratory stopover habitat, respectively, it is the smaller temporary and seasonal wetlands that draw breeding duck pairs to the Dakotas and other parts of the PPR. According to Reynolds (Service, pers. commun.), for every ten one-acre wetland there will predictably be 20 duck pairs, whereas one 10-acre wetland will likely support only seven duck pairs. The availability of wetlands is a major factor driving duck breeding in the PPR (Reynolds, Service, pers. commun.).

Despite the extensive loss in wetland area that has occurred throughout the State for so many years, there is ample opportunity for the Service, and more specifically the complex, to protect a large percentage of the area's remaining wetlands through the establishment of perpetual and long-term easements and the purchase of land for WPAs and refuges. Societal transformations that have been most evident in the State in the last half century (i.e., urban growth, out-migration of young people) may actually increase opportunities for acquiring and protecting critical wildlife habitats that are currently in private ownership (Dixon and Hollevoet 2005). Presently, there is a strong public interest in protecting wildlife habitats, and a disproportionately large amount of private land that includes wetland habitat, as compared to the funding available to acquire easements and WPAs; therefore, complex staff decisions can benefit from science-driven predictive habitat models. HAPET has developed a model which shows the distribution of priority wetlands relative to breeding duck pairs and cropland (figure 14). Purchase of easements and fee title wetland acres alike will be prioritized to focus on 1) those wetland regimes that are at the greatest risk of degradation (i.e., drainage, filling) – temporary and seasonal, 2) wetlands embedded (partially or totally) in cropland, 3) wetlands in areas capable of supporting ≥25 breeding duck pairs per square mile, and 4) wetlands that are currently not protected, and; 5) semi-permanent and permanent wetlands (<1 acre). This acquisition strategy has been adopted by the Service's DWG. If, over a 15-year period, ≥2000 acres of "high-risk" wetland habitat can be protected, this will prevent the loss of habitat for an estimated minimum of 2,254 breeding duck pairs, based on relationships between wetlands and breeding duck populations (circa 2000; Chuck Loesch, Service, unpubl. data).

According to State legislative authorization, the Service is bound to county-specific acreage limits for the purchase of wetland easements with Migratory Bird Conservation Fund (MBCF) dollars (i.e., in Kidder County, as of April 2006, approximately 1,006 acres remain under the current authorization to be protected using the MBCF). When these acreage ceilings are reached, high risk wetlands will remain unprotected and new legislative authorization will be needed to continue to protect wetlands

using this funding source. Other funding sources (e.g., Land and Water Conservation Fund [LWCF]) need to be explored as a way to continue wetland protection.

Strategy 1:

- Use an acquisition strategy developed by the Service's DWG from HAPET model results, which identifies priority (high-risk) wetlands for waterfowl and other wetland birds to determine the amount and approximate location of priority wetland acquisition areas. Purchase land through fee-title acquisition (i.e., WPAs, refuges).
- Establish perpetual and long-term easements on existing privately owned wetlands. Utilize Migratory Bird Conservation Fund monies until the State's approved acreage limits for Burleigh, Emmons, and Kidder counties are reached.
- Seek additional funding through the Land and Water Conservation Fund partners (LWCF), and/or other sources.
- Seek legislative authorization to protect additional wetland acreage on those wetlands identified as "high risk."

Objective 2:
Over a 15-year period, restructure (restore) ≥100 acres of degraded (i.e., drained, filled, leveled) wetlands for increased water-holding capacity on new or existing easements, waterfowl production areas, or refuges.

Rationale 2:

Historical losses of prairie wetlands in North Dakota were discussed in detail in Rationale 1, as was as the thought that due to certain recent societal transformations (i.e., urban growth, out-migration of young people) there may be increased opportunity for acquiring and protecting critical wildlife habitats that currently exist on private lands. Potential also exists for the restoration of previously drained or filled wetlands on private land. Relatively recently, societal interest has increased in restoring wetlands in the PPR (Knutsen and Euliss 2001). Results from telephone interviews of 305 landowners in 1996 revealed that landowners would restore wetlands if they thought it were the right thing to do, if they could afford it, and if they had financial help (Whitaker 1996). Eighty-four percent of those interviewed said providing habitat for wildlife was important in their decision to restore wetlands, whereas only 10 percent gave financial profitability as an important reason. When landowners were presented with the following reasons for not restoring their wetlands, 58 percent stated a dislike of government programs, 50 percent believed the problem was a lack of awareness about available programs, and about 50 percent said they could not afford to sacrifice the farmland. However, some drained wetlands still hold too much water at times to be productive agricultural land and are also of low value to most wildlife. These drained wetlands could possibly be restored if participants were found and landowner skepticism cast aside (Knutsen and Euliss 2001).

Wetland managers with a variety of natural resources agencies and organizations have been restoring prairie wetlands since the 1960s (Dornfeld 1988). Most wetland restorations in North Dakota are accomplished by plugging ditches with simple clay-core dams and seeding the surrounding upland to perennial grassland cover (Knutsen and Euliss 2001). Additionally, it has generally been concluded that, whenever possible, restoration efforts in the PPR should focus on restoring wetland complexes (groups of wetlands in relatively close proximity to one another that consist of multiple regimes [e.g., seasonal, permanent]), rather than individual basins. Knutsen and Euliss (2001) suggested that targeting large blocks of wetlands for restoration will increase the chances for the successful return of all wetland characteristics, including wildlife.

Strategy 2:

- Identify wetlands with restoration or enhancement potential prior to the purchase of easement and fee title lands and initiate restoration actions through the Service's Partners for Wildlife Program.
- Search existing wetland easement contracts for drainage facility maps (DFM) and contact current landowners to determine their willingness to restore specific wetlands.
- Fund restorations through the Service's Partners for Wildlife Program and fund easement purchases through the MBCF.
- Plug ditches on drained basins.
- Excavate filled and leveled basins.

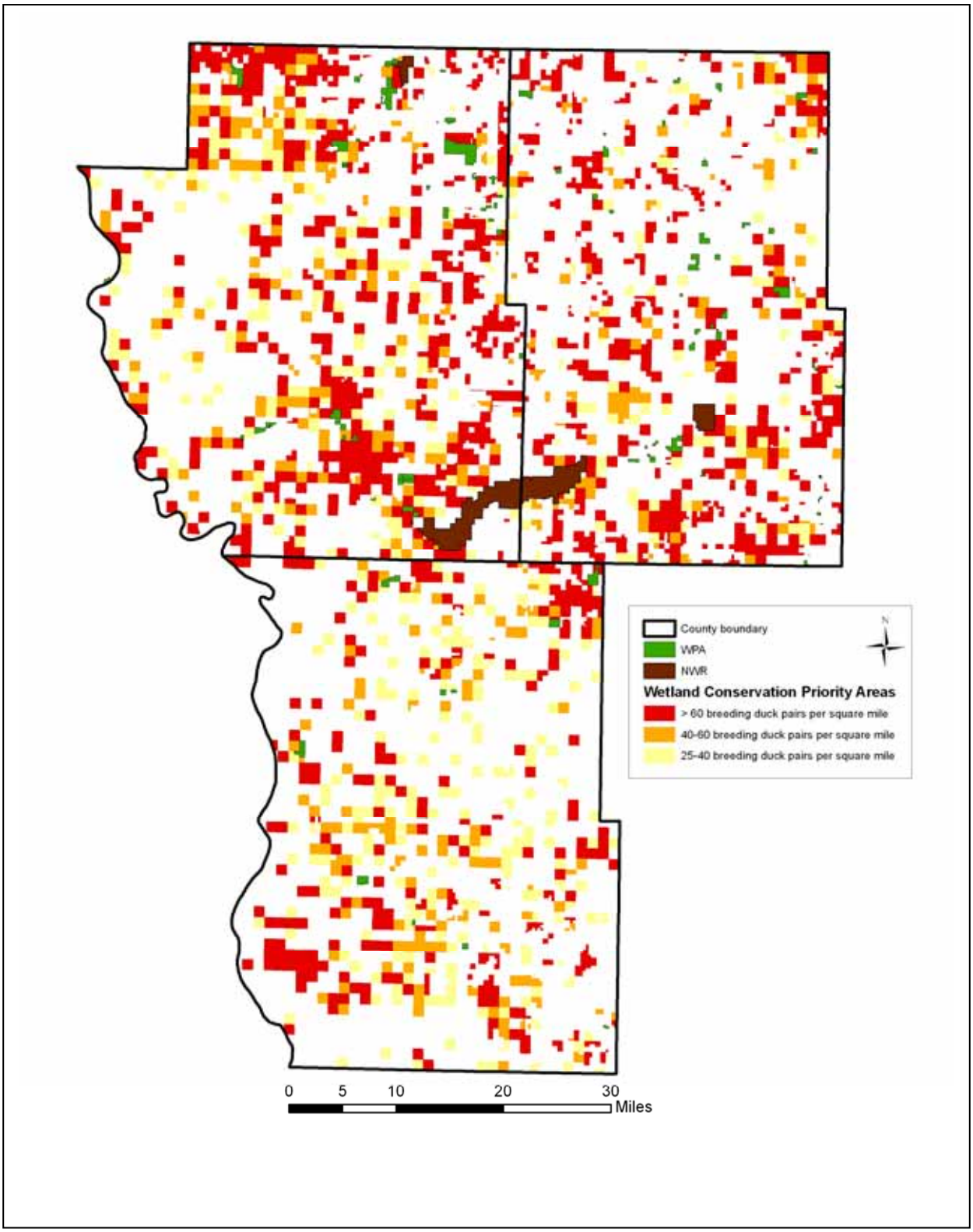


Figure 14: Distribution of 640-acre sections, which contain priority wetlands for conservation, relative to the number of breeding duck pairs per square mile and the existence of cropland.

Objective 3A:
Within one year of the completion of this CCP, evaluate and determine the degree of infestation of Canada thistle and absinth wormwood within 75 feet of all Service-owned temporary and seasonal wetland basins in the complex. Subsequent to this evaluation, and over a 5-year period, focus priority control efforts for wetland-associated Canada thistle and absinth wormwood infestations on those infestations that are more extensive (acres) than 75 percent of all wetland-associated infestations.

Strategy 3A:

- Use the complex's GIS and associated RLGIS cover type data (circa 2003-2006) to create a 75-foot buffer around all temporary and seasonal wetlands that depicts Canada thistle and absinth wormwood invasions both within and adjacent to these wetland basins.
- Determine which wetland-associated infestations (Canada thistle and absinth wormwood combined) are larger (acres) than 75 percent of all wetland-associated infestations.
- Mow infested areas.
- Spray appropriate herbicides.
- Release biological control agents for Canada thistle.
- Prioritize control efforts based on sites of ecological importance (e.g., native sod areas, high priority complex waterfowl production areas) and sites that have the greatest potential of spreading to ecologically important areas.

Objective 3B: Within 15 years of the completion of this CCP, determine on which Service-owned wetlands either reed canary grass or common reed is present and categorize the occurrence of these species at each applicable wetland as 1) limited, 2) scattered, or 3) dominant.

Strategy 3B:

- Document the presence or absence of both species and assign a broad categorical coverage classification (e.g., limited, scattered coverage, dominant), at each Service-owned wetland in the complex.
- Obtain GPS coordinates for areas of infestation.

Objective 3C: Over a 15-year period, during routine day-to-day activities in the field, document any occurrences of problematic exotic wetland plant species (e.g., purple loosestrife, salt cedar, Eurasian watermilfoil) that have not yet been documented on complex lands, but have the potential to exist on them.

Strategy 3C:

- Identify characteristics of problem exotic wetland plant species that could potentially occur within Burleigh, Emmons, and Kidder counties.
- Maintain a heightened visual awareness for these species whenever working in wetland habitats.
- Collect specimens of any confirmed or probable problem exotic wetland plant species for further query.
- Obtain GPS coordinates for all confirmed and probable occurrences.
- Post informational signage at Service lands that may have boating activity (i.e., duck hunting, fishing) to warn the public about the possibility of transferring aquatic nuisance species (i.e., curlyleaf pondweed, Eurasian watermilfoil, zebra mussel, spiny water flea, New Zealand mudsnail) to new waterbodys on portions their watercraft.

Rationales 3A, 3B, and 3C:
Wetland basins that are dry due to their natural tendencies (i.e., temporary and seasonal wetland regimes, Stewart and Kantrud 1971) are often prone to invasion by a variety of invasive forbs, some of which are State-listed Noxious Weeds (i.e., absinth wormwood, Canada thistle; Lym 2004). Absinth wormwood and Canada thistle both readily colonize sites that are devoid of vegetation (i.e., dry portions of wetland basins; Hutchinson 1992, Sedivec and Barker 1998, Liu et al. 2000). Additionally, Canada thistle thrives in moist, deep soil environments, such as the margins of prairie wetlands (Galatowitsch 1993, Sedivec and Barker 1998; Johnson and Larson 1999). Both of these plant species are aggressive alien invaders that are capable of crowding out and replacing native grasses and forbs (Wrage and Kinch 1981, Hutchison 1992). Where they become established, they can alter the natural vegetative structure and species composition. New infestations of absinth wormwood and Canada thistle that are associated with wetland areas (i.e., dry basins, wetland margins) could

potentially serve as a seed source for invasion into surrounding grassland areas. Therefore, complex staff must identify these areas of wetland-associated infestation and target them for management, which will generally consist of a variety of integrated actions (i.e., mowing, chemical application, biological control agents).

Additionally, two other exotic wetland plant species can be especially problematic in PPR wetlands, because of their aggressive, invasive nature. Common reed is a native (The Northern Great Plains Floristic Quality Assessment Panel 2001) deep-marsh perennial grass species that is widely distributed throughout the State (USDA 2006). This species is a "listed" noxious or invasive species in six states (USDA 2006). In the State, common reed is generally considered a troublesome species that can flourish in the most disturbed of all habitats (Northern Great Plains Floristic Quality Assessment Panel 2001). This species often develops monocultures in various wetland zones (e.g., shallow marsh, deep marsh; Kantrud 1986, Eggers and Reed 1987). Similarly, reed canary grass is a native (Northern Great Plains Floristic Quality Assessment Panel 2001) shallow-marsh perennial grass species that is widely distributed throughout the State (USDA 2006). A European strain of this species has basically assimilated the native strain (Eggers and Reed 1987). Stewart and Kantrud (1971) classify reed canary grass as a dominant, secondary species in the shallow marsh zone of seasonal wetlands. However, like common reed, this species is also a "listed" noxious or invasive plant in multiple states (n = 3; USDA 2006), but is essentially considered a troublesome species that can flourish in the most disturbed of all habitats in the State (The Northern Great Plains Floristic Quality Assessment Panel 2001). Reed canary grass is especially aggressive and often develops monocultures in various wetland zones (e.g., low-prairie, wet meadow, shallow marsh; Knutsen and Euliss 2001).

Biologists frequently equate decreased use of aquatic habitats by wetland birds to decreased habitat heterogeneity caused by a disruption (generally a reduction) in natural ecological processes (Kantrud 1986). The above wetland conditions generally result in vegetative domination by invasive hydrophyte species (e.g., common reed, reed canarygrass; Walker 1959, Jahn and Moyle 1964, Whitman 1976). Wetlands in the PPR are especially susceptible to the establishment of monotypic stands of hydrophytes because of little variability of soils or organic matter content within basins, low gradient shorelines, and the ability of many plant species to persist under a wide range of water conditions (Hammond 1961, Walker and Coupland 1968). Therefore, it is imperative that complex staff develops a better understanding of the frequency and degree to which complex wetlands have been invaded by the two aforementioned species. Currently, the complex staff realizes that both species are not uncommon on wetlands throughout the complex, but have a limited knowledge of what lands are especially impacted (e.g., Slade NWR) and what degree of problem this issue presents on complex lands from a management standpoint (i.e., equipment, staff, and cost requirements). Although literature (Kantrud 1986, Payne 1992) suggests multiple management techniques for reducing the coverage of these species, the complex does not necessarily intend to initiate formal management during this 15-year timeframe, but rather develop a better understanding of the problem these species currently present on complex lands.

In addition to these four wetland and wetland-associated plant species of concern, complex staff must be aware of the occurrence of other problematic wetland and wetland-associated plant species that have not previously been documented on complex lands, but have potential to be – specifically salt cedar, purple loosestrife, curlyleaf pondweed, and Eurasian watermilfoil. Salt cedar and purple loosestrife are both State-listed Noxious Weeds (Lym 2004), whereas Eurasian watermilfoil and curlyleaf pondweed are considered invasive plants (State, Dept. of Agriculture 2003).

Salt cedar is considered a shrub/tree and purple loosestrife is considered a forb, but both are perennial exotic species of Eurasian origin (USDA 2006). Salt cedar is an escaped ornamental that can transpire more than 200 gallons of water per day (Lym 2004). This species will rapidly choke waterways, artificially dry lakes and other water bodies, and creates hypersaline soils that are not conducive to the growth of native plant species. As of 2003, it had been documented in Burleigh, Emmons, and Kidder counties (N.D. Dept. of Agriculture 2003). Another escaped garden plant, purple loosestrife, grows in moist or marshy areas and creates monotypic stands of cover (Lym 2004). Whitt et

al (1999) concluded that purple loosestrife-dominated habitats at Lake Huron, Michigan, supported lower avian diversity that other area habitats. Purple loosestrife had been documented in Burleigh and Kidder counties, as of 2003 (N.D. Dept. of Agriculture 2003). Both Eurasian watermilfoil and curlyleaf pondweed are submergent aquatic species of Eurasian origin. Both of these species form dense underwater mats and ultimately rob water bodies of vegetative species diversity and dissolved oxygen (N.D. Dept. of Agriculture 2003, NDGF 2004). Additionally, both of these species are frequently spread from water body to water body through boating activities and a single plant fragment of either species can create a infestation in a new location (N.D. Dept. of Agriculture 2003, NDGF 2004). As of 2003, Eurasian watermilfoil had not been found in any of the complex's counties and curlyleaf pondweed had been found only in Burleigh County (N.D. Dept. of Agriculture 2003).

Several exotic invertebrate species also exist that have the potential to colonize Service lands and subsequently alter water quality and biotic communities. These species include the zebra mussel, spiny water flea, and New Zealand mudsnail. All of them reproduce quickly and can rapidly overtake a water body, out competing native zooplankton populations for food and space (NDGF 2004). Similar to Eurasian watermilfoil and culyleaf pondweed, these invertebrate species often hitchhike from one water body to another on boats and trailers (NDGF 2004).

If the complex staff maintains a constant vigil for these species while conducting other work (e.g., habitat surveys and/or management) on WPAs and refuges throughout the complex, it will help ensure prompt and swift management action if any of these species are found. Consequently, the likelihood of large, unmanageable infestations of these species should be reduced through the suggested proactive approach.

Objective 4: Within 15 years of the completion of this CCP, determine the degree of sedimentation at 50 Service-owned wetlands in the complex. Twenty-five of these wetlands will be "treatment" wetlands that have predictably high potential (defined in rationale 4) to receive excessive amounts of sediment and 25 will be reference wetlands that predictably accrue sediments at a rate similar to the pre-settlement era (defined in rationale 4). Through direct comparison of treatment and reference wetlands, staff will be able to determine quantitatively what defines "excessive sedimentation" within the complex.

Rationale 4:
A large percentage of wetlands on WPAs and refuges in the complex are surrounded by uplands that were at some point in the past cultivated for agricultural production. The temporal extent of agricultural cultivation varies from tract to tract and most of the upland area on WPAs and refuges in the complex has been restored to perennial grass cover (the remaining areas in agricultural production exist because short-term [e.g., 2–3 years] cropping is part of the seedbed preparation prescription for eventual native grass reseeding); however, past cultivation in wetland catchment areas may have exacerbated soil erosion and resulted in partially filled wetlands with reduced functional integrity.

Wetlands embedded in agricultural fields receive more upland sediment than do wetlands embedded in intact grasslands (Gleason and Euliss 1998). Excessive sediment accrual has the potential to severely impact PPR wetlands. In fact, according to Baker (1992), sedimentation is the major pollutant of wetlands, as well as rivers and lakes in the United States. Gleason (1996) suggested that the primary source of sediments in PPR wetlands is wind and water erosion from crop fields. Adomatis et al. (1967) found that a mixture of snow and dirt, referred to as "snirt", accumulate in crop-bordered wetlands at twice the rate as in grass-bordered wetlands. Impacts of sedimentation include:1) altered nutrient cycling; 2) altered aquatic food webs; 3) reduced primary production; 4) reduced invertebrate biomass, and; 5) shortened wetland lifespan (due to filling). Additionally, because accelerated sedimentation reduces wetland depth, dense, monotypic stands of cattails can overwhelm a wetland (Bellrose and Brown 1941). Cattail-choked wetlands support relatively little biodiversity and exacerbate problems with agricultural producers because they serve as roost sites for large concentrations of blackbirds (i.e., common grackles, red-winged blackbirds, yellow-headed blackbirds) that depredate cereal crops (Linz et al. 1996). The complex staff suspects that several wetlands on complex lands have been subject to accelerated sedimentation rates over time. These include wetlands on

waterfowl production areas and refuges that are: 1) now embedded in grass, but were previously embedded in cropland; 2) flow-through wetlands that have potential to receive inputs from nearby agricultural lands; 3) wetlands that share both a Service and private land boundary, which is cropland on the private land portion; 4) wetlands with a minimal surrounding grassland area that is insufficient to buffer the effects of adjacent agricultural activities. Wetlands that meet one or more of the above four characteristics will be considered "treatment" wetlands. Conversely, wetlands that are fully embedded in native sod and further buffered by a landscape that is largely native sod will be considered 'reference' wetlands. Therefore, complex staff hopes to work with staff from Northern Prairie Wildlife Research Center (NPWRC; USGS) to identify substantially silted-in wetlands in the complex. To satisfy long-term (>15 years) information needs, the staff also hopes to eventually determine how excessive sedimentation is impacting wetland functions on Service-owned wetlands within the complex, as well as determine appropriate management actions (e.g., excavation, creation of grassland buffer) to restore pool depth and/or improve various wetland functions (e.g., growth of wet meadow plant species).

Strategy 4:

- Examine soil profiles in various wetland zones (e.g., wet meadow, deep marsh) to identify indicators of sedimentation (i.e., buried soil horizon; Gleason 2001).
- Collect wetland sediment core samples to determine depth of soil horizons.
- Determine degree of sedimentation (siltation) by comparing specific soil horizon depths (e.g., A Horizon) in wetlands with suspected sedimentation problems (treatment wetlands) to nonflow-through wetlands that are embedded in native sod and further buffered by a landscape that is largely native sod (reference wetlands).
- Determine sample wetlands through ground checks of adjacent current land use, as well as records of past land use and landownership boundaries.

Objective 5: Through active enforcement, protect all wetland basins under perpetual Service easement from drainage, filling, leveling, and unauthorized burning, over a 15-year period.

Rationale 5:
The Service's SWAP was authorized by Congress in 1958 as an amendment to the Duck Stamp Act (Service 2005b). Since the program began in the early 1960s, more than 2,000,000 acres of both wetland and grassland habitats have been protected through the easement program in the State and South Dakota, Montana, and Minnesota (Service 2005b). As of 2005, 102,646 wetland acres were protected under perpetual Service easements in the complex.

Generally, a Service wetland easement is perpetual in nature. The Service issues the landowner a one-time payment in order to acquire the right to burn, drain, fill, or level specific wetlands. In other words, wetland easement regulations prevent landowners from burning, draining, filling, or leveling protected wetlands, without an SUP (e.g., allowing a wetland to be burned one in three years, allowing a temporary drain on a wetland to in order to alleviate flooding of roads or residences). Any proposed use which may drain, burn, level, or fill a protected wetland will need to be pursued as a potential violation or evaluated under the Service's compatibility standards.

The concept behind the easement approach was to protect the landscape for waterfowl production, while minimally affecting the farming and ranching community (Service 2005b). However, because of the history of periodic violations throughout North Dakota, as well as other states, easement compliance work is vitally important to the continued success of the program (Service 2005b). Annually, complex staff documents an average of two to five easement violations in the wetland management district. The number of potential violations observed during aerial surveillance is generally 3–4 times that number, and therefore creates a substantial investigatory easement workload for complex law enforcement officers. It is generally accepted that if easement compliance is not enforced annually through surveillance and necessary landowner contacts, violation rates in the State increase (Van Ningen, Service, pers. commun.). Federal agricultural programs administered through the farm bill (U.S. Department of Agriculture) contain conservation provisions that affect other wetland protection measures, including the Service's wetland easement program. As these provisions are tightened

and/or relaxed through the passage of subsequent Farm Bill legislation, violation rates on Service easements increase or decrease correspondingly.

In addition to the reactionary measure of surveying the integrity of easement wetlands each year, the complex also takes a proactive approach to easement enforcement by annually informing new landowners of existing Service easements on their property (since perpetual easements stay with the land, regardless of who owns it), as well as the associated regulations.

Through both proactive and reactive measures, the complex can assure a high rate of landowner compliance within the wetland management district, which in-turn assures that more than 100,000 acres of privately owned wetland habitat in Burleigh, Emmons, and Kidder counties will be protected in perpetuity and therefore available to a wide variety of wetland-dependent birds.

Strategy 5:

- Send letters to new landowners informing them of existing easements on their property, along with the associated regulations.
- Annually conduct aerial easement enforcement surveys of all existing easements (survey two-thirds of the wetland management district in the fall and the remaining one-third in the spring, rotating counties each year).
- Follow protocols within the Service's easement manual to handle all potential violations.

Native Prairie Goal:
Restore floristic diversity to native grasslands, as well as provide a mosaic of vegetative structure to satisfy the habitat needs of grassland-dependent bird species.

Background:
Currently, much of the native prairie owned by the Service in the complex is heavily invaded by a number of exotic invasive grasses (i.e., smooth brome, Kentucky bluegrass, crested wheatgrass) and forbs (e.g., Canada thistle, leafy spurge, absinth wormwood). In some areas, these and other exotic species have greatly reduced the coverage of native grasses and forbs, leading to reduced species and structural (height-density) diversity that is generally equated with a reduction in use by breeding grassland-dependent birds. A few tracts of native prairie in the complex that have received relatively little management and are especially prone to invasion (e.g., those surrounded by crop fields or old crop fields, or those surrounded by or even bisected by roads) have regressed to monocultures devoid of almost any vegetative-species richness and structural heterogeneity. Additionally, several of the complex's native-prairie tracts have been invaded to a greater-than-historic extent by certain native low-shrub species (i.e., western snowberry, silverberry). Due to past management, or lack thereof, these native, low-shrub species have greatly increased their coverage, as compared to the pre-settlement era, in mixed-grass prairie areas. Conversely, there exist several tracts that still have a seemingly intact native prairie community. These sites are only modestly invaded by problem-plant species and support substantial stands of both cool- and warm-season native graminoid species (e.g., needle-and-thread, green needle grass, prairie june grass, little and big bluestem, blue gramma), forb species (e.g., purple coneflower, blanket flower, blazing star, prairie coneflower, groundplum milkvetch), and an acceptable coverage of shrubs (e.g., prairie wild rose, leadplant, western snowberry). Certain plant species can be documented on these lands that indicate these areas have received relatively little past disturbance (e.g., white prairieclover, hoary puccoon, breadroot scurfpea, porcupine grass, leadplant; The Northern Great Plains Floristic Quality Assessment Panel 2001).

The complex has identified remaining areas of native prairie as its highest-priority upland sites. Through targeted and science-driven management, staff plans to reverse the decline in vegetative heterogeneity that, with modest management, resist invasion by exotic cool-season grasses and noxious weeds. Despite the most timely and successful management efforts, the rate of vegetative change on some heavily invaded lands will be slow and incremental, but positive. The native prairie goal is long-term (more than 15 years) in nature. Ideally, upland habitats in the complex will, over time, consist of large expanses of contiguous grassland habitat that provide a diversity of native flora and a mosaic of vegetative structure across a broad landscape.

The Service has selected 10 bird species to serve as "target" or "indicator" upland species, which as a group reflect quality upland habitats on Service lands within the complex. These species are the bobolink, chestnut-collared longspur, grasshopper sparrow, mallard, marbled godwit, northern harrier, sedge wren, sharp-tailed grouse, upland sandpiper, and western meadowlark. They were selected for a variety of reasons, including that:

- all 10 species regularly nest on complex lands;
- two species are endemic to the Great Plains and five others are secondary endemic species (Mengel 1970);
- eight are State Species of Conservation Priority (Hagen et al. 2005);
- six species are Birds of Conservation Concern (Service 2002);
- seven are Service Focal Species (Service 2005a);
- two are Stewardship Species under the North American Landbird Conservation Plan (Rich et al. 2004);
- two are Species of Concern under the United States Shorebird Conservation Plan (Skagen and Thompson 2003).

Table 7 lists the conservation plans associated with the target upland species. Upland habitat objectives in this CCP are geared toward the provision of quality habitats for these species. In addition to the target species, upland habitats found on Service lands within the complex should benefit a much broader group of "secondary" bird species (appendix K), as well as a variety of other nonavian wildlife.

Because structural-habitat preferences (e.g., vegetative height-density) of both the target and secondary species vary widely, it is assumed that the needs of all species will not be met on a single tract of Service land (e.g., WPA), but rather the needs of the target and secondary species groups will be met by providing a mosaic of vegetative structures (e.g., tall, dense cover; short, sparse cover) across many tracts of Service land in the complex.

Objective 1A: Establish permanent vegetation monitoring transects and collect baseline floristic composition data on all tracts with ≥25 upland acres, within one year of the approval of this CCP.

Rationale 1A:
Prairie areas throughout North America continue to decline in quantity and quality, due in part to invasion by exotic plant species (Samson and Knopf 1994, Bragg and Steuter 1995). Many native-prairie areas on Service-owned lands in the complex have been heavily invaded by a number of cool-season introduced grass species (e.g., smooth brome, Kentucky bluegrass, crested wheatgrass) and noxious weeds (e.g., leafy spurge, Canada thistle, absinth wormwood). Vegetative cover type data collected on all Service-owned lands within the complex suggest that approximately 64 percent of all native-prairie acres is currently (circa 2003-2006) dominated by nonnative grasses (≥95 percent coverage) or noxious weeds (>50 percent coverage; see appendix L for a complete list of cover type categories used between 2003 and 2005 on the complex). Numerous scientific studies suggest that a number of grassland-dependent birds, including target species like the chestnut-collared longspur, marbled godwit, upland sandpiper, and western meadowlark, favor areas dominated by native vegetation (Lindmeier 1960, Fairfield 1968, Owens and Myres 1973, Maher 1974, Stewart 1975, Kaiser 1979, Ryan 1982, Faanes 1983, White 1983, Ryan et al. 1984, Wilson and belcher 1989, Kantrud and Higgins 1992, Dhool et al. 1994, Anstey et al. 1995, Skeel et al. 1995, Prescott and Murphy 1996, Davis and Duncan 1999). Johnson and Igl (2001) consider the degradation of remaining grassland areas in the northern Great Plains, due to inadequate or improper management, as one of the principle factors in the declining populations of numerous grassland-bird species.

Smooth brome is a rhizomatous, sod-forming species that is also a prolific seed producer (Willson and Stubbendieck 1997). It often excludes other species, effectively altering the species composition and native-species diversity and biomass of native-prairie communities (Willson 1990; Willson and Stubbendieck 1997). Kentucky bluegrass and crested wheatgrass frequently have similar impacts on native-prairie areas once they successfully invade them (Nagel 1980, Grace et al. 2001, Wilson and Partel 2003). Additionally, Christian and Wilson (1999) found that effects of certain introduced grasses (i.e., crested wheatgrass) not only displace native species and consequently reduce diversity, but they also alter pools and flows of energy and nutrients in the prairie ecosystem. Leafy spurge,

Canada thistle, and absinth wormwood are also problem plants that have the ability to form nearly monotypic stands and therefore, threaten native biodiversity (Watson 1985, Bedunah 1992, Trammel and Butler 1995, Svedarsky and Van Amburg 1996, Wrage and Kinch 1981, Hutchison 1992). Additionally, the negative effects on native-prairie biodiversity related to the expansion of native woody vegetation (i.e., western snowberry and silverberry) have been documented by numerous authors.

Expansion of native, low shrubs has occurred over time since European settlement. The subsequent loss or misapplication of historic ecological disturbance regimes (i.e., fire and herbivory) have been a major contributing factor. Extirpation of bison (Campbell et al. 1994) and wildfire suppression are factors that have been tied to expansion of woody vegetation into the northern mixed-grass prairie (Grant et al. 2004b). According to Murphy (2005), invasion of native prairie by shrub species like western snowberry and silverberry is a principle threat to native-plant diversity in the State.

Additionally, this phenomenon has many detrimental affects on grassland nesting birds (discussed in detail in rationales 1D and 1E). Vegetative cover-type data collected on Service-owned lands within the complex suggest that several native prairie tracts have >43 percent of their upland acres classified as western snowberry (≥25 percent coverage; appendix L). Monitoring plant-species composition changes is essential to determining whether the complex's management practices (e.g., burning, grazing) and their associated timing (e.g., late fall, three-to-five leaf stage of smooth brome) benefit or harm native-plant communities.

Grant et al. (2004a) have developed a method (the belt transect method) of documenting the status and trend of certain plant species and species groups (e.g., dry cool-season native grasses) that are of management interest in the mixed-grass prairie region of the northern Great Plains. This methodology can be applied rapidly, efficiently, and extensively, and is repeatable over the course of time, due to its permanent nature. Further, compared to other methods of evaluating plant-species composition (e.g., Daubenmire 1959; Swink and Wilhelm 1994), the belt transect method can be more accurately accomplished by individuals of varied skill levels. This is important because the majority of the Service's vegetative field-data collection in the State is completed by seasonal biological science technicians who often have relatively little botanical experience.

Rather than classifying vegetation solely on a species-specific level, Grant et al. (2004a) recommend classifying vegetation according to a moderately detailed, hierarchical breakdown of vegetative groups. Plant groups are based on regional references that describe common native plant community types for State uplands (Hegstad 1973). This approach is supported by several factors, including: 1) Service managers in the Dakotas are most concerned with relatively few exotic and/or invasive plant species; 2) sampling accuracy and efficiency among observers are compromised by increasing the complexity of classifications, and; 3) subtle shifts in the species makeup of native grasses and forbs occur continuously due to the always dynamic precipitation patterns in the northern Great Plains.

The complex staff plans to establish transects on all native-prairie sites containing more than 25 upland acres, to evaluate species plant group composition change over time. In addition to collecting baseline vegetative data at the time that transects are established, staff will re-survey each individual tract within one year of it being managed (e.g., burned, grazed), or every 3–5 years if no management occurs (Grant et al. 2004a), to support informed restoration decisions. A list of habitat associations that complex staff will use in collecting belt transect data is provided in appendix H.

Strategy 1A:

- Establish one permanent 82-foot (25 meter) belt transect for every 10 acres of native-prairie upland on tracts with more than 50 total native prairie upland acres. On tracts with between 25 and 50 total native prairie upland acres, establish one permanent 82- foot (25 meter) belt transect for every 5 acres of native prairie upland.
- Collect baseline plant species composition data at these transects.
- Determine upland acreage of sites and employ systematic-random transect placement using the Service's Refuge

Lands GIS (RLGIS) extension and associated data layers.
- Establish transects and collect plant species composition and structural data.

(If any doubt exists about the sod history (native versus previously cultivated) of a tract it shall be considered native, until proven otherwise).

Objective 1B:
Reduce the frequency of occurrence of exotic cool-season grasses (i.e., smooth brome, Kentucky bluegrass, crested wheatgrass) by ≥5 percent, over a 15-year period on ≥50 percent of all native portions (e.g., management units) of WPAs and refuges. Correspondingly, increase the frequency of occurrence of both cool- and warm-season native grasses (e.g., little bluestem, needle-and-thread, switchgrass, prairie junegrass) by ≥5 percent over the same timeframe on the same tracts.

Strategy 1B:
- Manage tracts, or portions of tracts, with prescribed fire, grazing, or a combination of both.
- Manage tracts with select chemical herbicides (i.e., Imazapic-based, Glyphosate-based).
- Interseed (no till) a mix of cool- and warm-season native grass seed.
- Monitor change over time by collecting and evaluating belt transect data.
- Collect baseline data when transects are initially established (within one year of the completion of this CCP); Objective 1A will serve as a starting point for measuring changes in the frequency of occurrence of various habitat associations.

Objective 1C: Reduce the total acreage of State-listed noxious weeds (i.e., leafy spurge, Canada thistle, absinth wormwood; Lym 2004) by a total of ≥10 percent, over a 15-year period on ≥50 percent of all native portions of WPAs and refuges.

Strategy 1C:
- Chemically treat infested areas.
- Mow or hay infested areas.
- Graze infested areas.
- Burn infested areas to prepare the site for other control practices (e.g., biological control agents, chemical control).
- Release biological control agents (e.g., leaf spurge flea beetles).
- Use various combinations of the above treatments.
- Monitor change over time by collecting RLGIS cover-type data for the three principle noxious weed species, in a manner identical to how it was collected on Service-owned lands from 2003 to 2006 (see appendix L).

Rationales 1B and 1C:
The degree to which Service-owned native prairie in the complex is invaded by exotic cool-season grasses and noxious weeds (i.e., invasive forbs of Eurasian origin) is described in detail in rationale 1A, as are the problems associated with invasion by these species with respect to habitat suitability for grassland-dependent birds, native biodiversity, and overall functional integrity of remnant prairie areas.
The complex, therefore, plans to reduce the frequency of occurrence of exotic cool-season grasses and the overall acreage of noxious weed species on selected tracts of native prairie, over the next 15 years.

The complex staff proposes a relatively small reduction in frequency of occurrence (i.e., ≥5 percent) of exotic grasses because recent data on vegetative response to management on complex lands (Gregg Knutsen, Service, unpubl. data) indicate that proposing a more substantial reduction over the same timeframe is likely unrealistic, given several factors, including:
- the complex's management limitations (e.g., staff, weather-related problems, lack of ability to reliably conduct certain management practices);
- the degree of invasion (i.e., certain sites may have passed a "invasion threshold" beyond which management actions have little or no positive impact on the native plant community);
- climatic conditions (e.g., prolonged wet conditions that enhance the competitive abilities of exotic grass species);
- a lack of understanding on how to properly manage against exotic grass species (Brome Summit, Jamestown, ND, March 2006, unpubl. data), and;
- the aggressive nature of these invasive exotic grass species.

Changes in frequency of occurrence will be incremental, but positive, keeping in mind that the native prairie goal is long-term (>15 years) in nature. A reduction in the frequency of occurrence of these exotic-grass species should theoretically result in an increase competitive ability of native grass and therefore, and increased frequency of occurrence of cool- and warm-season native grasses. Changes in frequency of occurrence will be measured according to the methodology outlined in Rationale 1A (Grant et al. 2004a).

The complex also plans to reduce the overall acreage of noxious weeds over a 15-year period. Similar to the proposed reduction rate for exotic cool-season grasses, complex staff proposes what some may view a conservative reduction in the acreage of noxious weeds. A possibly conservative—but likely realistic and achievable—reduction value is most appropriate for noxious weeds. The complex's management and associated monitoring of noxious weed infestations and other habitat components would be adaptive in nature. Fifteen years is a short period of time with respect to altering the floral community of upland environments in the northern Great Plains. The complex staff intends to apply certain management practices, at certain rates and according to certain timing, with the understanding that if future data indicates that a change in strategy would be beneficial with respect to reducing the abundance of problem plant species, its management can be adaptive (Walters 1986). Therefore, the complex's proposed rate of reduction can be adjusted for future planning efforts, with an increased knowledge of vegetative response to various management practices, and continued consideration of all other extraneous variables.

Because of certain perceived limitations of the belt transect methodology (Grant et al. 2004a) with respect to accurately measuring change in abundance of noxious weed species, complex staff decided to measure noxious weed changes using a different methodology. The complex staff generally manages for a reduction of problem grass species (e.g., smooth brome) by applying a management practice (e.g., prescribed fire) to a broad area, such as an entire WPA, refuge management unit, or "field."

Conversely, complex staff often controls noxious weeds (e.g., leafy spurge) at specific, isolated sites within a field, WPA, or refuge management unit, using spot-management techniques like chemical application, mowing, or biological control agents. Therefore, it can be expected that if the treated infestations do not lie on one of the permanent belt transects, rate of change cannot be accurately determined. For example, several, small patches of Canada thistle could be present on multiple belt transects; however, because these patches may be considerably smaller than adjacent patches that do not lie on belt transects, they may not be deemed priority and may not receive treatment. Consequently, although the extent of the Canada-thistle patches that were treated (off transects) were greatly reduced or even eliminated, this reduction would not be reflected when belt transects were resurveyed. Therefore, complex staff has determined that a more appropriate approach to measuring changes is to measure an actual change in overall acreage, using data collected on all complex lands between 2003 and 2006 as a starting point and recollecting data on select sites in an identical fashion, 15 years from the completion of this CCP.

Objective 1D:
On ≥50 percent of all native portions of refuges, manage for a frequency of occurrence of native, low shrubs (i.e., western snowberry, silverberry) of ≤30 percent, over a 15-year period.

Objective 1E: On ≥50 percent of all native portions of WPAs, manage for a frequency of occurrence of native low shrubs (i.e., western snowberry, silverberry) of ≤50 percent, over a 15-year period.

Rationales 1D and 1E:
In addition to the negative effects on the biodiversity of native prairie caused by the invasion of exotic grasses (e.g., Kentucky bluegrass) and forbs (e.g.,absinth wormwood), expansion of native woody vegetation (i.e., western snowberry, silverberry) has occurred over time since European settlement and the subsequent loss or misapplication of historic ecological disturbance regimes (i.e., fire and herbivory). Extirpation of bison (Campbell et al. 1994) and wildfire suppression are factors that have been tied to expansion of woody vegetation into the northern mixed-grass prairie (Grant et al. 2004b). According to Murphy (2005), invasion of native prairie by shrub species like western snowberry and silverberry is a principle threat to native plant diversity in the State.

According to Igl and Johnson (1997), grassland-dependent bird populations in the State have declined over the last 25 years, whereas bird species associated with woody vegetation have increased. Grant et al. (2004b) determined that frequencies of occurrence of several bird species endemic to the Great Plains (e.g., chestnut-collared longspur), as well as mixed-grass prairie species of conservation concern (Igl and Johnson 1997; grasshopper sparrow, western meadowlark, bobolink, upland sandpiper) declined as the extent of woody vegetation increased in grassland areas. Occurrence of the most woodland-sensitive species declined rapidly as woody vegetation increased as little as 5–25 percent. Several grassland-nesting species, including the grasshopper sparrow and chestnut-collared longspur, had reduced densities in shrubby versus nonshrubby State study plots (Arnold and Higgins 1986). Additionally, Scheiman et al. (2003) found that grasshopper sparrow nest success was inversely related to shrub coverage in the eastern part of the State. Multiple other studies have documented the negative affects of shrubby and woody cover to multiple target bird species, including the bobolink (Johnson and Temple 1986, Sample 1989, Bollinger and Gavin 1992, Helzer 1986, Madden 1996), chestnut-collared longspur (Schneider 1998), grasshopper sparrow (Johnson and Odum 1956, smith 1963,Bent 1968, Wiens 1969, Wiens 1970, Kahl et al. 1985), marbled godwit (Renken and Dinsmore 1987), upland sandpiper (Buss and Hawkins 1939, Rotenberry and Wiens 1980, Renken 1983, Skinner et al. 1984, Sample 1989, Kantrud and Higgins 1992, Hull et al. 1996), and western meadowlark (Sample 1989, George and McEwen 1991, Kimmel et al. 1992, Anstey et al. 1995, Hull et al. 1996, Madden 1996).

Additionally, Arnold and Higgins (1986) found that brown-headed cowbirds, which are obligate nest parasites (Johnsgard 1979), were one of the two most abundant species on shrubby study sites. Davis and Sealy (2000) also documented increased brown-headed cowbird abundance on sites bordered by western snowberry.

Long Lake NWR, Florence Lake NWR, and Slade NWR were established as breeding grounds and sanctuaries for migratory birds; therefore, common sense dictates that the complex manage its lands for the benefit of bird species that are of the greatest concern in the PPR—grassland nesting birds. The aforementioned scientific data clearly illustrate the negative impacts of woody cover to a multitude of grassland birds, therefore, complex staff limited the amount of this vegetative component on Service lands.

Arnold and Higgins (1986) considered "shrubby" sites in the Missouri Coteau of the State as those sites with ≥30 percent coverage of western snowberry and silverberry. Similarly, Murphy (2005) recommended a frequency of occurrence of native low shrubs of ≤30 percent as a component of "high-quality" native prairie in the State. Further, Grant et al. (2004b) recommend that restoration efforts on northern prairie grasslands target ≤20 percent woody encroachment. The complex staff has elected to strive for a more conservative—and likely realistic—target (≤30 percent) in this initial restoration objective.
The purpose of wetland management districts is to ensure the long-term viability of the breeding waterfowl population and production through the acquisition and management of WPAs, while considering the needs of other migratory birds, threatened and endangered species and other wildlife (Service, June 2004 unpubl. report). Therefore, despite what is known about the negative affects of native, low-shrub encroachment on many grassland bird species, management of WPAs must, first and foremost, provide habitat conditions preferred by waterfowl, based on their establishing principles. Several studies indicate that western snowberry-dominated communities are attractive early season nest sites for several duck species (Leitch 1951, Dzubin and Gollop 1972, Hines and Mitchell 1983, Cowardin et al. 1985, Duebbert et al. 1986, Kruse and Bowen 1996). Therefore, the complex has decided to allow a greater extent of low shrub coverage in the wetland management district, than on its refuges, which were established for "migratory birds" in general. In addition to upland nesting ducks, extensive coverage of native, low shrubs is preferred as nest site vegetation by other grassland bird species, including the northern harrier (Sutherland 1987, Messmer 1990, Kantrud and Higgins 1992, Murphy 1993, Sedivec 1994) and to a slightly lesser degree the sharp-tailed grouse (Heart et al. 1950, Christenson 1970, Pepper 1972, Kohn 1976, Hillman and Jackson 1973, Sisson 1976, Giesen 1987, Meints 1991), which are complex target species. Further, scattered shrubs are often used as elevated singing perches for grassland-dependent species (e.g., chestnut-

collared longspur; Harris 1944, Fairfield 1968, Creighton 1974, Creighton and Baldwin 1974). On WPAs the low-shrub objective level is set at a maximum of 50 percent frequency of occurrence in order to provide quality duck nesting habitats, while not allowing these upland habitats to become so overrun with woody cover that use by certain target species (e.g., grasshopper sparrow, upland sandpiper) is precluded.

Strategies 1D and 1E:

- Manage tracts or portions of tracts with prescribed fire, grazing, and a combination of both.
- Concentrate cattle in shrub patches with salt licks during grazing operations.
- Manage tracts with appropriate herbicides (McCarty 1967).
- Mow shrub patches (Corns and Schraa 1965).
- Monitor change over time by collecting and evaluating belt transect data. Baseline data collected when transects are initially established (within one year of the completion of this CCP; Objective 1A) will serve as a starting point for measuring changes in the frequency of occurrence of various habitat associations.

Objective 2A: On refuges in the complex, maintain a minimum of 35 percent of all native-prairie upland acres in a high visual obstruction reading (VOR) category (>8 inches; Robel et al. 1970), a minimum of 25 percent in a medium VOR category (4 to 8in), and a minimum of 10 percent in a low VOR category (<4 inches).

Objective 2B: On WPAs in the complex, maintain a minimum of 40 percent of all native prairie upland acres in a high VOR category (>8 inches; Robel et al. 1970), a minimum of 25 percent in a medium VOR category (4–8 inches), and a minimum of 5 percent in a low VOR category (<4 inches).

Rationales 2A and 2B:
Vegetative structure is an important component of grassland habitats in the northern Great Plains. According to Robel et al. (1970), vegetative species composition alone does not typically provide all of the information necessary to appraise the habitat potential of a grassland. Further, Emlen (1956) suggested that vegetative density and screening efficiency were at least as important as species composition in describing avian habitats. This is particularly true for birds that are vegetative species generalists, such as upland nesting ducks (Mark Sherfy, USGS, unpubl. data), and several of the complex's target upland species, including the bobolink (Dechant et al. 2003), grasshopper sparrow (Kendeigh 1941, Birkenholz 1973, Whitmore 1979, Sample 1989, Wilson and Belcher 1989, Madden 1996), sedge wren (Mousley 1934, Meanley 1952, Birkenholz 1973, Cink 1973, Crawford 1977, Knapton 1979, Johnsgard 1980, Faanes 1981, Burns 1982, Higgins et al. 1984, Skinner et al. 1984, Renken and Dinsmore 1987, Manci and Rusch 1988, Frawley 1989, Sample 1989, Bryan and Best 1991, Frawley and Best 1991, Volkert 1992, Johnson and Schwartz 1993a, Dhol et al. 1994, Hartley 1994, Johnson and Igl 1995, King and Savidge 1995, Helzer 1996, Patterson and Best 1996, Best et al. 1997, Delisle and Savidge 1997, Helzer and Jelinski 1999, Horn and Koford 2000), sharp-tailed grouse (Hanson 1953, Sisson 1976, Baydack 1988, Saab and Marks 1992), and northern harrier (Stewart and Kantrud 1965, Stewart 1975, Linner 1980, Evans 1982, Apfelbaum and Seelbach 1983, Faanes 1983, Kantrud and Higgins 1992, Dhol et al. 1994, Prescott et al. 1995, MacWhirter and Bildstein 1996, Prescott 1997). For the above grassland species and many others, vegetative structure is a more important factor than species composition.

Laubhan et al. (2006) summarized numerous scientific data that quantified structural habitat preferences of multiple upland birds, including all 10 of the complex's target upland species. VOR (height-density) preferences for all are listed in table 8.

VOR measurements are strongly correlated ($P<0.01$) with the amount of vegetation present in a given area and can constitute a reliable index if certain measurement standards are followed (Robel et al. 1970). Based on the mean preferred VORs of these 10 species (Laubhan et al. 2006), they can be separated into three distinct categories: 1) low cover (<4 inches), 2) medium cover (4–8 inches), and high cover (>8 inches). Marbled godwits, chestnut-collared longspurs, and upland sandpipers prefer vegetation in the low-structural category; western meadowlarks, grasshopper sparrows, bobolinks, and sharp-tailed grouse prefer vegetation in the medium-structural category; and sedge wrens, mallards,

and northern harriers prefer vegetation in the high-structural category.

Table 8. Preferred visual obstruction reading (VOR) range and mean for 10 target upland bird species (Laubhan et al. 2006).

SPECIES	*VOR RANGE (inches)*	*VOR MEAN (inches)*
bobolink	12–21	17.8
chestnut-collared longspur	–	7.5
grasshopper sparrow	11–20	15.1
mallard	14.5–45	28.7
marbled godwit	0–10	5.5
northern harrier	≥10	37.7
sedge wren	–	23.5
sharp-tailed grouse	13–30	19.4
upland sandpiper	5–20	9.2
western meadowlark	12.5–20	13.6

Because structural habitat preferences (e.g., VORs) of both the target and secondary species vary widely, it is assumed that the needs of all species will not be met on a single tract or management unit, but rather the needs of the these species groups will be met by providing a mosaic of vegetative structures (i.e., high, medium, low) across many tracts of land in the complex. Prairies generally need frequent, carefully timed defoliation by various means (i.e., fire, grazing) to maintain vegetative diversity (species richness and structure; Grant et al. 2004b). The complex staff anticipates that periodic disturbance to portions of refuges and WPAs will not only maintain or enhance native plant diversity, but will also serve to annually provide a host of vegetative structures across the Service-owned landscape of the complex.

Post-burn vegetative monitoring efforts across the northern Great Plains indicate that after defoliating a site, it takes multiple years (e.g., 2–3) for structural conditions to resemble pre-burn conditions (Launchbaugh 1972). Rates of vegetative return (i.e., VOR profile) vary among treatment type (e.g, fire, grazing; Kruse and Bowen 1996). For example, one year after a spring grazing event in the northwestern portion of the State, vegetative structure was similar to that of control fields (Kruse and Bowen 1996). However, from immediately after a spring burn until one year post-burn, the percentage of short, sparse vegetation (<2 inches) increased, but by two-years post-burn it had decreased to a percentage similar to that in control fields. Therefore, conducting defoliation activities at variable intervals (e.g., every 3–5 years), across portions of numerous WPAs and refuges, will theoretically create a mosaic of vegetative structures across both temporal and geographical gradients.

Management recommendations for several upland target species, including the northern harrier (Dechant et al. 1998), sedge wren (Dechant et al. 2003a), grasshopper sparrow (Dechant et al. 2003b), bobolink (Dechant et al. 2003c), western meadowlark (Dechant et al. 2003d), and upland sandpiper (Dechant et al. 2003e), all stress the need for land managers to maintain a mosaic of grassland conditions. Defoliating different portions of Service-owned tracts in different years ensures that a variety of successional stages exist to not only meet the needs of a variety of nesting birds, but also to meet foraging (Schramm et al. 1986, Volkert 1992, Zimmerman 1993), loafing, and brood-rearing needs (Dechant et al. 2003e) of various bird species. In addition to prescribed fire, rotational grazing is commonly recommended as a beneficial defoliation tool for not only the aforementioned target species, but also the remaining three target species (mallard, chestnut-collared longspur, marbled godwit; Cowan 1982, Messmer 1990, Sedivec 1994). Suggested defoliation intervals for the aforementioned target species ranged from two to five years (Dechant et al. 1998, Dechant et al. 2003a, Dechant et al. 2003b, Dechant et al. 2003c, Dechant et al. 2003d, Dechant et al. 2003e).

Therefore, in general, complex staff intends to utilize a defoliation return interval of approximately three to five years, with the understanding that this return interval will apply only to priority lands, because of staff and budgetary limitations. Also, this return interval may be decidedly shorter (e.g., one year, less than one year) if the complex staff determines that more frequent treatments are needed to most effectively manage against the invasion of

cool-season exotic grasses on a particular tract. The complex staff anticipates that if management is applied approximately at this interval (3–5 years) complex lands will provide the percentages of vegetative structure categories outlined in Objective 2A and 2B. Thirty percent of the upland acreage in the complex will not be targeted for a specific structural category, in order to allow for various uncontrollables (e.g., climatic extremes).

The complex staff established different structural class target percentages for refuges and WPAs. Because WPAs are "waterfowl first" lands, complex staff decided it was appropriate to manage for a increased percentage of high VOR acres (40 percent; compared to 35 percent on refuges) and decreased percentage of low VOR acres (5 percent; compared to 10 percent on refuges). In addition to mallards, several other upland nesting duck species (i.e., northern shoveler, gadwall, northern pintail, blue-winged teal) prefer VORs in the medium (4–8 inches) and high (>8 inches) categories (Laubhan et al. 2006). Additionally, it should be noted that VORs in the low category (<4 inches) are abundant within Long Lake WMD, in the form of privately owned pasture land that is commonly subject to intensive grazing pressure on an annual basis (Van Ningen, Service, pers. commun.).

In order to determine if Objectives 2A and 2B are achieved, complex staff will monitor VORs annually for 15 years on a sample of 20 WPAs and refuge management units that are deemed high-management priority, 10 WPAs and refuge management units that are deemed medium-management priority, and five WPAs and refuge management units that are deemed low-management priority. This will allow complex staff to capture VOR data not only on those tracts that receive regular management attention (i.e., high, and to a lesser degree medium priority; managed every three to five years), but also on low priority units that are managed at much greater intervals (i.e., managed no more than once every seven years).

All high- and moderate-priority sample sites will contain a minimum of 25 native prairie acres, whereas low-priority sample sites will only have a minimum of 10 native prairie acres. To ensure collection of meaningful data, the complex staff will define a seasonal measurement window (e.g., mid-June to mid-July) during which all structural data will be collected each year.

Strategies 2A and 2B:

- Manage tracts or portions of tracts with prescribed fire, grazing, or a combination of both.
- Manage tracts with select chemical herbicides (i.e., Imazapic-based, Glyphosate-based).
- Measure VOR using a methodology modified from Robel et al. (1970) at approximately 19.5-foot intervals along permanent belt transects, excluding the start and end points (i.e., three measurement locations per 82-foot (25-meter) transect).
- Measure VOR annually, for a period of 15 years, at a sample of native prairie management areas (e.g., refuge management units, WPAs).

Objective 3: Within 3 years of the completion of this plan, a definitive determination will be made on the sod history (native versus previously cultivated) of all fee-title lands in the complex. Sod history data will be recorded as a layer in the complex's GIS.

Rationale 3:
Determining the sod history (native/virgin versus previously cultivated) of certain Service-owned lands or portions thereof is often relatively straightforward. Conversely, the determination can be difficult and exhaustive on some tracts. While some complex lands were farmed within the last 10–20 years, some old crop fields were seeded back to grass cover shortly after the Service acquired the land (e.g., the 1930s on Long Lake NWR), and others were farmed for only a few years between the 1900s and 1930s and were actually acquired in perennial grass cover. Still other lands may have been broken (cultivated) in the early 1900s, but never cropped. Such areas may have been readily reinvaded by native plants and might currently support native vegetation and other biological communities equivalent to some of the most pristine native prairie tracts in the complex (Grant, Service, pers. commun.).

A comprehensive and definitive determination of the sod history of all upland acres managed by the complex had not been attempted prior to 2006. Knowledge of a tract's sod history is

important because the suite of management tools available to complex staff is dependent upon whether that tract is native prairie (never cultivated) or an old cropfield (previously cultivated). Specifically, the Service restricts any cultivation of native prairie, regardless of its apparent condition (i.e., whether dominant vegetative cover is native or exotic and invasive), to preserve various components (e.g., soil structure) of this increasingly rare habitat-type. On the other hand, sites that have previously been cultivated and are now in perennial grass cover can again be cultivated (i.e., part of a multi-year prescription for eventual reseeding to a native grass mix) if it is determined that such an action is appropriate.

The degraded condition of much of the Service-owned native prairie in the complex was discussed in detail in the background section of the native prairie habitat-type and the problems associated with native prairie being in this degraded condition (e.g., reduced use by breeding grassland-dependent birds) was discussed in rationales 1A, 1B, and 1C. Based on systematic and nonsystematic evaluations of vegetative response to various grassland management practices on complex lands, it is generally accepted that, in most cases, obtaining a desired grass diversity (i.e., a dominance of native species) on a severely degraded piece of land is most easily achieved by cultivating the tract and eventually reseeding it to a native grass mix (Knutsen and Van Ningen, Service, pers. commun.). Therefore, if complex staff determines that a tract of land has a history of previous cultivation, they can utilize this management strategy to achieve a desired grass diversity. Conversely, if it is determined that the tract is native sod, staff must utilize other methods to improve the vegetative diversity of that particular tract.

For those tracts in which a definitive determination of sod history is especially difficult, multiple site visits and use of various historic data and possibly non-Service biological expertise may be necessary to accomplish this objective.

Strategy 3

- Check tracts in question for evidence of plow furrows or other linear disturbances caused by implements (e.g., plows disks, seed drills).
- Examine acquisition records, old refuge narratives, aerial photographs from multiple years, and U.S. Soil Conservation Service records for tracts in question.
- Utilize soil experts from the U.S. Natural Resources Conservation Service (USDA) or another agency or organization to examine the soil A-horizon for evidence of disturbance due to cultivation for tracts in question.
- Create a comprehensive, attributed GIS layer using either GPS or "heads-up" digitize boundaries of areas identified as old crop fields.
- Consider other indicators of old cropland (when evaluating questionable tracts) including: 1) rock piles or rocks strewn linearly along fence lines or what appears to be a field edge; 2) distinct field edges; 3) nearly monotypic stands of smooth brome, with some Kentucky bluegrass, but little native plant community (frequent native re-invaders include pasture sage, common yarrow, several goldenrod species, and silverleaf scurfpea); 4) no partially buried rocks covered with profuse lichens; 5) especially deep furrows or linear piles of windborne topsoil along preexisting fence lines, and; 6) an absence of clubmoss and cryptogamic crust

Objective 4A: Over a 15-year period, secure protected status on ≥80,000 grassland acres, with efforts focused on two priority area types: 1) areas of undisturbed grass (≥55 acres), located in areas that support ≥25 breeding duck pairs per square mile; 2) areas of contiguous undisturbed grass (≥640 acres), with ≤30 percent of their area being comprised of semi-permanent or permanent wetlands.

Rationale 4A:
The central grasslands were once North America's most extensive ecosystem (Johnson and Igl 2001). Grasslands are one of the two major habitat components (wetlands) in the PPR that influence the productivity of waterfowl (Dixon and Hollevoet 2005), as well as many other bird species that depend on both wetland and grassland areas during various parts of their life cycle (e.g., marbled godwit, Wilson's phalarope). However, in the late 1800s, the first wave of farmers or "sodbusters" settled in the

PPR. The central and eastern portions of the Dakotas were highly attractive to these settlers because of homesteading and agricultural opportunities. With settlement came agricultural, rural, and urban development, and a corresponding change in the face of the prairie landscape. Grassland losses in the mixed-grass prairie portion of the State are estimated at ≥70 percent compared to pre-settlement times (Sampson and Knopf 1994, Sampson et al. 1998, Conner et al. 2001). Associated with the large-scale conversion of native prairie has been a related change in grassland-dependent birds and other wildlife (e.g., Richardson's ground squirrel) communities (Johnson and Igl 2001). The rich abundances of prairie wildlife that are described in historical accounts (e.g., Dinsmore 1994) can now only be imagined. It was not until the 1960s that widespread and systematic surveys of most bird species were initiated, in the form of the North American Breeding Bird Survey (BBS; Robins et al. 1986). Therefore, quantitative evidence of grassland bird species population changes exist for only the past ~35 years, long after most grassland losses occurred. However, BBS data does indicate that populations of many grassland bird species have been in decline over that brief time period alone. From 1967–1993, several bird species, including the chestnut-collared longspur and western meadowlark declined by ≥39 percent in the State (Johnson and Igl 2001). Bobolinks and many other species also showed noteworthy, but less dramatic, declines. Grassland-nesting birds have shown more consistent population declines during this period of time than any other group of birds in North America (Sauer et al. 2001).

Although the prairie potholes of the Dakotas support a wide diversity of birdlife, they are most well-known for their role in waterfowl production. Although the PPR occupies only 10 percent of North America's waterfowl breeding range, it produces approximately 50 percent of the continent's waterfowl population (Kantrud 1983). Many species of waterfowl (e.g., mallard, northern pintail, gadwall, blue-winged teal, northern shoveler) commonly nest in the grassed uplands that surround wetland basins; therefore, grassland losses equate to reduced productivity for these species. Converting native prairie areas of the PPR to cropland has directly impacted waterfowl, by increasing habitat fragmentation and reducing the overall area of breeding cover for grassland nesting species (Sugden and Beyersbergen 1984, Batt et al. 1989). Greenwood et al. (1995) determined that duck nest success in the PPR increases as the amount of grassland in the landscape increases. Furthermore, it has been determined that increased grassland cover increases the daily survival rate for multiple duck species (Reynolds et al. 2001). Specifically, according to Ron Reynolds (Service, pers. commun.), for every 1 percent decline of "priority" grassland in the PPR, there will be 25,000 fewer ducks in the fall.

Presently, unprotected grassland areas in cropland dominated landscapes are typically converted to cropland, and associated wetlands are drained or converted to other uses (Dixon and Hollevoet 2005). Striving to protect what remains of the pre-settlement prairie landscape is an integral part of the Service's wildlife conservation efforts.

Despite the extensive loss of grasslands that has already occurred throughout the State, there is ample opportunity for the Service, and more specifically for the complex, to protect a large percentage of the area's remaining grasslands through the establishment of perpetual and long-term easements and the purchase of WPAs and refuges. Societal transformations that have been most evident in the State in the last half century (i.e., urban growth, out-migration of young people) may actually increase opportunities for acquiring and protecting critical wildlife habitats that are currently in private ownership (Dixon and Hollevoet 2005). Presently, there is a strong public interest in protecting wildlife habitats, and a disproportionately large amount of private land that includes grassland habitat, as compared to the funding available to acquire easements and WPAs; therefore, the complex staff's decisions can benefit from science-driven predictive habitat models. HAPET has developed a model which shows the distribution of priority grassland patches (≥55 acres) in relation to breeding duck pairs (≥25 per square mile; figure 15). Model outputs denote priority grassland patches, primarily with respect to upland nesting ducks; however, the protection of these sometimes small grassland areas will also benefit a wide variety of grassland nesting birds that are not area-dependent (e.g., western meadowlark; Johnson and Igl 2001). Funds directed primarily toward waterfowl conservation (i.e., NAWCA) should be targeted towards grassland areas that

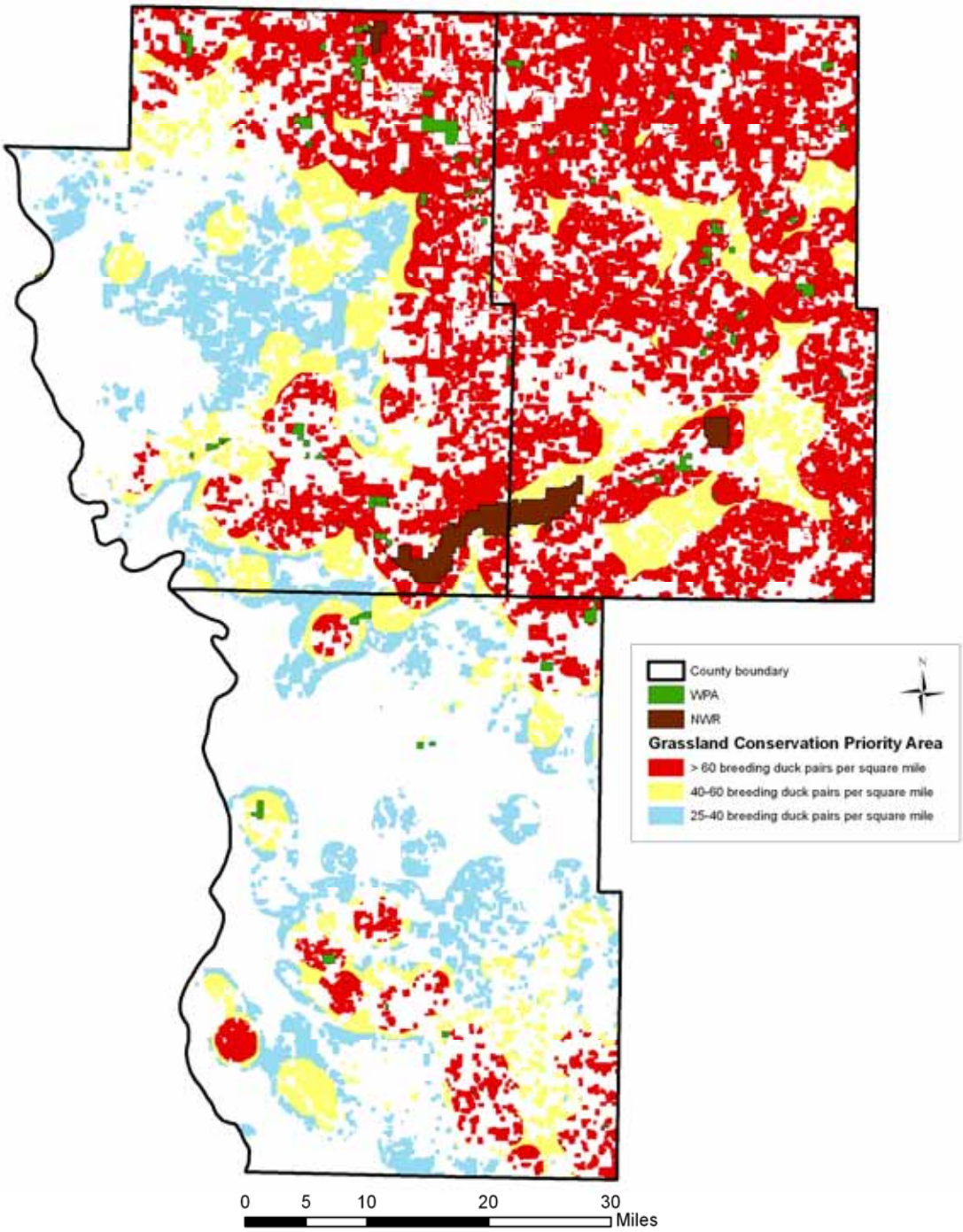


Figure 15: Distribution of 55-acre sections, which contain priority grasslands for conservation, relative to the number of breeding ducks per square mile.

this model deems priority. This acquisition strategy has been adopted by the Service's DWG for grassland easement acquisition that is ultimately directed at increasing waterfowl productivity. If, over a 15-year period, ≥2,000 acres of grassland habitat can be protected, this will prevent the loss of habitat for an estimated minimum of 2,254 breeding duck productivity, based on relationships between grassland and nest success (circa 1995). Another HAPET model identifies priority grassland areas with respect to area-dependent grassland nesting birds (e.g., northern harrier, upland sandpiper, grasshopper sparrow, bobolink, sharp-tailed grouse; Johnson and Igl 2001). It shows the distribution of contiguous areas of grass cover that are ≥640 acres, with ≤30 percent of their area being comprised of semi-permanent or permanent wetlands (figure 16). These areas, known as Grassland Bird Conservation Areas (GBCA; Type I) are based on the assumption that the protection of large, contiguous blocks of grass within a larger, grassland-dominated landscape provide adequate habitat for a wide range of grassland-dependent bird species (Mike Estey, Service, unpubl. report). The model was developed largely on the judgments and recommendations of numerous Midwestern grassland bird experts. Funds directed at bird groups other than waterfowl (e.g., LWCF) should be focused on grassland areas that this model deems priority. HAPET compared the GBCAs with empirical models developed with BBS data and found strong correlation between the two (Niemuth et al. 2005).

Prioritization for purchase of easements and fee-title lands can be done by giving preference to those currently unprotected grassland patches that are deemed priority by one of the above HAPET models and are located in close proximity to already protected tracts of grassland. Prioritizing for land protection in this manner ultimately leads to large protected areas that theoretically suffer reduced negative effects of fragmentation. According to Johnson and Igl (2001) habitat fragmentation is one of the main factors contributing to the present decline of numerous grassland-bird populations.

Strategy 4A:

- Use an acquisition strategy developed by the Service's DWG from HAPET model results, which identifies priority grasslands (both native prairie and old cropfields) for upland nesting ducks, to determine the amount and approximate location of priority grassland acquisition areas for protection with NAWCA and donated partner (i.e., Ducks Unlimited) funds.
- Use a model developed by HAPET (Grassland-bird Conservation Areas – Type I) to identify priority grasslands (both native prairie and old crop fields) for grassland-dependent and area sensitive birds, to determine the amount and approximate location of priority grassland acquisition areas for protection with LWCF and other funds.
- Purchase land through fee title acquisition (i.e., WPAs, refuges).
- Establish perpetual easements on existing privately owned grasslands (both native prairie and old crop fields). Seek additional funding through the LWCF, partners, and/or other sources

Objective 4B: Through active enforcement, protect all grassland areas under perpetual Service easement from cultivation, over a 15-year period.

Rationale 4B:
The Service's SWAP was authorized by Congress in 1958 as an amendment to the Duck Stamp Act (Service 2005b). Since the program began in the early 1960s, more than 2,000,000 acres of both wetland and grassland habitats have been protected through the easement program in the Dakotas, Montana, and Minnesota (Service 2005b). As of 2005, 41,181 grassland acres were protected under perpetual Service easements in the complex.

Service grassland easements are perpetual in nature. The Service issues the landowner a one-time payment in order to acquire the maintain grass cover. This prevents landowners from ever cultivating protected grassland areas, or haying these areas prior to July 15 of each year. There are additional restrictions on development and mining of these protected areas.

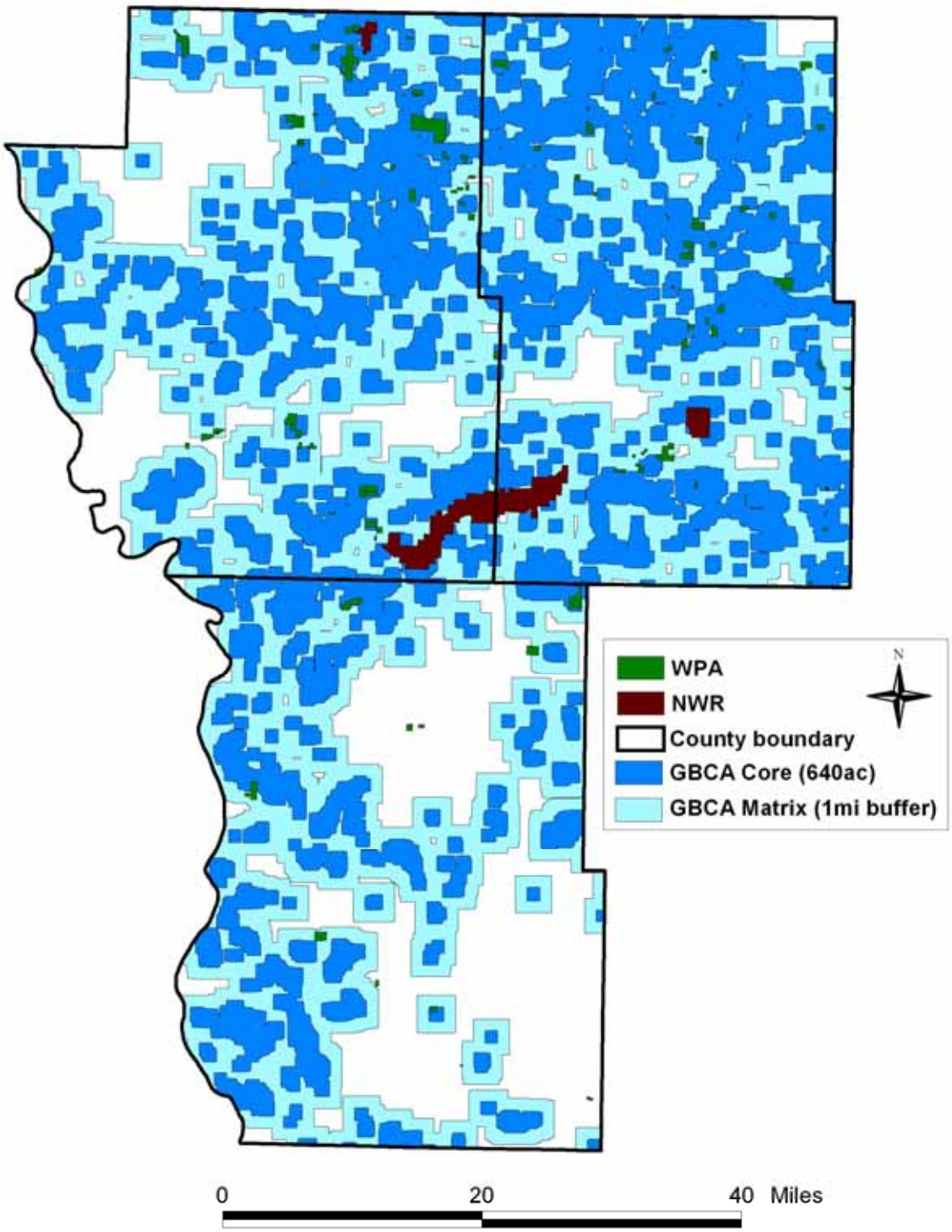


Figure 16: Grassland Bird Conservation Areas (GBCA; Type 1) and their associated 1-mile buffer areas in Long Lake WMD.

The purpose of the easements is to protect the landscape for waterfowl production, as well as to secure the need of other breeding grassland-dependent birds (e.g., marbled godwit, bobolink, grasshopper sparrow) while minimally affecting the farming and ranching community (Service 2005b). However, because of the history of periodic violations throughout the State, as well as other states, easement-compliance work is vitally important to the continued success of the program (Service 2005b). Based on current easements in the complex, which are predominantly native prairie, the major regulatory enforcement issue concerns cultivation, since native prairie is rarely used as hay land. However, in the future as the complex acquires tamegrass (previously farmed) tracts that are used as hay land by landowners, the potential will increase for violation of the pre-July 15th haying restriction. The complex will evaluate the need for additional enforcement strategies (e.g., aerial flights on, or shortly after, July 15) as easements are acquired on tamegrass tracts in the complex. It is generally accepted that if easement compliance is not enforced annually through surveillance and necessary landowner contacts, violation rates in the State will increase (Van Ningen, Service, pers. commun.).

In addition to the reactionary measure of surveying the integrity of easement wetlands each year, the complex also takes a proactive approach to easement enforcement by annually informing new landowners of existing Service easements on their property (since perpetual easements stay with the land, regardless of who owns it), as well as the associated regulations.

Through both proactive and reactive measures, the complex can assure a high rate of landowner compliance within the wetland management district, which in-turn assures that more than 41,000 acres of privately owned grassland habitat in Burleigh, Emmons, and Kidder counties will be protected in perpetuity and will therefore be available to a wide variety of grassland nesting birds.

Strategy 4B:

- Send letters to new landowners informing them of existing easements on their property, along with the associated regulations.
- Annually conduct aerial easement enforcement surveys of all existing easements (survey two-thirds of the wetland management district in the fall and the remaining one-third in the spring, rotating counties each year).
- Follow protocols within the Service's easement manual to handle all potential violations.
- Initiate annual aerial enforcement surveys of new tamegrass easements, timed to determine if haying restrictions are violated. Conduct these surveys on, or shortly after, July 15.

Old Cropland Sub-Goal:
Restore native floristic diversity to old cropland, as well as provide a mosaic of vegetative structure to satisfy the habitat needs of grassland-dependent bird species.

Background:
Approximately 9,600 acres (~ 48 percent) of the Service-owned upland acres in the complex were previously cultivated. For the purpose of this CCP, they will hereafter be referred to as "old cropland." Nearly all of these old cropland areas are presently in perennial grass cover, but many of them are in poor condition with respect to vegetative diversity. These fields are often dominated by only 2–3 exotic cool-season grass species (e.g., smooth brome, Kentucky bluegrass, crested wheatgrass), and a few low-quality native forb (e.g., goldenrods; The Northern Great Plains Floristic Quality Assessment Panel 2001) and nonnative forb (e.g., absinth wormwood) species. These vegetative monocultures typically support a reduced diversity of grassland nesting birds (Johnson and Igl 2001) and possess altered pools and flows of energy and nutrients, as compared to intact native prairie sites (Christian and Wilson 1999).

The complex hopes to reclaim these lands and vegetate them with a diversity of native flora, creating systems that, with modest management, are relatively resistant to invasion by cool-season exotic grasses and noxious weeds. Ideally, these areas will become a functional part of several extensive and relatively contiguous blocks of grass. One of the primary obstacles, which must be overcome, concerns the paucity of information on reestablishment of native grasses and, to a

greater extent, forbs, on previously cultivated sod in the northern Great Plains.

Meeting the old cropland sub-goal will require that extensive reclamation-level management is conducted to restore the native vegetation. Ideally, old cropland in the complex will consist of large expanses of contiguous grassland habitat that provide a diversity of native flora and a mosaic of vegetative structure across a broad landscape.

The Service has selected 10 bird species to serve as "target" or "indicator" upland species, which as a group reflect quality of upland habitats on Service lands within the complex. These species are the bobolink, chestnut-collared longspur, grasshopper sparrow, mallard, marbled godwit, northern harrier, sedge wren, sharp-tailed grouse, upland sandpiper, and western meadowlark. They were selected for a variety of reasons, including that:

- All 10 species regularly nest on complex lands;
- two species are endemic to the Great Plains and five others are secondary endemic species (Mengel 1970);
- eight are State Species of Conservation Priority (Hagen et al. 2005);
- six species are Birds of Conservation Concern (Service 2002)
- seven are Service Focal Species (Service 2005a);
- two are Stewardship Species under the North American Landbird Conservation Plan (Rich et al. 2004);
- two are Species of Concern under the United States Shorebird Conservation Plan (Skagen and Thompson 2003).

Table 7 lists the conservation plans associated with the target upland species. Upland habitat objectives in this CCP are geared toward the provision of quality habitats for these species. In addition to the target species, upland habitats found on Service lands within the complex should benefit a much broader group of "secondary" bird species, as well as a variety of other nonavian wildlife.

Because structural habitat preferences (e.g., vegetative height-density) of both the target and secondary species vary widely, it is assumed that the needs of all species will not be met on a single tract of Service land (e.g., WPA), but rather the needs of the target and secondary species groups will be met by providing a mosaic of vegetative structures (e.g., tall, dense cover; short, sparse cover) across many tracts of Service land in the complex.

Objective 1A: Over a 15-year period, annually seed ≥150 acres of old cropland to a native grass mix.

Strategy 1A:

- Drill or broadcast a native-grass seed mix.
- Prepare seeding sites (i.e., old cropfields) using multiple years of cropping, followed by multiple years of chemical fallowing (using a glyphosate-based herbicide).
- Ensure seed mix has nearly equal cool- and warm-season components.
- Include a variety of tools in post-seeding management, including clipping, prescribed fire, and prescription grazing.

Objective 1B: Introduce a mix of native forbs on ≥100 acres of "established" native seedings within 15 years of the completion of this CCP.

Strategy 1B:

- Conduct a forb diversity inventory on "established" native grass seedings to select sites for limited interseeding of forbs. Potentially survey along existing belt transects, but incorporate floristic quality index methodology to obtain both qualitative (Swink and Wilhelm 1994, The Northern Great Plains Floristic Quality Assessment Panel 2001) and quantitative (Grant et al. 2004a) data on the existing forb communities at various sites.
- Conduct a fall prescribed burn to prepare seedbed (Glass, USDA Forest Service, pers. commun.; Koerner, Service, pers. commun.; Kleiman, TNC, pers. commun.). Broadcast forb seed during late fall or winter (Glass, USDA Forest Service, pers. commun.; Koerner, Service, pers. commun.; Kleiman, TNC, pers. commun.)

Rationales 1A and 1B:
Grassland scientists in the northern Great Plains often speculate that some mixed-grass prairie areas become so heavily invaded by exotic cool-

season grasses, that they pass a biological threshold beyond which even the most timely and appropriate management efforts will not restore any semblance of native plant diversity (Brome Summit, Jamestown, ND, March 2006, unpubl. data). The vegetative monocultures that exist on many old cropfield tracts are an example of sites where certain biological thresholds may have been surpassed. Considerable past effort has been directed at planting old cropfields to a DNC mix. DNC is generally a mix of sweet clover, alfalfa, and introduced wheatgrass species (e.g., intermediate, tall) that is planted primarily to provide quality upland nesting duck habitat (Duebbert 1969; Duebbert and Lokemoen 1976).

Although the complex recognizes that properly maintained DNC serves as quality nesting habitat for a variety of upland nesting ducks, staff proposes to reseed all old cropland portions of Service-owned lands to a native-grass mix, over a substantial period of time (i.e., >15 years), for multiple reasons. First, DNC is not likely as self-sustaining a vegetative community over the long-term as native grass seedings (Meyer 1987). Frequently, 10–15 years after establishment of DNC, its vegetative species composition changes (e.g., a reduction in the alfalfa component) due to a condition commonly described as "sod-bound" that is related to nitrogen deficiency (Canode 1965). Therefore, radical management strategies (e.g., light cultivation) are required to rejuvenate degraded DNC stands (Meyer 1987, Duebbert 1981, Van Ningen, Service, pers. commun.)

Conversely, it is thought that the establishment of native-dominated perennial herbaceous cover will, with modest management (i.e., periodic fire or grazing), better resist invasion by exotic cool-season grasses (Meyer 1987, Grant, Service, pers. commun.). Second, native vegetation is preferred over nonnative vegetation by a number of the complex's target upland species, including the chestnut-collared longspur, marbled godwit, upland sandpiper, and western meadowlark (Lindmeier 1960, Fairfield 1968, Owens and Myres 1973, Maher 1974, Stewart 1975, Kaiser 1979, Ryan 1982, Faanes 1983, White 1983, Ryan et al. 1984, Wilson and belcher 1989, Kantrud and Higgins 1992, Dhool et al. 1994, Higgins et al. 1994, Anstey et al. 1995, Skeel et al. 1995, Prescott and Murphy 1996, Davis and Duncan 1999).

With respect to ducks, Mark Sherfy (USGS, unpubl. data) found that ducks nesting in Conservation Reserve Program (CRP) fields in the State and South Dakota showed no significant preference for tamegrass-seeded (e.g., DNC) fields over native-seeded fields. Also, nest success was actually slightly higher in native seedings than tamegrass seedings. According to Klett et al. (1984), nest initiation rates for mallards, gadwalls, and blue-winged teal in the Dakotas were as high or higher in native-seeded fields than in seeded fields that lacked natives. Nest success also was not significantly different in native-seeded versus tamegrass-seeded study fields (Klett et al. 1984).

Therefore, the Service proposes to seed old cropfields to a mix of cool- and warm-season native grasses over time. Duebbert et al. (1981) and Meyer (1987) suggest that quality grass habitat can be successfully established on previously cultivated lands. Many important considerations exist in planning for native seedings, including the mixture of species to be seeded. Duebbert et al. (1981) suggested several native species that can be seeded successfully in central part of the State, including green needlegrass, prairie junegrass, needle-and-thread, western wheatgrass, little bluestem, blue grama, prairie sandreed, and big bluestem. The complex staff has used many of these species in past seed mixes. The number of species in complex seed mixes is in part dependent on annual budgets; however, more important seed-mix considerations concern the ratio of cool-season to warm-season species. The complex is part of an historically cool-season grass (C3) dominated ecosystem, which is supplemented with multiple warm-season (C4) grasses. The complex staff strives for cool-season to warm-season grass ratio close to 1:1. The early emergence of cool-season grasses are an important component of quality nesting cover, especially for early nesting ducks (i.e., mallard, northern pintail; Reynolds, Service, pers. commun.).

Other important variables in the actual seeding effort include, but are not limited to: 1) timing; 2) planting method (i.e., drilling, broadcasting and depth; 3) seed source; 4) seeding rate (i.e., pounds of pure live seed per acre), and; 5) landform and topography (e.g., location in the landscape, such as aspect, slope, high- vs. mid- vs. low prairie). However, the site and more specifically seedbed

preparation are also especially important in the establishment of native seedings (Duebbert et al.1981). A prescription that has been successful within the complex in the past includes: 1) multiple years of cropping (i.e., small grains), followed by; 2) no less than one season of chemical fallowing using glyphosate-based herbicide, followed by seeding of natives during the appropriate timeframe. Bakker et al. (2003) found that competition from exotic cool-season grasses (i.e., crested wheatgrass) was significantly and consistently reduced through an annual application of a glyphosate-based herbicide. This strategy increased establishment, survivorship, and diversity of native seedings in Saskatchewan. Despite the native seeding establishment success derived in part from four years of generalist herbicide applications, exotic cool-season grasses may persist at these sites (Bakker 2003). A final important consideration when planning native seedings is uncontrollable climatic variability. Adequate precipitation is important for germination of native seeds; however, it also favors the competitive abilities of exotic cool-season grasses which are generally less drought-resistant that their native counterparts (Knutsen and Euliss 2001, Bakker 2003). Bakker (2003) recommended that management focus on establishing native vegetation during wet years and controlling exotic grasses during dry years.

Management subsequent to seeding should target the reduction of perennial nontarget plant species (e.g., smooth brome) and to a lesser extent annual nontarget plant species (e.g., green foxtail) through a variety of methods. Duebbert et al. (1981) indicated that seeded native grass will typically out-compete annual plants by the second or third year post-seeding.

Native grass reseeding efforts over the next 15 years will be based on a priority hierarchy established in this CCP for complex lands (table 1). As with many management actions, but maybe more importantly for native reseeding activities, the complex staff needs to consider budgets when determining annual seeding efforts.

Certain "established" native-grass seedings may lack a diversity of native forbs (e.g., prairie coneflower, prairie smoke, dotted blazing star), perhaps due to cultivation and herbicide use. However, forbs are an important habitat component for nesting grassland birds (Buss and Hawkins 1939, Rotenberry and Wiens 1980, Renken 1983, Skinner et al. 1984, Sample 1989, Kantrud and Higgins 1992, Kimmel et al. 1992, Anstey et al. 1995, Hull et al. 1996, Madden 1996), as well as other prairie-obligate wildlife species (i.e., Dakota skipper; Marrone 1992, Murphy 2005).

Over a 15-year period, complex staff intends to gain an improved understanding of the native forb communities that naturally revegetate after establishment of a native grass seeding, as well as learn more about the methods of interseeding of native forbs into "established" native grass stands.

Currently, there is a paucity of scientific literature related to the mechanics of interseeding forbs in the mixed-grass prairie of the northern Great Plains. However, based on limited, unpublished information, the complex staff suspects that adequate seed to soil contact is an important factor in native forb establishment; therefore, various defoliation measures may need to be applied (Glass, USFS, pers. commun.; Koerner, Service, pers. commun.; Kleiman, TNC, pers. commun.). Defoliation prior to seeding also potentially creates openings for forbs to grow. Application of forb seed through broadcasting, rather than drilling, is preferred, according to several sources of personal communication (Glass, USFS; Koerner, Service; Kleiman, TNC). A late fall or winter seeding timing (with or without snow cover) is generally preferred, so that the freeze-thaw cycle draws forb seed into the ground (Glass, USFS, commun.; Koerner, Service, pers. commun.; Kleiman, TNC, pers. commun.; Kleiman TNC, pers. commun.) also recommended harrowing seed into the soil and Koerner (Service, pers. commun.) suggested a postseeding graze, because cattle help to "plant" seed as they trail through an area. Koerner (Service, pers. commun.) also recommended multiple applications of forb seed over multiple years, coupled with multiple iterations of post-seeding management (e.g., prescribed fire). Finally, Koerner (Service, pers. commun.) cautions as to the extended amount of time (i.e., >10 years) for some forb species to express themselves in a seeded field.

Prior to any forb seeding, complex staff plans to conduct a limited forb diversity survey at a

sample of established native seedings, in order to determine an actual need for interseeding forbs.

Objective 2A:

Establish permanent vegetation-monitoring transects and collect baseline floristic composition data on all native seedings that are classified as "established" (i.e., floristic composition is estimated to be ≥50 percent native grass, with both cool- and warm-season species represented), within 3 years of classification.

Strategy 2A:

- Establish one permanent 82-foot (25 meter) belt transect for every 10 acres of upland on tracts with >50 total upland acres. On tracts with between 25 and 50 total upland acres, establish one permanent 82-foot belt transect for every 5 acres of upland. Collect baseline plant species composition data at these transects.
- Determine upland acreage of sites and employ systematic-random transect placement using the Service's RLGIS extension and associated data layers.
- Estimate percent native grass composition (e.g., ≥50 percent) through ocular estimation. Document native grass species (at least one cool-season and one warm-season grass) presence during a nonsystematic survey, conducted only after it is determined that native grass composition ≥50 percent.

Objective 2B: Ten years after being classified as an "established" native seeding, a frequency of occurrence of ≥65 percent native grass (including both cool- and warm-season species) will exist on 75 percent of all "established" native seedings.

Strategy 2B:
Determine native-grass percent composition through the collection and evaluation of belt transect data 10 years after a native seeding is designated as "established."

Rationale 2A and 2B:
Some native seedings on the refuges and WPAs have achieved a floristic composition that is ≥50 percent native grass within two years of being seeded (in most cases seedings take ≥3 years to achieve this level of native composition). Although the species richness of native graminoids is often relatively low in this early stage of restoration, at least one cool-season and one warm-season grass are generally present. Based on the timing of a management treatment (e.g., late spring burn), the vegetative expression at a particular seeding my be skewed towards either cool- or warm-season species. However, the Service intends to manage for a near 1:1 ratio of cool- and warm-season grasses. For management purposes, native seedings that have a dominance of native grass, represented by both cool- and warm-season species, should be considered "established" and subsequently be managed and monitored.

Therefore, complex staff proposes to establish permanent belt transects on all native seeded tracts that are considered "established" within 3 years of that classification. Detailed information on monitoring methodology is present in rationale 1A in the native-prairie habitat section.

The complex staff anticipates that through properly timed and executed management activities (i.e., fire, grazing) native grass composition will increase to at least 15 percent above the minimum threshold for a native seeding to be considered "established" (50 percent). The staff hopes that these seedings will become sites that, with modest management, resist invasion by exotic cool-season grasses and noxious weeds. Ideally, native seedings in the complex should become a functional part of the large, contiguous grassland blocks that support a variety of grassland-dependent birds. Permanent belt transects (Grant et al. 2004a) will be used to determine vegetative change over time and complex-imposed minimum success thresholds (e.g., a frequency of occurrence of native grasses ≥65 percent).

Objective 3A:
Over a 15-year period, continue to maintain perennial grass cover (i.e., DNC, tamegrass) on tracts that have not yet been seeded to native grass or begun the seedbank preparation process (e.g., multiple years of row cropping) for eventual reseeding.

Objective 3B:
At 5-year intervals, the complex will actively manage ≥300 of state-listed noxious weeds (i.e., leafy spurge, Canada thistle, absinth wormwood; Lym 2004) on old cropland portions of refuges and WPAs.

Rationales 3A and 3B:
Old cropfield tracts that have not yet entered into their seedbed preparation process will be maintained in an idle state that generally consists of a predominance of exotic cool-season grass species. Prior to initiating seedbed preparation management for eventual seeding to native grass, these sites are of relatively low priority. Management efforts can be better directed toward other higher priority upland areas (i.e., native prairie, tracts already reseeded to native grass, tracts being actively prepared for native reseeding). Despite their sometimes substantial degree of degradation from a floristic diversity standpoint, the presence of perennial grass cover will likely support multiple plant species and generalist birds, including upland nesting ducks (Mark Sherfy, USGS, unpubl. data), northern harriers (Dechant et al.1998), and sedge wrens (Dechant et al. 2003a).

The presence of noxious weeds species in old cropfields can, however, lead to additional infestations in new locations, as well as future noxious weed problems once native grasses are reseeded. Further, a total lack of effort to control noxious weeds on even the lowest priority sites sends a negative message to area landowners and the visiting public (e.g., birdwatchers, hunters). The various problems associated with invasion by noxious weed species is discussed in detail in rationales 3A, 3B, and 3C of the undeveloped wetlands habitat section.

The complex staff intends, therefore, to address public complaints about weeds on Service-owned lands in the complex and also to target active noxious weed management on a minimum acreage of old cropfields. A predetermined target treatment acreage will exist for a 5-year time span.

Strategies 3A and 3B:

- Chemically treat infested areas.
- Mow or hay infested areas.
- Graze infested areas.
- Burn infested areas to prepare the site for other control practices (e.g., biological control agents, chemical control).
- Release biological control agents (e.g., leaf spurge flea beetles).
- Use various combinations of the above treatments. Idol old cropfields until native seeding site preparation activities (e.g., cropping, chemical fallowing) are initiated.
- Determine infestations that will receive treatment based on: 1) landowner or other public complaints; 2) RLGIS cover-type data (circa 2003–2006), and; 3) anecdotal observations of noxious weed infestations made by complex staff, while conducting other work activities afield.

Planted and Exotic Woody Vegetation Sub-Goal:
Reduce fragmentation of grasslands, caused by planted and exotic woody vegetation, and thereby increase the extent of contiguous grassland habitat, for the benefit of grassland-dependent bird species.

Background:
Tree and shrub plantings presently occur on 31 WPAs and all three refuges in the complex. Some of these plantings existed prior to Service ownership of these lands, whereas, some were established after the acquisition of these lands. Although some planted tree and shrub species are native to North America (e.g., green ash, cottonwood, buffaloberry), many others are nonnative (e.g., caragana, Russian olive, Siberian elm). Nonetheless, woody vegetation that was planted in any fashion (i.e., single trees, rows, blocks) on Service lands within the complex is considered an unnatural component of the historic habitat. Additionally, certain exotic species of woody vegetation (e.g., Russian olive, Siberian elm) are invasive and readily spread from plantings into new areas. Similarly, any exotic trees and shrubs that have colonized portions of WPAs and refuges are considered an unnatural component of the historic habitat.

Historically, the south-central portion of the State was part of a grassland-dominated system, where fire and grazing restricted natural tree growth to limited areas (e.g., wooded draws, leeward wetland edges, riparian floodplains; Higgins 1986). Naturally occurring native trees and shrubs presently exist in limited acreage on several waterfowl production areas and refuges.

Meeting the planted and exotic woody vegetation goal will require that the complex staff removes planted and exotic woody vegetation from Service lands. Ideally, upland habitats in the complex will, over time, consist of large expanses of contiguous grassland habitat that provide a

diversity of native flora and a mosaic of vegetative structure across a broad landscape.

The Service has selected ten bird species to serve as "target" or "indicator" upland species, which as a group reflect quality upland habitats on Service lands within the complex. These species are the bobolink, chestnut-collared longspur, grasshopper sparrow, mallard, marbled godwit, northern harrier, sedge wren, sharp-tailed grouse, upland sandpiper, and western meadowlark. They were selected for a variety of reasons, including that:

- all 10 species regularly nest on complex lands;
- two species are endemic to the Great Plains and five others are secondary endemic species (Mengel 1970);
- eight are North Dakota Species of Conservation Priority (Hagen et al. 2005)
- six species are Birds of Conservation Concern (Service 2002)
- seven are Service Focal Species (Service 2005a)
- two are Stewardship Species under the North American Landbird Conservation Plan (Rich et al. 2004)
- two are Species of Concern under the United States Shorebird Conservation Plan (Skagen and Thompson 2003).

Table 7 lists the conservation plans associated with the target upland species. Upland habitat objectives in this CCP are geared toward the provision of quality habitats for these species. In addition to the target species, upland habitats found on Service lands within the complex should benefit a much broader group of "secondary" bird species, as well as a variety of other nonavian wildlife.

Because structural habitat preferences (e.g., vegetative high-density) of both the target and secondary species vary widely, it is assumed that the needs of all species will not be met on a single tract of Service land (e.g., WPA), but rather the needs of the target and secondary species groups will be met by providing a mosaic of vegetative structures (e.g., tall, dense cover; short, sparse cover) across many tracts of Service land in the complex.

Objective 1A: Over a 15-year period, remove 15–30 acres (1–2 acres per year) of planted and other exotic woody vegetation from WPAs and refuges. During the first 10 years, target removal efforts towards individual trees and shrubs, fields invaded by exotic saplings, and single- to few-rowed linear plantings. During years 10–15, explore the removal of many-rowed linear plantings and "block" plantings, based on the results of prior systematic wildlife surveys (see Objective 1B).

Strategy 1A:

- Cut standing trees and shrubs and remove below-ground woody material (i.e., stumps, roots) using chainsaws and a variety of heavy equipment.
- Apply herbicides in situations where suckering occurs or is anticipated.
- Pile and burn down woody material.

Objective 1B:
Between years 5 and 10 after completion of this CCP, complete two separate systematic wildlife surveys (one during summer, one during the following winter) in at least 2 of the 5 years, at three extensive planted woody vegetation areas (i.e., many-rowed linear plantings, "block" plantings).

Strategy 1B:

Use modified area-search methodology (Ralph et al. 1993) or other methodologies (e.g., Emlen 1956) to evaluate seasonal wildlife use.

Rationales 1A and 1B:
Prior to European settlement, scattered patches and corridors of native trees and shrubs were the only woodland features in the prairie landscape of the northern Great Plains (Rumble et al. 1998). Today, although numerous patches of native woodlands still exist in the northern Great Plains, once large expanses of nearly treeless prairie are now intermixed with cropland and scattered small (<5 acres) linear and block-shaped tree plantings (also commonly referred to as windbreaks, shelterbelts, and tree belts). Baer (1989) estimated that these plantings cover 3 percent of the land area in the State. In Emmons County alone, local county conservation districts and the Natural Resources Conservation Service (NRCS) annually plant more than 130,000 trees (Jacobs, NRCS, pers. commun.). Tree plantings are designed to reduce soil erosion from croplands (Baer 1989) and are viewed by many as striking landscape features that symbolize settlement of the western United States.

However, they also further fragment remaining grasslands by creating abrupt boundaries that exacerbate edge effects (O'Leary and Nyberg 2000, Winter et al. 2000, Ribic and Sample 2001).

Additionally, the suppression of ecological processes, such as fire, has allowed an increase in woody encroachment into grassland habitats (Bakker 2003). These factors have been linked to the deterioration of grassland-bird populations, which are declining faster and more consistently than any other group of North American birds (Sampson and Knopf 1994, Herkert 1995). An extensive body of literature indicates that planted and/or exotic trees in prairie landscapes often are negatively associated with a variety of avian taxa (Bakker 2003).

Several studies have documented a reduced probability of occurrence of grassland passerines in areas rich in woody vegetation and at limited distances from woody vegetation. Bakker et al. (2002) determined that in eastern South Dakota grasslands, the sedge wren, grasshopper sparrow, and western meadowlark, among other species, exhibited a decreased probability of occurrence as the amount of woody perimeter increased. Further, Bakker (2000) suggested that bobolinks, grasshopper sparrows, and western meadowlarks were all negatively associated with increased proportions of woodland habitat in the eastern South Dakota landscape. In Oklahoma, most grassland birds, including the western meadowlark and grasshopper sparrow, exhibited population declines related to the invasion of woody species (Coppedge et al. 2001). Areas with the least amount of woody vegetation retained core area characteristics suitable for several area-dependent species. In Iowa, Stauffer and Best (1980) found that pastures and haylands were preferred by western meadowlarks over woody areas. Western meadowlark nest density was negatively correlated with sapling/tree richness. In New York, bobolink abundance was significantly lower in fields with approximately 25 percent woody cover than in old hayfields with <25 percent woody cover (Bollinger and Gavin 1992). Habitats with >25 percent woody cover were determined to be unsuitable for bobolinks. In southern Wisconsin, no western meadowlark territories contained trees, and only 10 percent of grasshopper sparrow territories contained trees (Wiens 1969). In Missouri, Kahl et al. (1985) characterized typical grasshopper sparrow habitat as having no woody vegetation >3.3 feet tall. In Illinois, numbers of singing males of five species, including the grasshopper sparrow and bobolink, increased in fields of similar size with progressively less planted tree belt acreage (O'Leary and Nyberg 2000). In Georgia, grasshopper sparrows were found in fields with ≤10 percent shrub cover and were absent from fields containing ≥35 percent shrub cover (Johnston and Odum 1956). Similarly, in West Virginia, grasshopper sparrow territories had lower shrub cover (mean 0.7 percent) than nonterritories (mean 31.1 percent; Whitmore 1981). Helzer (1996) found that in Nebraska, grasshopper sparrow abundance increased significantly when >246ft from wooded edges. Also, in Nebraska, none of the ten recorded grasshopper sparrow nests were within 164 feet of edge habitat (e.g., wooded draws; Delisle and Savidge 1996). In western Minnesota, the probability of grasshopper sparrow and western meadowlark nest occurrence was lower in habitats <148 feet from forest edges (Johnson and Temple 1990a). Similarly, in southwestern Wisconsin, total nest density for grasshopper sparrows and bobolinks increased linearly with distance from woody edge (Renfrew 2002).

The Service believes that this documentation is sufficient to suggest that planted tree belts and invaded exotic trees and shrubs likely have a negative impact on grassland passerine use of Service lands in the complex. However, to acquire more localized evidence, the complex staff is working with the University of Montana and other refuges and wetland management districts in the State and South Dakota to evaluate the effects of tree belts on grassland birds. In 2005, staff evaluated bird use at varying distances from planted tree belts (66–722 feet) on three WPAs and one refuge in the complex. In the winter of 2005–06, complex staff removed the treebelts on two of these sites, in order to evaluate before-and-after bird use at these sites through continued surveys in 2006. Preliminary data from Service study sites, as well as others in the eastern Dakotas, suggested increasing densities of both bobolinks and sedge wrens (as well as other passernine species) at increasing distances from treebelts and in open (treeless) grassland control sites (figure 17; Quamen, University of Montana, unpublished data) Further, at four sites in eastern South Dakota where before-and-after tree removal bird surveys were conducted in 2004 and 2005, data indicated that although grassland birds may

avoid trees, they may also redistribute to areas they previously avoided, after trees have been removed (Quamen, University of Montana, pers. commun.).

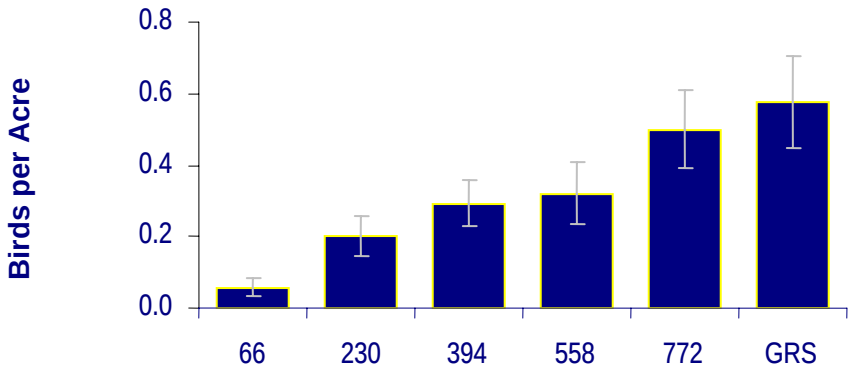
Regarding predation rates and associated nest-success rates, Bergin et al. (1997) suggested that wooded areas in Iowa provide cover for mammalian predators and elevated perches for avian predators. Additionally, certain predators (e.g., raccoons) have an affinity for wooded habitats and use them for travel and foraging. In Missouri, Burger et al. (1994) found that artificial nests located <197 feet from woody cover were less successful than those located >197 feet from woody cover (predation rates of 28.7 percent versus 7.9 percent). Distance to woody cover also explained twice as much variation in predation rates as did grassland patch size. Similarly, in western Minnesota, nest predation rates were lower for five species, including the grasshopper sparrow, bobolink, and western meadowlark, in nests located ≥148 feet from woody vegetation (Johnson and Temple 1990a,b). Further, in West Virginia, woodlots surrounding a 103-acre reclaimed grass site concentrated predators and resulted in low-nesting success for grasshopper sparrows, according to Wray et al. (1982).

Additionally, several studies examined the effect that woody vegetation had on brown-headed cowbird nest parasitism rates and abundance. Davis and Sealy (2000) found that female cowbirds were more abundant, and nests of other birds were more frequently parasitized, on a shrub-bordered study site in southwestern Manitoba. Increased cowbird activity was attributed in part to the increased availability of perches at this site, as compared to other study sites. Gates and Gysel (1978) also determined that brown-headed cowbird parasitism was higher near field-forest edges. In western Minnesota, nest parasitism was lower for nests ≥148 feet from wooded edges for five species, including the grasshopper sparrow, bobolink, and western meadowlark (Johnson and Temple 1990b).

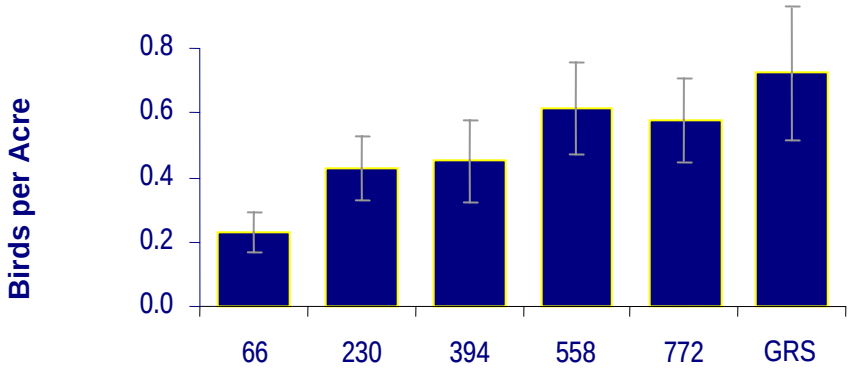
Concerning upland-nesting ducks, a study of South Dakota stock ponds found that mallard brood use was negatively associated with the proportion of shoreline with trees (Rumble and Flake 1983). In Idaho, duck nest success was 6.8 percent where Russian olive abundance was high, 19.8 percent where it was moderate, and 42.9 percent where it was low (Gazda et al. 2002). Artificial nest survival increased with distance from the nearest Russian olive trees.

Several studies have examined use of planted cover by gallinaceous birds, such as sharp-tailed grouse and ring-necked pheasants. In Manitoba, sharp-tailed grouse were found to abandon leks once woody vegetation exceeded a certain percent coverage (Berger and Baydack 1992). Similarly, in Minnesota, Hanowski et al. (2000) determined that sharp-tailed grouse were sensitive to even small increases (1–2 percent) in the amount of woody vegetation. Active sharp-tailed grouse leks had significantly lower proportions of upland forest and brush cover types and higher proportions of native grasses within 1,640 feet and 3,281 feet of the site, than inactive leks. Despite the fact that trees and shrubs are often planted to provide winter habitat for ring-necked pheasants, a number of studies suggest that these plantings may have some negative affect on this species. During typical South Dakota winters and during the early part of a severe winter (1 every 10–15 years), cattail-choked wetlands, tall grass cover (>29.5 inches), and food-plot habitats were used to the greatest extent by females (Gabbert et al. 1999). Woodland and farmstead habitats were only preferred during the late stages of the severe winter. Authors concluded that cattail-choked wetlands, grassland habitat, and food plots are crucial for winter ring-necked pheasant survival. During severe winters, dense woody cover may prevent substantial ring-necked pheasant losses. According to Larsen et al. (1994), in South Dakota, the presence of wetland- and grassland cover in the landscape were the most important variables determining food plot use. Tree cover appeared to be negatively associated with winter food plot use, primarily due to the negative relationship between trees and herbaceous winter cover. Tree plantings may also serve as a reproductive "sink" for ring-necked pheasants during the breeding season. Hanson and Progulske (1973) found that between June and October ring-necked pheasants in South Dakota used shelterbelts only intermittently. Nest success of ring-necked pheasants in that study ranged from a high of 34.1 percent in idle farmland (tamegrass cover), to 13.6 percent along roadsides and in small grain fields, to only 9.1 percent in shelterbelts (Olson and Flake 1975).

Bobolink



Sedge Wren



Distance (ft) from treebelt and grassland control sites (GRS)

Figure 17. Densities of bobolinks and sedge wrens at increasing distances from treebelts and in open grassland control sites (GRS) in North and South Dakota during 2005 (n = 48; Frank Quammen, University of Montana, unpublished data).

Similarly, Trautman et al. (1959) documented that in South Dakota the heaviest predation rates on ring-necked pheasant nests were in roadside, fencerow, and shelterbelt habitats. In Colorado, ring-necked pheasant nest predation was greater (33 percent) on or near (<0.37 miles) an area with extensive tree plantings than at more distant locations (14 percent) (Snyder 1984). In areas near extensive tree plantings both avian and mammalian predators decreased nest success, whereas mammals were the major source of predation farther (>0.37 miles) from the tree plantings. In Oklahoma, the ring-necked pheasant exhibited population declines related to the invasion of woody species (Coppedge et al. 2001).

Based on the above scientific findings, complex staff proposes to remove planted and invaded exotic woody vegetation from waterfowl production areas and refuges, as time, staffing constraints, and funding allow, with an initial emphasis being placed on: 1) individual trees and shrubs; 2) fields invaded by exotic saplings, and; 3) single- to few-rowed linear plantings. Removal actions will be conducted to meet the established planted and exotic woody vegetation goal. The Service anticipates that these areas of "limited" woody vegetation will offer more practical removal efforts than many-rowed linear plantings and "block" plantings. Additionally, staff suspects that from a habitat standpoint, these "limited" woody vegetation areas offer less

to wildlife than their more extensive counterparts (i.e., many-rowed linear plantings, "block" plantings). Because evidence suggests that extensive areas of dense woody vegetation provides important winter cover for resident bird species (e.g., sharp-tailed grouse, ring-necked pheasant; Parker 1970, Hillman and Jackson 1973, Sisson 1976, Berg 1990, Meints 1991, Gabbert et al. 1999) and they obviously receive a certain degree of use from a variety of migratory woodland bird species (e.g., yellow-rumped warbler, red-headed woodpecker, loggerhead shrike) and other wildlife (e.g., white-tailed deer), complex staff proposes to evaluate the overall wildlife importance of these habitats on complex lands through a series of systematic wildlife surveys, prior to determining their fate (e.g., removal).

Objective 2: Restore bare areas that result from woody vegetation removal to perennial grass cover within 6 years of the removal action.

Rationale 2:
Bare areas that occur as a result of tree and shrub removal will be prone to invasion by a variety of invasive forbs, some of which are State-listed Noxious Weeds (e.g., absinth wormwood, Canada thistle; Lym 2004). Absinth wormwood and Canada thistle both readily colonize sites that have been disturbed, or are undergoing manipulative restoration management (Hutchinson 1992, Sedivec and Barker 1998, Liu et al. 2000). Both of these plant species are aggressive alien invaders that are capable of crowding out and replacing native grasses and forbs (Wrage and Kinch 1981, Hutchison 1992). Where they become established, they can alter the natural vegetative structure and species composition. New infestations, resulting from tree- or shrub-removal disturbance, could potentially serve as a seed source for invasion into surrounding grassland areas. To reduce this risk, complex staff will informally survey these bare areas annually for invasive weed occurrence. New infestations will be treated with herbicides and/or other appropriate management practices (e.g., mowing). To reduce the overall likelihood of removal-site weed infestations, complex staff will attempt to reseed these areas to perennial grass cover with six years of woody vegetation removal. In some cases broadcast spot seeding will be used (i.e., areas where a small number of trees or shrubs were removed), but in most cases the field (e.g., management unit) associated with the removed trees (generally old cropland) will be targeted for immediate native-restoration site preparation.

Strategy 2:
- Spray appropriate herbicides for noxious weed invasions (e.g., wormwood), as needed, prior to native grass reseeding.
- Prepare a seedbed through 2–3 years of cropping, followed by 1–2 years of chemical fallowing.
- Reseed to a cool- and warm-season native-grass mix.

Priority Population Issues Sub-Goal:
Improve protection and quality habitat for federally threatened, endangered, and candidate species that may occur on complex lands.

Objective 1A:
Over a 15-year period, annually place nest exclosures over piping plover nests found within the Long Lake WMD and monitor fate of caged nests.

Rationale 1A:
The northern Great Plains population of piping plovers is listed as threatened in the United States (Service 1985) due to a poorly understood decline in abundance. Mabee and Estelle (2000) suggested that nest predation is a major problem limiting piping plover nest success throughout their range. However, according to Murphy et al. (2003), predators can successfully be deterred from depredating eggs of piping plovers by placing large (10-foot diameter) mesh exclosures (cages) over individual nests. Recruitment has improved through the use of these cages in the northern Great Plains (Murphy et al. 2003). The complex staff plans to erect these exclosures over piping plover nests that are encountered within the boundaries of the complex; not limited to Service lands, when permission is granted on private property. Exclosures placed after ≥1 egg has been laid in the nest bowl have resulted in <2 percent nest abandonment on an operational basis in the northwestern portion of the State and northeastern Montana (Ryba, Service, pers. commun.).

Strategy 1A:
- Erect wire mesh cages with netted tops over piping plover nests.

- Monitor fate of caged nests by searching for "pick chips" in or near the nest bowl and/or timing nest visits based on known (or suspected) nest initiation date, laying rate, and mean incubation period.

Objective 1B:
Over a 15-year period, use a variety of vegetation control methods to restrict annually vegetation on a 0.7-mile section of unit II Marsh Dike to ≤5 percent coverage. Control methods will not be conducted between May 15 and August 7 (Stewart 1975) or any time that piping plovers are present in the unit II marsh area.

Rationale 1B:
Piping plovers do not generally nest in areas of evenly distributed vegetation (Prindville Gains and Ryan 1988). Additionally, Espie et al. (1996) found that in Saskatchewan, depredated piping plover nests were closer to vegetation than successful nests. The portion of Long Lake NWR where the greatest extent of piping plover nesting activity has occurred in recent years (2001–2005) is atop the central portion of unit II marsh dike. This dike was resurfaced by Ducks Unlimited from 1999–2000, after high-water events in the mid-1990s severely damaged the embankment. Substrate used to repair the dike consisted of a substantial seed bank of various weedy upland plants (e.g., field pennycress). Therefore, although this substrate has shown to be of suitable composition for piping plovers, it also readily re-vegetates each year. Without intervention (i.e., herbicide application, mechanical disturbance) vegetation expands to become the predominant cover type on the dike. The complex staff plans to annually remove as much of this vegetation as possible along a 0.7-mile portion of this dike (figure 18), through a variety of means, prior to and following the piping plover nesting season, to continue to provide quality piping plover breeding habitat at this location.

Strategy 1B:
- Determine percent coverage of vegetation by ocular estimation.
- Apply herbicides and mechanical disturbance (i.e., grading) to remove upland vegetation.

Objective 1C:
Within 10 years of the completion of this CCP, complete a single survey for the presence of piping plovers on ≥50 percent of the wetland basins in the complex identified by a HAPET-developed predictive model as having habitat potentially suitable for breeding piping plovers.

Wetlands on which breeding piping plover have already been documented will be excluded.

Rationale 1C:
Beginning in 1991, biologists from throughout North America collaborated in a monumental effort known as the International Piping Plover Census (Haig and Plissner 1993). Both breeding and wintering habitats were censused in an effort to: 1) establish benchmark population levels for all known piping plover sites; 2) survey additional potential breeding and wintering sites, and; 3) assess the current status of the species relative to past population estimates. Since 1991, the International Piping Plover Census has been conducted at 5-year intervals (1996, 2001) at sites censused in 1991 and a very limited number of new sites (Plissner and Haig 2000). The complex staff has participated in each of these survey efforts. In an attempt to identify additional sites that have habitat potentially suitable for piping plovers, HAPET developed a predictive model through use of satellite imagery and data from the national wetlands inventory. This model identifies individual wetlands based on the presence of suitable habitat (i.e., alkaline gravel substrate lacking upland or wetland vegetation). In addition to re-surveying sites of known piping plover activity to determine population trends at 5-year intervals, the complex staff plans to additionally survey new sites predicted by HAPET's model. This effort will allow staff to develop a better understanding of the role Service and private lands in Burleigh, Kidder, and Emmons counties play in the recovery of piping plovers, as well as determine wetlands in need of protection through acquisition (i.e., fee title, wetland easement) or Piping Plover Critical Habitat designation.

Strategy 1C:
- Survey wetlands for piping plovers by the most appropriate means (e.g., boat, walk shoreline, view from vehicle with spotting scope).
- Surveys will be conducted between early and mid-June.

Objective 2:
Over a 15-year period, inform the hunting public of fall, migrant whooping cranes using complex lands, in an effort to reduce the risk of an accidental shooting.

Rationale 2:
The whooping crane is one of the most endangered birds in North America. Presently, the only naturally occurring wild, migratory population in the world numbers fewer than 215 individuals (Tom Stehn, Service, per. commun.). Each fall, a number of whooping cranes utilize wetlands and agricultural fields in the State as migratory stopover areas en-route to their wintering grounds in Texas. In particular, Long Lake NWR is one of the most frequently used stopover areas in the State (Beyersbergen et al. 2004). In addition to occasional whooping cranes, several thousand sandhill cranes stage in the central portion of the State each fall, where they are a relatively popular game species. Due to the large number of sandhill cranes that stage at Long Lake NWR each fall (between 10,000 and 25,000) and the refuge's proximity to Bismarck, it is one of the State's most popular destinations for sandhill crane hunters. Because of the often close interaction between sandhill and whooping cranes and their use of similar habitats, potential exists for a whooping crane to be accidentally mistaken for a sandhill crane and shot. In 2004, two whooping cranes were shot and killed near Quivera NWR in south-central Kansas by sandhill crane hunters who mistook them for the huntable species Since 1968, there have been other shooting incidents involving the whooping crane, four in Texas and one in Saskatchewan, Canada (Richard Hinton, Bismarck Tribune, pers commun. 2003). The Service hopes that by informing and educating area hunters about whooping cranes' use of the refuge, it can greatly reduce any risk of an accidental shooting. The Service will consult the Whooping Crane Contingency Plan (Service 2001) for appropriate actions when dealing with fall migrant whooping cranes that show potential for remaining in a particular portion of the complex for multiple days.

Strategy 2:

- Post warning signs in the area being used by whooping cranes.
- Contact local media (e.g., radio, television, newspapers) upon confirmed fall observations, where it appears that whooping cranes will stay in the area for multiple days and where hunting activity exists or is likely.
- Actively patrol areas being used by whooping cranes to periodically monitor their whereabouts and inform hunters of their presence.
- On a case-by-case basis (i.e., individual occurrence of a whooping crane[s]), consider the merits of a possible voluntary hunting closure on private lands where whooping crane use is occurring regularly. If it is deemed appropriate, contact the necessary landowner(s) to discuss a possible voluntary closure in accordance with the current Whooping Crane Contingency Plan (Service 2001).

Objective 3: At 5-year intervals, native prairie portions of refuges and WPAs >80 acres in size will be reevaluated as to their suitability as Dakota skipper habitat, based on new vegetative species composition data. Sites deemed suitable for the Dakota skippers (Tier II; Murphy 2005) will be managed in accordance with their habitat needs and will be surveyed ≥1 time to document Dakota skipper presence or absence, within five years of classification.

Rationale 3:
In 2005 complex staff classified the degree of Dakota skipper habitat potential that existed on Service lands within the complex, according to guidelines in a Service Conservation Strategy for Dakota Skippers in North Dakota and South Dakota (Murphy 2005). It was determined that only a portion of a single tract of land (Schiermeister WPA) presently has habitat characteristics (i.e., size, vegetative species composition) that indicate possible Dakota skipper occurrence (Tier II; Appendix I). Upland habitat management of this WPA unit will follow guidelines presented in the Service Conservation Strategy (Murphy 2005). Additionally, any Service lands in the complex that have habitat capable of supporting Dakota skippers need to be systematically surveyed in an attempt to document the presence or absence of this species. Further, periodic reevaluation (i.e., every five years) of native-prairie tracts must be completed to capture changes in vegetative species composition that occurs over time as a result of Service management, climatic changes, or other

Figure 18: Unit II Marsh Dike piping plover management area (0.7 mile).

factors (e.g., new invasion by exotic plant species).

Strategy 3:

- Use new belt transect (Grant et al. 2004) data to re-evaluate vegetative species composition.
- Systematically survey for Dakota skippers using either "the checklist" or "Pollard Walk" methods (Royer et al. 1998).
- Contract survey work to qualified lepidopterists.

Predator Management Sub-Goal:
Through management efforts, support upland duck nesting success sufficient to achieve recruitment rates, at or above, maintenance level (≥0.49).

*Objective 1:*_Over a 15-year period, reduce indirect effects of heightened predation rates through the removal of artificial microhabitats (e.g., rock piles, abandoned buildings, downed fences, and miscellaneous junk) on ≥10 WPAs or refuge management units.

Rationale 1:
Abandoned buildings are often used by raccoons as winter shelter, den sites, and resting areas. These areas also provide year-round cover, and often a source of food (e.g., seeds, grains, rodents; Sovada et al. 2004). According to Larivière et al. (1999), skunks often winter, rest, and raise their young in rock piles and under abandoned structures. Removing unnatural microhabitats (e.g., rockpiles, abandoned buildings) from Service lands may reduce the attractiveness of these areas to several waterfowl predators (Dixon and Hollevoet 2005); however individual predators will simply relocate to nearby suitable habitats.

Removing abandoned structures and rock piles is a costly endeavor that likely will not single handedly result in improved nest success for waterfowl (Sovada et al 2004). Therefore, complex staff plans this removal effort to be a

part of a multi-facetted strategy aimed at meeting the predation management goal. Removal of planted and exotic woody vegetation should also benefit upland duck nesting recruitment. However, the goal, objectives, rationale, and strategies for this effort are covered in detail under the planted and exotic woody vegetation section of this CCP.

Strategy 1:

- Focus initial efforts in areas of highest breeding duck pair density (i.e., ≥80 pairs per square mile).
- Bury or remove rock piles. Remove other "junk" (e.g., old equipment bodies, old, nonfunctional culverts) and downed fences. Demolish and burn abandoned buildings.

Objective 2: Within 10 years of the completion of this CCP, initiate predator removal activities at no less than one 36 square-mile site within the complex, in order to support mean upland duck nest success rates ≥20 percent, over a ≥3-year period.

Rationale 2:
According to Beauchamp et al. (1996), nest success of upland nesting ducks has declined from a mean of 30 percent in 1935 to a mean of 10 percent in the early 1990s. This decrease in nest success can likely be attributed to multiple factors, including a substantial long-term loss of wetland- and grassland habitat, as well as an unbalanced predator community. According to Sovada et al. (2004), habitat conversions have changed predator-prey relationships and increased populations of certain waterfowl predators. In addition to waterfowl, predation is an important cause of nest failure for passerines, shorebirds, ground-nesting raptors (e.g., northern harrier, short-eared owl), and upland gamebirds (Martin 1988, Martin1995, Helmers and Gratto-Trevor 1996).

Several studies support the hypothesis that predator (e.g., striped skunk, raccoon, red fox) removal increases waterfowl nest success (Mense 1996, Garrettson et al. 1996, Zimmer 1996, Hoff 1999, Garrettson and Rohwer 2001), productivity (Sovada et al. 2001), and brood production (Balsar et al. 1968, Duebbert and Lokemoen 1980, Sargeant et al. 1995, Garrettson et al. 1996). Greenwood and Sovada (1996) suggested that lethal control of predators can potentially improve waterfowl production across large landscape areas. Predator removal can be a viable alternative where habitat management actions are not sufficient to support waterfowl nest success at or above maintenance levels (Sovada et al. 2004). Reynolds et al. (2001) suggested that on average (dependent on multiple variables) the landscape must be comprised of ≥40 percent grass cover for mallards to achieve a nest success of 15–20 percent (population maintenance level). Sovada et al. (2001) stresses that predator management activities must provide for flexibility across the landscape because of the dynamic nature of factors (e.g., climatic conditions) that influence waterfowl recruitment. Additionally, Sargeant et al. (1995) and Garrettson et al. (2001) both concluded that predator control on large blocks is more efficacious than on smaller areas.

Past surveys of upland duck nest success on complex lands indicate that in some years duck nests suffer predation at levels which suppress nest success to a point below a minimum maintenance threshold (15 – 20 percent). For example, in 2002, determined nest success to be 3 percent, based on 79 duck nests at Long Lake NWR. Additionally, several studies have shown that the nest success for ducks on refuges and WPAs throughout much of the PPR is often less than the recommended minimum nest success values of 15 – 20 percent (Cowarding et al. 1985, Greenword 1986, Klett et al. 1988, Greenwood et al. 1990). Furthermore, Klett et al. (1988) suggested that while conservation programs may curb grassland and wetland losses, a minimal increase in duck nest success will occur unless mammalian predation is reduced. Based on the above information, propose to hire a professional trapper(s) to reduce mammalian predator populations on large township-sized blocks (approximately 36 square miles) over a period of ≥3 years. A decision matrix developed by HAPET (figure 19) will allow us to access the wetland density, breeding duck pair density, and grassland cover in an area to aid in the decision making process for focusing predator management activities. The complex staff will focus its efforts only on what it determines to be the highest priority areas, with respect to this management technique: 1) ≥60 duck pairs-per-square mile and 2) 20–40 percent grassland cover (Dixon and Hollevoet 2005).

An evaluation of upland duck nesting success on a sample of study sites within the predator removal area will be conducted during each year of predator removal to determine if a mean nest success rate of 20 percent was achieved (Mayfield 1961).

Strategy 2:

- Contract the services of a professional trapper to remove mammalian duck nest predators within a selected township-sized block of land (approximately 6 miles x 6 miles).
- Remove predators for approximately a four-month period between March 15 and July 15 (Dixon and Hollevoet 2005).
- Obtain permission to trap across ≥80 percent of a selected predator removal block, including both public and private lands (Dixon and Hollevoet 2005).
- Annually determine upland duck nest success rates, on 5 80-acre sites chosen through systematic-random selection, using chain drag methodology (Klett et al. 1986).

Alternatively, complex staff may use other new or developing methods to determine the effectiveness of predator management activities. For example, scientists with Delta are experimenting with the use of brood count indices as a measure of predator management success (Dixon, Service, pers. commun.)

Objective 3:
Within 10 years of the completion of this CCP, initiate annual predator removal activities at no less than three priority islands on Service lands within the complex to support mean upland duck nest success rates ≥40 percent.

Rationale 3:
Naturally occurring and created islands (includes peninsula cut-offs) are present on various WPAs and refuges throughout the complex, as well as throughout the PPR of North Dakota and South Dakota. Research has shown that islands in the Dakotas have higher waterfowl nest densities and higher nest success than in surrounding upland areas (Lokemoen and Woodward 1992). Duck species that show the greatest affinity for islands are mallards, gadwall, and lesser scaup; however, Canada geese, shorebirds (e.g., Wilson's phalarope), and colonial waterbirds (e.g., common tern, California gull) also readily nest on islands (Lokemoen and Woodward 1992).

Nest success is usually higher on islands than on surrounding uplands, because access by mammalian predators is limited (Giroux 1981, Williams and Crawford 1989). Therefore, Duebbert et al. (1983) concluded that predator removal efforts on islands, prior to, and during, the nesting season, result in high nest success rates with relatively little effort. Lokemoen et al. (1987) found that when predators were removed from 9 islands in the Devils Lake area, total nests increased by 799 (n=851) and nest success increased by 71 percent (87 percent), as compared to one year prior to predator removal.

Based on knowledge of waterfowl nesting dynamics on natural and created islands in the PPR and knowledge regarding the success of predator removal efforts on upland duck nesting success (discussed in detail in rationale 2 above), complex staff proposes to initiate predator removal efforts on selected Service-owned islands within the complex, in an attempt to make these predator-limited microhabitats predator-free, or nearly so. Because research suggests that duck nest success on islands is generally higher than on surrounding uplands without any supplemental management, Objective 3 aims for a greater mean nest success (≥40 percent) than does Objective 2 (township-sized block predator removal effort).

Strategy 3:

- Remove mammalian duck nest predators on selected islands. Work will be done by either complex staff or a contracted professional trapper.
- Remove predators for approximately a 4-month period between March 15 and July 15 (Dixon and Hollevoet 2005).
- Determine upland duck nest success rates on all islands where predator removal activities occur, once every two years.
- Use current aerial photography to identify all manageable (i.e., predator removal) islands on refuges and WPAs in the complex.

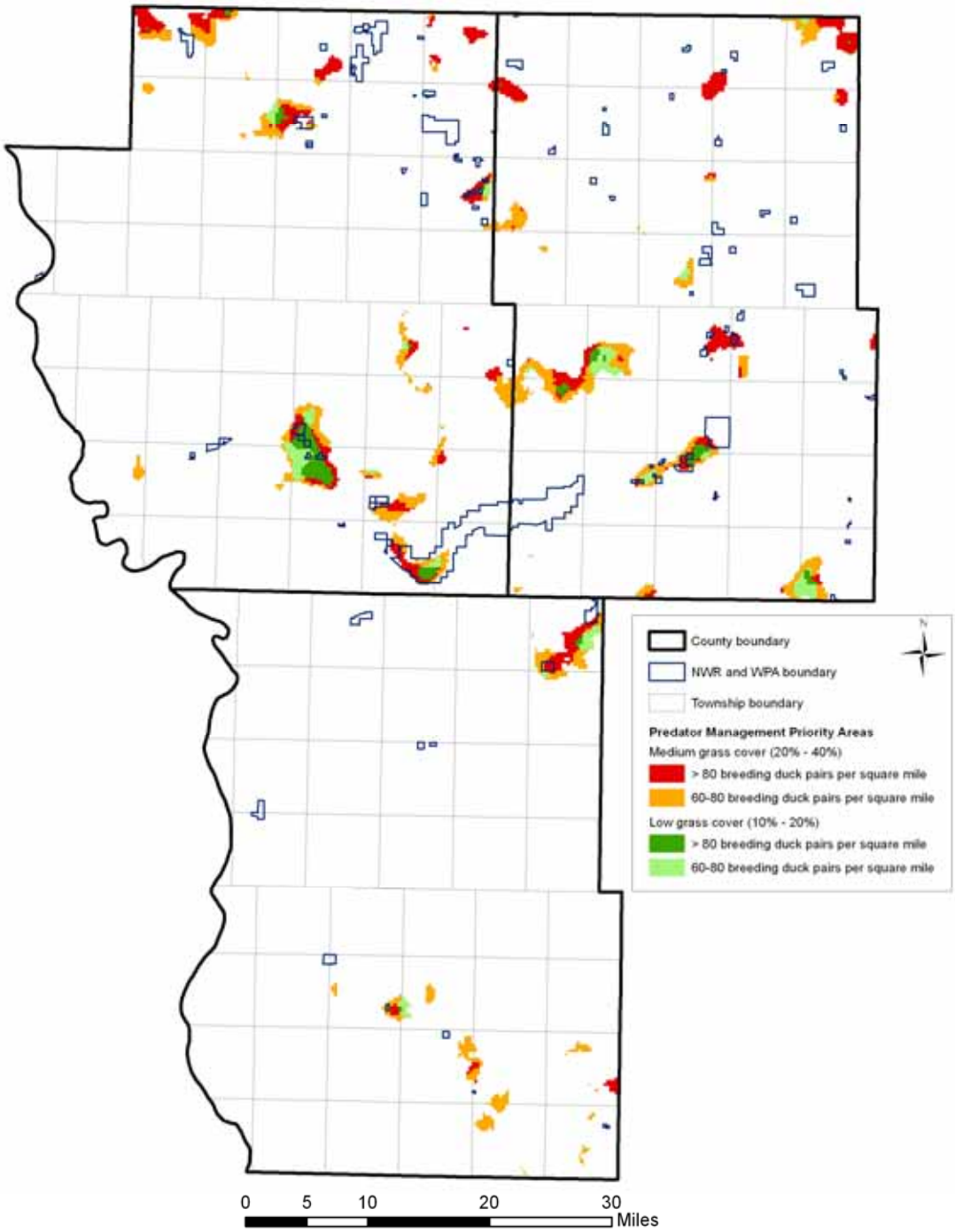


Figure 19: Priority areas for large-block predator management, relative to the percent grass cover on the landscape and the number of breeding duck pairs per square mile.

Objective 4:
Through a partnership with Delta, complex staff will oversee the placement of hen houses on priority WPA and refuge wetlands. Delta will erect new hen houses at a rate that will increase the total number that existed on complex lands in 2005 (n=23) by 10 percent a year, over a 15-year period. Delta will annually determine duck use, nest success, maintenance needs, and replace nesting material at all existing hen houses.

Rationale 4:
Artificial duck nesting structures provide secure nest sites for ducks because they put the nests out of reach of most mammalian predators (Sovada et al. 2004). Both Artmann et al. (2001) and Chouinard (2003) reported >80 percent nest success by mallards using artificial structures. Nest success by ducks using these structures (largely mallards) is generally high (Dixon and Hollevoet 2005). Eskowich et al. (1998) suggests that because mallards are highly philopatric, use of nest structures has potential to increase local production and ultimately local populations. Comparison of several mallard nesting structure designs has shown that flax straw-woven tunnel designs (hereafter hen houses) appear to be the most effective (Eskowich et al. 1998). Using a GIS model developed by HAPET, the complex staff plans to select semi-permanent and permanent wetlands in areas that contain <40 percent grassland and >10 mallard pairs per square mile (Dixon and Hollevoet 2005) for placement of new hen houses.

Strategy 4:
- Prioritize hen house placement on WPAs and refuges utilizing a model generated by HAPET.
- Delta members will erect hen houses in ice-covered wetlands between the months of December and March.
- The complex staff will provide various types of support (e.g., materials, special access provisions, maps and aerial photos, priority placement locations) for this effort.

Wildlife Disease Sub-Goal:
Manage habitats and wildlife populations to minimize or avoid wildlife disease outbreaks, whenever possible. Respond to outbreaks in accordance with established protocols that promote safe and effective Service actions.

Objective 1A:
Either a statewide Service or complex avian disease contingency plan will be completed within one year of the completion of this CCP, to address all existing avian diseases (e.g., botulism) and those that are now emerging (e.g., avian influenza).

Objective 1B:
Over a 15-year period, follow monitoring and response protocols outlined in the CWD Plan for Service Lands in the Dakotas (Service 2004).

Strategies 1A and 1B:
Follow the monitoring and response protocols outlined in various disease contingency plans.

Rationale 1A:
Because of emerging disease threats, complex staff can no longer rely on past informal disease protocols. Avian disease response will be a readily evolving process. Prior to 2006 and the present threat level regarding highly pathogenic avian influenza (HPAI) in North American migratory birds, the complex dealt primarily with two principal diseases in our avian communities: botulism and more recently, West Nile virus. Although safe handling practices (e.g., rubber gloves) have always been employed, human health threats are relatively minor with respect to the handling of birds with botulism (Friend and Franson 1999) and WNV (USGS 2006c). However, the highly pathogenic H5N1 strain of avian influenza (HPAI) presents complex staff and other wildlife resource personnel with a wide range of unknowns, including possibly serious human health threats.

HPAI (or bird flu) is a disease caused by a virus that infects both wild birds (e.g., shorebirds, waterfowl) and domestic poultry. Each year, there is a bird flu season just as there is a flu season for humans and, as with people, some forms of the flu are worse than others (USGS 2006a). Recently, the H5N1 strain of HPAI has been found in an increasing number of countries in Europe, Asia, and Africa. Currently, this strain is not present in the United States, but it is likely to spread to this country (Roffe, Service pers. commun.). There are a number of ways that the H5N1 strain could potentially reach the United States, including: 1) wild bird migration; 2) illegal smuggling of birds or poultry products; 3) travel by infected people or people traveling with virus-contaminated articles

from regions where H5N1 already exists (USGS 2006).

The Service is taking a proactive approach to HPAI, both with respect to monitoring and employee safety. In the near future, the complex will conduct all avian disease surveillance, reporting, response, and handling activities under the auspices of either a complex-specific or a State-wide avian disease contingency plan.

Objective 1C:
Over a 15-year period, follow monitoring and response protocols outlined in the CWD Plan for Service Lands in the Dakotas (Service 2004).

Rationale 1C:
CWD is a disease of the nervous system in deer and elk that results in distinctive brain lesions. Presently, CWD has not been detected in either wild or captive white-tailed deer, mule deer, or elk in the State (Fecske, NDGF, pers. commun.). The NDGF has conducted surveillance for this disease since 2002 and tested tissue samples from more than 5,600 deer heads (mostly hunter-harvested) in the process. Through 2004, all samples were negative, but results of some 2005 samples are still pending as of this writing (Fecske, NDGF, pers. commun.).

CWD, however, has been documented in surrounding states and Canadian provinces (captive cervids in Minnesota, Montana, and Saskatchewan; captive and wild cervids in South Dakota; USGS 2006b) and potential does exist for it to currently be present, but undetected, or eventually infect cervids in the State. The complex staff assisted with NDGF CWD surveillance efforts in 2003 and 2004 by establishing drop-off sites for white-tailed deer (heads) harvested on Long Lake NWR during the State's firearms deer season and assisting with tissue sample processing in 2003. The complex staff plans to adhere to protocols within the CWD Plan for Service Lands in the Dakotas (Service 2004) for all future CWD-related work. This plan acknowledges the NDGF as the lead in all CWD efforts in the State and describes the Service's role as a supporting partner.

Objective 2:
Within one year of the completion of this CCP, eliminate all winter feeding operations on complex lands.

Rationale 2:
For a number of years, complex staff provided supplemental food, in the form of feed bales and loose grain in constructed feeders, to wildlife on Long Lake NWR and certain WPAs (e.g., Schiermeister) during the winter. The intent of this activity was to provide a reliable food source to resident gallinaceous birds (primarily ring-necked pheasants) during periods of especially harsh winter weather. In addition to attracting concentrations of ring-necked pheasants and other birds, these concentrations of food also typically attract large groups of white-tailed deer. Artificial concentrations of wildlife increase their susceptibility to diseases and other types of mortality (e.g., vehicle collisions). Supplemental feeding overrides the natural tendencies of wildlife, like deer, to disperse themselves across the landscape. Unnatural concentrations of wildlife are known to promote disease outbreaks (Williamson 2000). One of the diseases that is associated with artificial feeding is CWD (Williamson 2000). CWD is passed from animal to animal; therefore, any unnatural concentration of wildlife caused by supplemental feeding can increase potential for its spread (Williamson 2000). In addition to CWD, unnatural concentrations of white-tailed deer can increase their susceptibility to bacterial diseases like tuberculosis (Williamson 2000).

In many cases resident wildlife abundance reflects weather patterns. During especially harsh winters, resident wildlife populations, including both white-tailed deer and ring-necked pheasants, will be reduced by nature's stronghold. Conversely, during moderate and mild winters, little natural mortality will occur, allowing for population growth. These climatic fluctuations are natural and a constant influence on wildlife abundance and distribution (Williamson 2000).

Despite popular belief, ring-necked pheasants seldom succumb to starvation, even during extended periods of deep snow and extreme cold (NDGF 1992). Rather, most mortality of winter ring-necked pheasant is a result of exposure during blizzard events. When pheasants are caught away from adequate winter cover during a blizzard, they frequently die from suffocation and freezing. The critical factor for ring-necked pheasant winter survival is quality habitat (i.e., marshes; NDGF 1992). Winter feeding programs for ring-necked pheasants in the State, as well as other Midwestern states are generally considered to be very expensive and ultimately provide few tangible

results (NDGF 1992). The complex will, therefore, terminate this practice of winter food supplementation and remove existing wooden feed bunkers from WPAs and refuges.

Strategy 2:

- Cease distribution of winter feed (including bales) for white-tailed deer and gallinaceous birds.
- Destroy wooden feed bunkers that currently exist on refuges and WPAs.

Objective 3:
Between 2–15 years after the completion of this CCP, complete a multi-year scientific evaluation of the Service's botulism cleanup procedures, including a determination of avian carcass fate and the relationship of detection rates to: 1) botulism surveillance intensity; 2) carcass size; 3) abundance of emergent vegetation, and; 4) other lake characteristics.

Rationale 3:
As discussed in Rationale 2 under the developed wetlands section, botulism is a disease that can cause substantial mortality of waterfowl, shorebirds, and other waterbirds. Long Lake's varied history of botulism, including its frequency of occurrence and severity, was also discussed in that section.

The most common causative agent of botulism is a type-C toxin produced by the bacterium Clostridium botulinum (Friend and Franson 1999). The disease appears to be exacerbated through what is commonly referred to as "the carcass-maggot cycle", which includes the following events: 1) C. botulinum (from previously ingested spores), vegetates and produces toxin in response to biochemical changes associated with death and decomposition; 2) maggots feed on carcasses and concentrate toxin; 3) toxic maggots are ingested by birds, and; 4) toxicity leads to death, producing additional carcasses and perpetuating the cycle. Because of the botulism toxin's extremely high potency, these events lead to rapid acceleration in the rate of deaths due to botulism. Consumption of as few as 1 or 2 toxin-laden maggots may be adequate to kill an otherwise-healthy bird (Friend and Franson 1999).

The presumed significant role of the carcass-maggot cycle in the epizootiology of botulism has been the central factor in development of field procedures for reducing impacts of the disease on migratory bird populations. Botulism management typically involves late-summer surveillance of lakes that are prone to botulism, and intensive carcass retrieval with the goal of removing dead birds from the affected lake as quickly as possible. Carcass pickup has been widely accepted as the best approach to minimizing botulism-induced mortality of waterbirds and has been recommended by wildlife health professionals based on knowledge of botulism epidemiology (Friend and Franson 1999). However, substantial time, expense, and effort are expended by complex staff annually in surveillance activities, based on little scientific data regarding the effectiveness of this management on progression of the disease or survival of migratory birds. Despite the lack of scientifically valid supporting data, the USGS National Wildlife Health Center continues to recommend carcass pickup for botulism control (Sohn, USGS, pers. commun.)

Recently, the significance of carcass removal to waterfowl survival during botulism outbreaks has been challenged (Evelsizer 2002). Evelsizer (2002) and Bollinger et al. (2003) suggested that carcass removal did not appear to be an effective technique for managing botulism in prairie Canada. The apparent failure of this management was attributed to the inefficiency of carcass removal on large wetlands. Under ideal conditions, no more than 30 percent of carcasses present were found and collected. What level of carcass pickup efficiency, if any, would have been effective is unknown. Nonetheless, these data have been used to defend the cessation of botulism cleanup efforts in Canada (Delta 2003). Carcass detection and pickup are likely biased toward detection of large, intact carcasses in unvegetated areas, potentially underestimating carcass presence and density for shorebirds and secretive marsh birds. However, no credible data exist regarding efficiency of Service carcass cleanup crews on PPR lakes and wetlands.

Reed and Rocke (1992) found that mortality in penned mallards was 4.5 times higher in pens with carcasses compared to pens without carcasses. In addition, T. Rocke (USGS, pers commun.) found that when mortality did occur in penned mallards from causes unrelated to botulism, botulism developed only in those pens where carcasses were not removed. These data reinforce that effective carcass pickup might be effective at increasing waterfowl survival.

In addition to the complex, Service lands throughout the PPR are especially impacted by botulism, with no less than 13 field stations having historically managed botulism outbreaks in North Dakota and South Dakota alone. Many of these stations must deal with outbreaks on multiple WPAs, refuges, and privately owned lakes and wetlands. As Evelsizer (2002) provides the only available field research on carcass pickup effectiveness, attempts should be made to replicate the findings in the PPR of the United States, where habitats, lake size, and search methods differ from those at Evelsizer's (2002) Canadian study sites.

The ultimate question of interest with regard to carcass pickup is whether these efforts curtail progression of the disease and/or improve survival of affected species. A scientifically valid answer to this question would require an expensive, long-term project that is likely not feasible with respect to the complex's resource availability. As an alternative, the complex staff proposes to (over a 3-year period), measure effectiveness of carcass retrieval crews in operational settings to determine the conditions under which carcass retrieval rates are maximized. This information will allow targeting of cleanup activities and will serve as a foundation for future research. Furthermore, information gathered during this initial three-year study (e.g., under given habitat conditions, Service pickup crews can expect to recover a given percentage of shorebird carcasses) will provide a better foundation and reduce the overall workload for eventual research attempting to answer this fundamental question. Because carcass removal is logistically difficult and very expensive, it is critical that the effectiveness of these management activities are evaluated. The study will be conducted in conjunction with operational botulism surveillance and carcass pickup on no less than three wetland management districts (i.e., Long Lake, Northeast Montana, Kulm) in the PPR of the State and Montana. Additional areas, potentially including portions of the PPR in South Dakota, will be sought as the study develops.

Objective 3 states that this research will be conducted sometime between 2–15 years after the completion of this CCP. The complex will not attempt to initiate this study immediately (i.e., from the completion of the CCP until two years after the completion of the CCP) because of unknowns related to HPAI. All indications are that the H5N1 strain of HPAI will surface in the United States, with the biggest unknown being "when" (Roffe, Service, pers. commun.). The incidence of HPAI anywhere in the United States will likely cause dramatic changes in how all Service staff are required to handle dead birds they encounter, no matter what is the suspected mortality agent is. Therefore, the complex will temporarily shelve plans for botulism-related research until it becomes clear how HPAI might affect the completion of certain aspects of the study (i.e., handling dead birds of unknown origin).

Strategy 3:
Initiate a 3-year scientific study in cooperation with the NPWRC and the USGS and no less than two other wetland management districts (i.e., Kulm, northeast Montana).

Research, Inventory, and Monitoring Sub-Goal:
Utilize data from inventory, monitoring, and applied research to advance the understanding of the natural resources and their management on lands within the complex.

Objective 1:
Within 10 years of the completion of this CCP, develop and complete a new inventory and monitoring plan for the complex.

Objective 2:
Within 7 years of the completion of this CCP, develop and complete a new habitat management plan for the complex.

Strategies 1 and 2:
Complete detailed and accurate plans within the allowed timeframes.

Objective 3:
Over a 15-year period, focus priority inventory, monitoring, and research efforts on related information needs outlined in the biological objectives within the complex's CCP.

Strategy 3:
Direct the principal thrust of the complex's biological efforts towards the information needs outlined in its CCP's biological objectives.

Objective 4:
Within one year of the completion of this CCP, establish a secondary priority needs list of research, inventory, and monitoring information needs for the complex.

Strategy 4:
Evaluate the complex's biological information needs not addressed in the CCP's biological objectives to determine which deserve consideration as secondary priority needs.

Rationales 1, 2, 3, and 4:
Because the CCP is intended as a broad umbrella plan that provides general concepts and specific management and operational complex objectives, it is imperative that step-down plans, such as an inventory and monitoring plan and habitat management plan are produced. The purpose of step-down plans is to provide greater detail and clearer direction to Service managers and other employees that will implement the strategies described herein. Specifically, the habitat management plan will provide staff with detailed information relating to the various proposed management practices (e.g., timing of prescribed fire, timing and intensity of grazing, timing, application rate, and pesticide type for chemical applications). The inventory and monitoring plan will outline all proposed activities (e.g., wildlife, habitat, abiotic) and provide detailed information on methodology and analysis.

Knowledge gaps, regarding natural resources that the complex has been entrusted with managing and protecting, are many and varied. The information needs that the complex staff has determined to be of the highest priority are included in this CCP's biological objectives. These objectives are listed below by habitat types or category. Additional details concerning these objectives can be found in previous portions of this chapter.

Developed Wetlands
Objective 1A:
Objective 1B:
Objective 2:

Undeveloped Wetlands
Objective 1A:
Objective 1B:
Objective 1C:
Objective 2:

Native Prairie
Objective 1A:
Objective 1B:
Objective 1C:
Objective 1D:
Objective 1E:
Objective 2A:
Objective 2B:
Objective 3:

Old Cropland
Objective 1:
Objective 2:

Priority Population Issues
Objective 1A:
Objective 1B:
Objective 2:

Predator Management
Objective 1:
Objective 2:

Wildlife Disease
Objective 1:

Inventory, Monitoring and Research
All inventory, monitoring, and research activities that are not identified above need to be evaluated as to their importance, due to the inevitable fact that Service resources (e.g., staff, funding, equipment) are always limited and oftentimes insufficient. Therefore, complex staff will identify biological activities, in addition to those addressed in the CCPs biological objectives, which are deemed as important and accomplishable. This group of biological activities will be considered as a secondary priority.

Socioeconomics

Objective 1:
Develop a demographic profile of wildlife-dependent recreational users (users within a 6-hour commuting radius) within 5 years of CCP approval, to determine the long-term direction to provide for quality, public use opportunities.

Strategy 1:
- Develop partnerships with local fishing and hunting groups, as well as birders and other wildlife enthusiasts to learn about: 1) fishing, hunting, and wildlife observation and photography use in the area; 2) access needs, and; 3) sport fishery and hunting goals.
- Work with NDGF and other refuges in North Dakota and South Dakota to determine what they offer and whom they serve.
- Work with local environmental education groups and other wildlife enthusiast groups

to determine what they offer and whom they serve.

- Determine environmental education needs and student numbers within a 2-hour travel radius through collaboration with local schools and universities.
- Obtain information on wildlife-dependent recreational users (e.g., Himalayan snowcock hunters) visiting the area, in coordination with NDGF, local and State travel boards and chambers of commerce.
- Establish mechanisms to work collaboratively with the USGS's biological resource division economists and area universities (i.e., departments of agriculture and resource economics) to find ways to obtain or generate data on wildlife-dependent recreational expenditures in the area of the complex.

Objective 2:
Develop a demographic, attitudes, and expectations profile of wildlife-dependent recreational users (users throughout the nation and overseas) within 10 years of CCP approval, to determine a long-term direction and to provide quality, public use opportunities for people who travel from outside the State to visit the complex. Establish mechanisms to work collaboratively with USGS's BRD economists, area universities (i.e., departments of agriculture and resource economics) as well as with other U.S. governmental agencies, national and worldwide travel agencies, and nongovernmental organizations (NGOs) to obtain the necessary data to ascertain travel trends concerning the complex. Work with USGS's BRD economists and area universities, as well as with region 6's Education and Visitor Services (EVS) division to develop user-friendly, easily distributed questionnaires to obtain information from local, national and international complex visitors.

Objective 3:
Develop an economic impact analysis within 5 years of CCP approval, to determine and describe how the complex's management activities affect the local and State economies.

Rationales 1, 2, and 3:
Because of its size and rural location, the complex has limited information concerning what the public wants and expects from the complex. The Service would analyze this data to make decisions about future public use program developments and facilities. Finally, this data would supplement existing data on economic benefits generated for the local and State economies where the complex lies.

Strategies 1, 2 and 3:
Establish mechanisms to work collaboratively with the USGS's biological resource division economists and area universities to develop the economic impact analysis.

Public Use Overall Goal:
Provide a safe environment for visitors of all abilities to enjoy wildlife-compatible recreation while increasing their knowledge and appreciation of the mixed-grass prairie ecosystem and the mission of the Refuge System.

Fishing Sub-goal:
Provide quality fishing opportunities and access points to meet visitor needs. Support the Improvement Act's focus on one of the six priority public uses.

Objective 1:
Within 10 years after CCP approval, survey all permanent wetlands on Long Lake NWR, Slade NWR, and Florence Lake NWR to gain a baseline of their fishery resource and within 15 years provide fishery programs and access where compatible.

Rationale 1:
Objective 1 capitalizes on existing fisheries only, and proposes programs where fish currently exist, therefore, programs can be offered in a compatible manner. Introducing fish to new areas is not planned as fish compete for aquatic invertebrate resources associated with migratory bird objectives. Fish have been recognized as competitors for aquatic resources with migratory birds (e.g., ducks; Cox et.al., 1998, Swanson and Nelson 1970).

Sport fishing is one of the priority public uses of the Refuge System. Where compatible, this public use should be considered. Most permanent wetlands in the wetland management district have not been surveyed to document the presence or absence of fish. Certain wetlands on both Long Lake NWR and Slade NWR have marginal sport fish populations and thus have potential to provide limited fishing opportunity during PPR wet cycles. A limited sport fishing program already exists at Long Lake NWR. Due to relatively shallow water levels during moderate and low water cycles, most

permanent wetlands on complex lands are shallow enough that winterkill erases or substantially reduces fish populations. During periods of marginal conditions (low oxygen and shallow depths) gamefish (e.g., northern pike) tend to succumb first leaving only nongame fish (i.e., rough fish) which are less desirable to fishermen. Because of higher survival in poor conditions and lack of removal by fishermen, the fish biomass quickly skews toward undesirable rough fish (e.g., common carp, bullhead). Rough fish contribute to increased turbidity and lower aquatic productivity. They result in a marginal sport fishery with high rough fish biomass which perpetuates and exacerbates conflicts between accomplishing public use objectives and wildlife and habitat objectives (e.g., maintaining quality habitat for migratory birds).

Lead sinkers and spent lead birdshot are known contributors of lead to the aquatic environment. While restrictions can be placed on the use of lead sinkers for sport fishing in a manner similar to nontoxic shot regulations on WPAs and refuges, the availability of nonlead fishing sinkers is less universal than nontoxic shotshells. Primarily due to the comparatively large size of lead sinkers used for fishing, they present fewer problems for migratory birds, as suitability for ingestion is limited primarily to larger species (i.e., tundra swans, large races of Canada geese) whereas due to its small size, lead shot is available to a diversity of migratory birds for ingestion across the size spectrum. Consequently, if lead sinker use in refuge fishing programs poses a significant threat for certain larger-bodied migratory bird species in areas where fishing is allowed, restrictions should be placed on the use of lead sinkers in these areas. Enforcement patrols would need to be substantially increased to assure compliance if fishing programs were expanded significantly, however, this plan only focuses efforts on providing access to fisheries where they may exist (the complex staff expects to discover few additional existing fisheries) and not in developing new fisheries due to biological conflicts between fish and migratory birds. Due to marginal fish resources on refuges in the complex and relatively low expected fishing activity over the long-term, lead sinker issues are not believed to be significant in the limited areas where fishing occurs.

By identifying and collecting data on complex fisheries, complex staff may be able to develop additional compatible fishing programs and provide information about these fishing opportunities (i.e., fishery locations maps for the public). This would enable the complex to capitalize on existing fisheries to increase fishing opportunities for the public where compatible, and potentially to maintain those programs through stocking efforts to augment fisheries where they currently exist if/when necessary. Survey information will determine whether or not areas support fish, and further evaluation will determine whether areas can be opened for fishing in a compatible manner (i.e. ice fishing, seasonally restricted or limited access - due to migratory bird breeding and nesting activities).

Additional programs and facilities will require additional operations, law enforcement and maintenance costs which need to be addressed through funding, partnerships, and/or interagency commitments. The complex may be able to administer and provide some of the proposed opportunities without the need for additional resources.

- Coordinate with the Service's Bismarck fisheries assistance office and NDGF fisheries division staff to sample permanent wetlands with fisheries potential.
- No new fisheries will be developed through introduction of fish.
- Where current fisheries exist, fish populations could be augmented with stocking, provided that fish are not collected from sites that could lead to accidental species introductions (e.g., invasive plant introductions) or the spread of disease (e.g., iridovirus [tiger salamanders], various fish diseases).
- Identify types of fishing use which are potentially compatible (e.g., ice fishing only, shore fishing only, seasonal restrictions to avoid migratory bird objectives, primitive or developed access and facilities) and develop fishery programs using restrictions to maintain compatibility where appropriate.
- Identify needs for an enhanced public fishing program (i.e., patrol for law enforcement, facility needs, maintenance needs) and identify potential sources (e.g., NDGF, additional staff/funds through the Service's budget, other partnerships) to facilitate the additional opportunities.
- Identify fishing restrictions necessary to maintain compatibility of the fishing program with objectives for migratory

birds and impose site-specific restrictions (e.g., lead sinkers, ice fishing only, seasonal restrictions) as warranted.
- Develop a Long Lake NWR or complex tear sheet or fishing pamphlet to communicate fishing program specifics to the public.

Objective 2:
Within 10 years after CCP approval, survey all permanent wetlands on WPAs to gain a baseline of the existing fisheries and within 15 years provide fishery programs and access where compatible.

Rationale 2:
The objective capitalizes on existing fisheries only, and proposes programs where fish currently exist and programs that can be offered in a compatible manner. Introducing fish to new areas is not planned as fish compete for aquatic resources associated with migratory bird objectives (Cox et al. 1998).

By identifying and collecting data on WPA fisheries, complex staff may be able to develop additional compatible fishing programs and provide information about these fishing opportunities (i.e., fishery locations maps for the public). This would enable the wetland management district to capitalize on existing fisheries to increase fishing opportunities for the public where compatible, and potentially to maintain those programs through stocking efforts to augment fisheries where they currently exist if and when necessary. Survey information will determine whether certain WPAs support fish, and further evaluation will determine whether areas can be opened for fishing in a compatible manner (i.e. ice fishing, seasonally restricted or limited access - due to migratory bird breeding and nesting activities, etc.).

Additional programs and facilities will require additional operations, law enforcement and maintenance costs which need to be addressed through funding, partnerships, and/or interagency commitments. It is possible that the complex may be able to administer and provide some of the proposed opportunities without the need for additional resources.

Strategy 2:
- Coordinate with Service Bismarck FAO and NDGF Fisheries Division staff to sample permanent wetlands with fisheries potential. (Target those wetlands associated with WPAs with depths greater than or equal to ten feet and surface acreage of greater than 200 acres).
- No fisheries will be developed through the introduction of fish.
- Where current fisheries exist, fish populations could be augmented with stocking.
- Target wetlands with depths of ≥10 feet and a surface acreage of ≥200 acres.
- Identify types of fishing use which are compatible (i.e. ice fishing only, shore fishing only, seasonal restrictions to avoid migratory bird objectives, primitive or developed access and facilities) and develop fishery programs where appropriate.
- Identify needs for an enhanced program (i.e., patrol for law enforcement, facility needs, maintenance needs) and identify potential sources (e.g., NDGF, additional staff/funds through the Service's budget, other partnerships) to facilitate the additional opportunities.
- Identify fishing restrictions necessary to maintain compatibility of the fishing program with objectives for migratory birds and impose site-specific restrictions (e.g., lead sinkers, ice fishing only, seasonal restrictions) as warranted.
- Develop tear sheet or fishing pamphlet to communicate fishing program specifics to the public.
- Use volunteers to collect and analyze data.

Objective 3:
Annually conduct a youth fishing event (currently "Lines for Little Ones").

Strategy 3:
- Annually conduct a youth fishing event.
- Recruit volunteers to assist with and help fund the event.

Objective 4:
Upon CCP approval, continue to provide year-round access to designated fishing areas on Long Lake NWR.

Strategy 4:
- Provide current information at the fishing area kiosk and visitor center.
- Update current fishing brochure as necessary.

Hunting Sub-goal
Provide quality hunting opportunities and access points to meet visitor needs. Support the Improvement Act's focus on one of the six priority public uses.

Objective 1:
Within 5 years after CCP approval, explore additional hunting opportunities on three fee-title refuges within the complex, where compatible. Within 10 years provide hunting programs and access where compatible and where management constraints allow them.

Rationale 1:
Late season upland gamebird hunting has been allowed on Long Lake NWR since 1989 and has existed in a compatible manner. This recreational opportunity can be expanded to Slade NWR and Florence Lake NWR.

Deer hunting is allowed on Long Lake NWR and Slade NWR and has been provided in a compatible manner. This recreational opportunity can be expanded to Florence Lake NWR.

Although hunting predators during early- and mid-winter months may have a more limited impact on reducing predation on ground-nesting birds, as compared to predator removal between March 15 and July 15 (Dixon and Hollevoet), those animals removed in late winter (e.g., late February, early March) may assist in reducing predation affects on ground nesting birds. Localized depredation problems have been experienced by refuge neighbors requiring removal of predators (e.g., coyotes) from the refuges by USDA/APHIS Wildlife Services personnel. These problems could likely be somewhat mitigated by providing a compatible recreational predator hunting program on refuges administered by the complex.

Access to harvestable populations of migratory birds during open seasons is becoming more restricted to hunters as lands adjacent to the refuges in the complex are increasingly becoming leased, posted or otherwise off limits. Because of the large size and attributes of these refuges, there may be potential to provide hunting access for migratory birds in a compatible manner without adversely affecting refuge objectives for migratory birds.

Additional programs and facilities will require additional operations, law enforcement and maintenance costs which need to be addressed through funding, partnerships, and/or interagency commitments. The complex may be able to administer and provide some of the proposed opportunities without the need for additional resources.

Strategy 1:
- In partnership with the NDGF identify areas at Florence NWR, Slade NWR, and Long Lake NWR with potential to provide additional hunting opportunities.
- Evaluate the potential for a late-season (potentially December through March) predator hunting program targeting coyote and fox.
- Provide a predator hunting program in appropriate areas.
- Evaluate the potential for expanding late-season upland gamebird hunting programs on Slade NWR and Florence Lake NWR.
- Provide a hunting program in appropriate areas.
- Evaluate the potential for a deer hunting program on Florence Lake NWR. Provide this hunting program if deemed appropriate.
- Evaluate the potential for limited migratory bird hunting on Long Lake NWR. Provide this hunting program in areas if deemed appropriate.
- Identify needs for enhanced program (i.e., patrol for law enforcement, facility needs, maintenance needs) and identify potential sources (NDGF, additional staff/funds through the Service's budget, other partnerships) to facilitate the additional opportunities.
- Determine program restrictions necessary to maintain compatibility and regulate the programs (e.g., open areas, timing of seasons, access).
- Develop tear sheets or hunting program pamphlets to communicate hunting program specifics to the public.

Trapping Sub-goal:
Manage furbearing species that have potentially negative impacts on certain other wildlife populations and Service infrastructure.

Objective 1: Maintain the existing management-directed trapping program on refuges administered by the complex.

Rationale 1:
Permit trappers are an essential resource to management as they provide information for assessing populations of various furbearing mammals.

Permit trappers serve another important function. They target the furbearing mammals that damage refuge infrastructure and prey on neighboring livestock.

Trappers who continue to remove mammals that predate ground nesting birds late in the winter or in early spring, may assist management in reducing the effects of nest predators on ground nesting birds

The use of management-directed trappers is a cost effective way of obtaining information regarding targeted mammal groups, and reducing surplus mammals that present specific management issues while providing a biologically sound recreational/ economic activity.

Strategy 1:
Continue to administer the refuge trapping program by issuing SUPs to qualified trappers who serve as agents of management to:

- monitor mammal populations.
- remove portions of the annual surplus of furbearing mammals.
- reduce the mammals that cause damage to refuge infrastructure and/or present localized predation and/or depredation issues for management.

Objective 2:
Continue to provide recreational trapping on WPAs administered by the complex.

Rationale 2:
On WPAs, recreational trapping is an activity that was approved by legislation.

Limits on means of access that are normally used on private lands to support trapping (e.g., snowmobiles, ATVs) are necessary to maintain compatibility. Therefore, although trapping is allowed on WPAs, the use of motorized vehicles is restricted to designated roads and trails.

Strategy 2:

- Allow trapping on WPAs within the framework of State seasons and regulations as prescribed by law.
- Continue to monitor and enforce trapping with regard to access and use to maintain compatibility with other WPA objectives.

Environmental Education and Interpretation Sub-goal:

Provide and actively support opportunities for compatible wildlife-dependent environmental education and interpretation in support of the one of the six priority public uses outlined in the Improvement Act.

Facilities at Slade NWR would be upgraded to meet accessibility standards. Adjustments in facilities at Lake Isabel Recreation Area would be made to augment wildlife-dependent activities and reduce or eliminate nonpriority public uses. Upgrades would include accessible trails and tables. Signage at the refuge would be reduced by installing a centralized kiosk, which would include rules and regulations, wildlife information, and an interpretive panel about the history of the refuge.

The expansion of environmental education and interpretation opportunities will also include Small WPA. The existing nature trail at this WPA will be made accessible, and include wildlife interpretation information either in the form of a pamphlet, or a panel. This WPA has the potential to see an increasing amount of public use, because it is located only 6 miles from the city of Bismarck.

Objective 1:
Within five years of the approval of the CCP, expand the quantity and quality of on-site wildlife-oriented interpretive events and programs.

Strategy 1:

- Conduct two theme-related events, one in the spring and one in the fall to interpret the migration of birds. Advertise in local newspapers and recruit guest speakers for events.
- Continue to promote recreational fishing by holding one annual event associated with national fishing week (currently “Lines for Little Ones”).
- Continue to promote hunting and other wildlife-dependent recreation activities by holding one annual event associated with national wildlife refuge week (currently JAKES Day).

- Construct an observation tower at Long Lake NWR, along with an accessible observation deck overlooking unit II Marsh and unit II (near the Ducks Unlimited nesting island). The tower/deck would include interpretive panels containing information about the area wildlife.
- Develop a trail at Long Lake NWR from the stone buildings to the observation tower. Develop a pamphlet to interpret the sights and sounds along the trail. At Long Lake NWR, develop an auto tour using existing roads around Long Lake NWR, along with a pamphlet and signs to interpret popular wildlife viewing locations.
- Through partnerships, secure funding and design and develop accessible facilities and trail.
- Upgrade facilities at Slade NWR to meet compatibility and accessibility standards. Upgrades would include accessible trails and tables.
- Install a centralized kiosk at Slade NWR, which would include rules and regulations, wildlife information, and an interpretive panel about the history of the Refuge. Redesign and remove nonwildlife-oriented visitor use facilities at Slade NWR Secure funding to improve facilities and identify potential partners to support the renovation.
- Enhance the existing nature trail at this Small WPA to make it accessible, and include wildlife interpretation information either in the form of a pamphlet, or a panel. Work with NGOs to secure funding, then design and construct trail upgrades

Objective 2:
Within 5 years of the approval of this CCP, expand the quantity and quality of on-site wildlife-oriented environmental education program offered by the complex.

Rationale 2:
Environmental education and interpretation are two of the priority public uses established by the Improvement Act. Where compatible and contingent upon funding limits provided by the Service and its partners, these uses should be considered. Tremendous opportunities exist for educating and informing the local communities and refuge visitors about refuge resources.

It is valuable to expend energy realizing these objectives for a variety of reasons, including: 1) Long Lake NWR lies in close proximity to Bismarck (the State's capitol) which has a population of nearly 100,000 people and a number of schools in the immediate commutable area; 2) the area attracts large numbers of tourists due to its central location in the State; 3) the availability of existing historical stone buildings could be developed into an environmental education center; 4) the availability and diversity of wildlife, especially migratory birds;

Strategy 2:
- Continue to conduct a minimum of one teacher's workshop annually (teachers currently obtain one credit through accreditation by Minot State University).
- Explore specific habitat types as themes for the workshop. Coordinate themes with potential on-site self-guided environmental education tours/activities targeting a menu of specific lesson themes for school groups.
- Promote self-guided tours which are led by educators targeting on-site environmental education for school-age children.
- Develop educator's guide to self-guided refuge tours, which provides a menu of options/lessons for site-specific environmental education tours. The educator's guide would be tailored to needs of various class levels with varied levels of complexity depending on the age/class level of the students.
- Develop an on-site shorebird tour/activity as one potential theme, and develop others, for educators and school groups who visit Long Lake NWR. Work with refuge biologist to obtain information to support interpretive messages.
- Rehabilitate the historic stone buildings into an environmental education/ interpretive center to provide an on-site classroom.
- Secure funding to reuse the stone facilities and make them accessible.
- Coordinate with the regional historic preservation officer. Design exhibits and educational programs.
- Construct an observation tower, along with an accessible observation deck overlooking unit II marsh and unit II (near the Ducks Unlimited nesting island). The tower/deck would include interpretive panels

containing information about the area wildlife.

Objective 3:
Within 10 years after approval of the CCP, expand the quality and quantity of the *off*-site wildlife-dependent environmental education program offered by the complex.

Strategy 3:
- Develop an environmental outreach program to focus on specific themes (e.g., shorebird habitat).
- Visit science classes at two schools annually.
- Work with the complex biologist to obtain information to support interpretive messages.
- Promote the program at local schools and make contact with teachers to generate interest.
- Continue to provide educational trunks (i.e. shorebird, wetland, prairie, endangered species, etc.) for off-site classroom reservations for area schools.

Objective 4:
Increase visibility of the complex by having signage installed on Interstate 94 and other local roads and highways. Accomplish this within 5 years of this CCP's approval.

Strategy 4:
Coordinate with the State Highway Department, Department of Transportation, and/or the department of Tourism to develop directional signs for tourist notification on major routes.

Wildlife Observation and Photography Sub-goal:
Provide increased opportunities for wildlife observation and photography that enhance the visitor experience in support of the refuges purpose and in support of the Improvement Act's focus on the priority public uses.

Objective 1:
Upon completion of the CCP, increase the opportunities for wildlife observation and photography by increasing the number of nonpermanent blinds on Long Lake NWR.

Rationale 1:
Presently, opportunities for wildlife observation and photography are limited in some areas due to lack of facilities, lack of access, and a limited availability of nonconsumptive wildlife-dependent recreational opportunities during periods that do not conflict with wildlife resource needs (e.g., breeding and nesting seasons of migratory birds) and/or consumptive wildlife recreation (e.g., hunting). Additional viewing blinds on the refuge will provide an increased opportunity for nonconsumptive public recreation.

Strategy 1:
- Identify areas that support exceptional wildlife viewing opportunities, and offer viewing opportunities through the placement of portable blinds as enhanced recreational opportunities.
- Designate potential areas, determine appropriate timing of activities (e.g., sharp-tailed grouse dancing) and construct new blinds.
- Inform the public of new and existing opportunities through various media outlets.

Cultural Resources Goal
Identify, value, and preserve the cultural resources and history of the complex and connect complex staff, visitors, and the community to the area's past.

Objective 1:
Avoid, or when necessary mitigate, adverse effects to significant cultural resources in compliance with Section 106, at all times.

Strategy 1:
Continue cultural resource review of complex projects to identify concerns.

Objective 2:
The Section 106 process is always successfully integrated into all applicable complex projects by notifying Service Cultural Resource staff early in the planning process and, whenever possible, completing the review without delay to the project.

Strategy 2:
- Incorporate the Section 106 review in project design as early as possible and complete process as applicable.
- Complete a Programmatic Agreement (PA) with the State Historic Preservation Office (SHPO) to expedite project review.

Objective 3:
Create a site sensitivity model for the three refuges within 5 years of implementation of the CCP. Survey and document ≥20 percent of the high-sensitivity areas within 10 years.

Strategy 3:
- Use Service cultural resource staff to create the model and to conduct the survey.
- Partner with universities to conduct surveys of high potential areas.

Objective 4:
Within 5 years of implementation of the CCP, complete a structural assessment for the Works Progress Administration-built headquarters complex (stone house complex) including recommendations for adaptive reuse.

Strategy 4:
- Find an architectural student to do the project as a thesis or independent study.
- Apply for grants to fund assessment surveys.

Objective 5:
Within 5 years of the implementation of this CCP, write a report examining educational opportunities on the complex. If feasible, implement recommendations within 10 years.

Rationale 5:
The protection and interpretation of cultural resources is important to the public. Federal laws and policies mandate the consideration and often the protection of significant cultural resources.

Strategy 5:
- Research educational opportunities concerning cultural resources and the history of the region.
- Produce a brochure concerning the Works Progress Administration/ civilian conservation corps activities at Long Lake and the surrounding refuges.

Partnerships Goal:
Join a wide range of partners to support research and management, promote awareness of the Refuge System, and foster an appreciation of the mixed-grass prairie pothole ecosystem.

Objective 1: Upon approval of the CCP, the refuge will continue to participate in partnerships that promote sound wildlife management or contribute to the missions of the Service, Refuge System, or the complex.

Strategy 1:
- Continue to partner with Driscoll Wildlife Club, Delta, the National Wild Turkey Federation, and various contributing partners to hold educational and recreational events. Continue to partner with various groups (e.g., Bismarck/Mandan Birding Club, Delta, Ducks Unlimited) to accomplish wildlife censuses and surveys, habitat development, and habitat maintenance projects that further the accomplishment of complex goals and objectives. Continue to partner with local county commissions, weed boards, soil conservation districts, and others to accomplish localized and broad scale conservation projects including invasive weed control, recreation area maintenance, conservation education, etc.
- Explore opportunities for new nontraditional partnerships that further the accomplishment of the goals and objectives of the complex (e.g., Hazelton-Moffit-Bradock Long Lake Creek watershed water quality monitoring, Boy Scouts of America eagle badge projects, 4-H Club projects)

Objective 2:
Within 5 years of CCP approval, develop a Long Lake NWR friends group to support and advocate for the refuge's programs and needs.

Strategy 2:
- Identify and recruit a core group of individuals from the surrounding communities to develop and promote the refuge.
- Develop a charter and obtain nonprofit status.
- Write a grant to acquire "soft" monies to create the group.

Objective 3:
Upon approval of the CCP, continue to participate in partnerships that promote a broad group of wildlife species and address complex resource needs at the complex.

Rationale 3:
Partnerships require extensive staff time to coordinate, develop, and maintain. Long-term

commitments including funding and staff time are needed to maintain a strong and lasting relationship with partners. Without appropriate staffing, the complex runs the risk of losing its current partners and not developing new partners. Several of the objectives in the CCP depend on partner support and funding. Many of our wildlife, habitat, and public use programs would not continue without the additional funding and support from partners. Without partners, many of the habitat protection, restoration, and enhancement projects would go unfunded. Over time, the diversity of wildlife species would begin to decline as habitat became degraded. Partners are essential in fully implementing the CCP for the complex.

The complex reaches across the entire three-county landscape with wetland and grassland easement programs and activities that occur on lands administered by the complex. They have the potential to affect neighbors and the surrounding communities. Communication through various outlets as well as on an individual basis, and staff participation in local events, meetings, and activities builds and maintains support for the complex's programs. Partnerships are vital to accomplishing the Service mission. By establishing and maintaining partnerships it will foster communication between our local communities, stakeholders and other interested complex parties.

The complex staff will continue to seek out new opportunities and foster existing relationships to assist with achieving mutually beneficial goals and objectives.

Strategy 3:

- Attend local NGO meetings to exchange information.
- Hold open houses, appreciation day or other similar events annually for the complex's neighbors and friends.

Step-Down Management Plans

Service managers have traditionally used the refuge manual to guide field station management actions. The policy direction given through the manual has provided direction for developing a wide variety of plans, which are used to prepare annual work schedules, budgets, public use, safety, and land management actions. The CCP is intended as a broad umbrella plan which provides general concepts and specific wildlife, habitat, endangered species, public use, and partnership objectives. The purpose of step-down management plans is to provide greater detail to managers and employees who will implement the strategies described in the CCP.

Under the CCP, complex staff will revise or develop several step-down plans for the complex. Step-down plans to be revised include:

- public use plan
- water management plan
- upland management plan
- fisheries management plan
- fire management plan
- habitat and wildlife monitoring plans

Monitoring and Evaluation

Adaptive management is a flexible approach to long-term management of natural resources that is directed over time by the results of ongoing monitoring activities and other information. Habitat, wildlife, and public use management techniques and specific objectives will be regularly evaluated as results of the monitoring program and other new technology and information become available. These periodic evaluations will be used over time to adapt both the management objectives and techniques to better achieve management goals. Monitoring is an essential component of the CCP. Monitoring strategies have been integrated into many of the goals and objectives. Specific details including monitoring strategies, methods, techniques, and locations will be outlined in a step-down complex monitoring plan. In this CCP, habitat monitoring receives the primary emphasis. Many of the wildlife species in the complex are migratory birds. Migratory birds are impacted by a variety of factors (e.g., drought, disease, pollution, habitat destruction) on their wintering and nesting grounds and all along their migration pathways.

Determining whether a habitat manipulation on a Service-owned field or wetland is partly or wholly responsible for an associated migratory bird population change is difficult. Managers can strive to gather current information about the critical habitat needs for targeted species and then design habitat management plans and strategies to meet these needs. Habitats can then be monitored to determine if the management strategies are providing the critical habitat elements for a wildlife species. For example, if one of the critical habitat elements for bobolinks is vegetative structure at a specific height-density, managers can manipulate vegetation to achieve this structure and density. Whether or not bobolink use increases on the manipulated field when the vegetation structure

and density meet the conditions that bobolinks prefer, may or may not be directly tied to the manipulation. Monitoring bobolink populations in the manipulated field over the long-term can provide some general local population trend information and document bird use. Managers must then carefully evaluate the bird use data to try and determine if a direct correlation exists to the habitat manipulation.

The majority of habitat management activities will be monitored to assess whether the desired effect on wildlife and habitat components has been achieved. Baseline surveys will be conducted for wildlife species for which existing or historical numbers and occurrence is not well known. It is also important to conduct studies to monitor wildlife responses to increased public use including fishing, hunting, wildlife observation, and environmental education.

Whenever possible, monitoring should be designed and developed in cooperation with universities and/or government research divisions (e.g., NPWRC, USGS) when stringent protocols or complex data analysis is needed. Applied research can help to answer habitat, wildlife, and public use management questions. The complex staff will work with researchers to ensure that the research is applicable and compatible with complex objectives.

This CCP is designed to be effective for a 15-year period. Periodic review of the CCP will be required to ensure that established goals and objectives are being met and strategies are being implemented. Ongoing monitoring and evaluation will be an important part of this process. Key monitoring needs are identified throughout the CCP. A step-down monitoring plan will incorporate and describe how, when, and who will conduct the monitoring on Service lands within the complex.

APPENDIX A: Draft Compatibility Determinations

Refuge Name
Long Lake National Wildlife Refuge Complex

Establishing and Acquisition Authority
Long Lake National Wildlife Refuge Complex
Executive Order 5808, February 25, 1932
Migratory Bird Conservation Act 45 Stat 1222

Refuge Purposes
"…as a refuge and breeding ground for migratory birds and other wildlife…" Executive Order 5808, dated February 25, 1932.

"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." USC 715d (Migratory Bird Conservation Act.)

Refuge Name
Florence Lake National Wildlife Refuge

Establishing and Acquisition Authority
Florence Lake National Wildlife Refuge
Executive Order 8119, May 10, 1939
Migratory Bird Conservation Act 45 Stat 1222

Refuge Purposes
"…as a refuge and breeding ground for migratory birds and other wildlife…" Executive Order 8119, dated May 10, 1939.

"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." USC 715d (Migratory Bird Conservation Act.)

Refuge Name
Slade National Wildlife Refuge

Establishing and Acquisition Authority
Slade National Wildlife Refuge
Donation, 1940
Migratory Bird Conservation Act 45 Stat 1222

Refuge Purposes
"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." USC 715d (Migratory Bird Conservation Act)

Refuge Name
Long Lake Wetland Management District

Establishing and Acquisition Authority

Migratory Bird Hunting Stamp Act 16 U.S.C. 718(c) "…as waterfowl production areas subject to all provisions of the Migratory Bird Conservation Act …except the inviolate sanctuary provisions…"

Migratory Bird Conservation Act 16 U.S.C. 715d "…for any other management purposes, for migratory birds."

Consolidated Farm and Rural Development Act 7 U.S.C. 1924 "… for conservation purposes"

Consolidated Farm and Rural Development Act 7 U.S.C. 2002 "…for conservation purposes"

Refuge Purposes
Long Lake WMD was established "…to assure the long-term viability of the breeding waterfowl population and production through the acquisition and management of waterfowl production areas, while considering the needs of other migratory birds, threatened and endangered species and other wildlife." (The purpose statement was developed for all wetland management districts in region 6 in June 2004)

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

1. Description of Proposed Use:
Farming, Grazing, and Haying
Continue upland management activities such as farming, grazing, and haying that are conducted under cooperative farming or SUP by private individuals. Currently, these economic uses are used as tools to manage habitat for wildlife.

Approximately 1,100 acres of uplands are farmed each year. Farming is conducted for the sole purpose of grassland restoration. The complex targets restoration of natives on 300–400 acres annually by planting native grass on fields that are currently degraded tamegrass and/or farmed fields. Grazing by cattle is used as a grassland and wetland management tool. Grazing was employed on 827 acres in 2005. Approximately 20–30 percent of the upland acres in the complex could potentially be grazed annually, primarily targeting the early season, April 1–June 15 to reduce invading cool-season exotic species. Occasionally, grazing is also employed as a management treatment outside the seasonal window to address some other management issue. Grazing is also used to open shorelines in certain areas, which, in absence of treatment, are closed stands of dense emergent vegetation. Haying is sporadically used as a grassland management tool. It is utilized to control noxious weeds, prepare areas for upland restoration, treat litter accumulation and/or the ratio of live to dead plants in a stand, and prepare areas for prescribed burns.

The CCP proposes to continue grassland restoration activities throughout the complex. Farming would subsequently be reduced as native-grass seeding activities throughout the complex are completed. Cooperative farming activities are employed only on previously farmed uplands. Farming allows the refuge to establish seedbeds relatively free of noxious plants, maximizing the likelihood that grassland restoration will be successful. Crops that may be used during farming include, but are not limited to, corn, soybeans, grain millet, hay millet, winter wheat, barley, and spring wheat.

The CCP proposes to utilize grazing as a management tool for wetland and upland habitats. Specific acreages have not been identified in the CCP because habitat conditions within wetland and upland areas

can change dramatically on a yearly basis due to precipitation and temperatures. An adaptive approach will be used when prescribing grazing treatments for complex habitats.

Availability of Resources

The resources necessary to administer haying, grazing, and farming programs at existing levels are sufficient at current staffing and budgetary levels. Haying, grazing, and farming programs are generally conducted through SUPs or cooperative farming agreements minimizing staff time and refuge assets to complete work. In order to restore native grass and forbs on degraded tamegrass and farmed fields as outlined in this CCP, the complex will require additional funds to purchase seed annually (until the tame grass and farmed fields are converted).

Anticipated Impacts of the Use

Over a 5-year period, grazing has been conducted on approximately 1,000 acres annually. While annual acreages have not been specified in the CCP, it is expected that future grazing in the complex will increase to address management issues with primary cool-season invasive species (e.g., smooth brome, Kentucky bluegrass). Additionally, habitat requirements of a diverse mix of target bird species requires that habitat be provided in high (> 8 inches), medium (4–8 inches), and low (< 4 inches) visual obstruction categories. In order to provide these grassland habitats, habitat manipulation, through a variety of means including grazing, haying, and stand reestablishment through reseeding is required. Farming acres will likely remain at or near the current level of 1,100 acres farmed annually for 8–10 years. They will then be reduced as previously farmed and tamegrass uplands are converted to native grass. Approximately 300–400 acres of native grass are targeted to be seeded annually. Haying is used sporadically to address specific grass stand issues throughout the complex and this use is not anticipated to change.

Without management, wetland and upland habitat conditions would deteriorate due to long periods of rest. Cool-season invasive species would likely increase and infest additional areas without the use of spring grazing. While all these activities disturb habitat and wildlife in the short-term, long-term habitat and wildlife benefits outweigh these disturbances. Farming causes decreases in wildlife habitat availability; however, habitat conditions will improve following grassland restoration activities.

The anticipated effect on target bird species, and other species which have similar habitat needs, is a positive effect on their habitats and subsequently their populations.

No cultural resources would be impacted. No impact to endangered species should occur.

Determination

The use of haying, grazing, and farming as habitat management tools is compatible.

Stipulations Necessary to Ensure Compatibility

- Monitor vegetation and wildlife to assess the effects of the management tools.
- Require general and special conditions for each permit to ensure consistency with management objectives.
- Restrict farming permittees to a list of approved chemicals that are less detrimental to wildlife and the environment.
- Restrict haying to commence after August 1 to avoid disturbance to nesting birds (unless the refuge manager deems it necessary to hay earlier to control invasive plants or restore grasslands).

Justification

To maintain and enhance the habitat for migratory birds and other wildlife, some habitat manipulation needs to occur. Upland and wetland habitat conditions would deteriorate without the use of a full range of management tools. Migratory bird habitat and ecological diversity would decrease as habitat suitability

declines. Habitat would degrade and meet the requirements of fewer migratory bird species on an annual basis as quality and condition deteriorate. Exotic and invasive plant species would increase and habitat diversity would decrease if management practices did not continue throughout the complex.

Mandatory 15-year reevaluation date: 2021

2. Description of Proposed Use:
Environmental Education and Interpretation
Provide opportunities for environmental education and interpretation.
Environmental education consists of activities conducted by refuge staff, volunteers, and teachers. Interpretation occurs in less formal activities with refuge staff, volunteers or through exhibits, educational trunks, signs, programs, and brochures. Currently, environmental education and interpretation activities are conducted at the Long Lake NWR office and occasionally on Slade NWR and select WPAs in the wetland management districts, and at various off-site locations where activities and/or programs are presented.

The recent staff addition of an outdoor recreation planner and proximity to a population of over 100,000 provides potential to expand substantially environmental education and interpretation programs at the complex. The CCP proposes to continue with current uses as well as improve environmental education and interpretation for all visitors. The following are facility and program improvements described in the CCP:

- Conduct two theme-related events, one in spring, one in fall to interpret the migration of birds.
- Construct observation tower overlooking the unit II marsh.
- Develop an accessible trail from stone buildings to observation tower.
- Upgrade facilities at Slade NWR and focus on wildlife-oriented activities at Lake Isabel Recreation Area.
- Enhance and upgrade the Small PWA interpretive trail.
- Update and improve refuge signs.
- Update existing brochures to the Service graphic standards.
- Rehabilitate historic stone buildings into an environmental education and interpretation center.
- Develop an on-site shorebird tour/activity as one potential theme and develop others for educators and school groups.
- Continue to conduct teacher workshops with a central theme of wildlife and habitats.
- Increase contact with students, on- and off-site, to develop and enhance an understanding and appreciation of wildlife and their habitats.
- Continue public outreach through various events and compatible wildlife-dependent recreation opportunities.

Availability of Resources
Implementing new facilities outlined in the CCP is closely tied to funding requests in the form of refuge operation needs system (RONS) and maintenance management system (MMS) projects. Existing programs such as current refuge signs and brochures can be updated with available resources.

Anticipated Impacts of Use
Minimal disturbances to wildlife and wildlife habitat would result from these uses at the current and proposed levels. Adverse impacts are minimized through careful timing and placement of activities. Some disturbance to wildlife would occur in areas frequented by visitors. There would be some minor damage to vegetation, littering, and increased maintenance would be necessary. Location and time limitations

placed on environmental education and interpretation activities would ensure that this activity would have only minor impacts on wildlife and would not detract from the primary purposes of the various units of the complex.

No cultural resources would be impacted. No impact to endangered species should occur.

Determination
Environmental education and interpretation are compatible public uses.

Stipulations Necessary to Ensure Compatibility

- Allow environmental education and interpretation only in designated areas or under the guidance of refuge staff, a volunteer, or a trained teacher to ensure minimal disturbance to wildlife, minimal damage to vegetation, and minimal conflicts between groups.
- Annually review environmental education and interpretation activities to ensure these activities are compatible.

Justification
Based on biological impacts described in the EA and the draft CCP, staff determined that environmental education and interpretation within the complex would not materially interfere with, or detract from, the purposes for which this complex was established.

Environmental education and interpretation are priority public uses listed in the Improvement Act. By facilitating environmental education, refuge visitors would gain knowledge and an appreciation of fish, wildlife, and their habitats, which would lead to increased public awareness and stewardship of natural resources. Increased appreciation for natural resources would support and complement the Service's actions in achieving the purposes of the refuge and the mission of the Refuge System.

Mandatory 15-year reevaluation date: 2021

3. Description of Proposed Use: Wildlife Observation and Wildlife Photography
Provide opportunities that support wildlife-dependent recreation
Wildlife observation and wildlife photography are facilitated by an auto tour route, one hiking trail and two wildlife observation pullouts.

The CCP proposes to continue previously stated uses and add the following to improve wildlife observation and wildlife photography:

- Designate and develop auto tour route.
- Identify exceptional wildlife viewing opportunities and improve viewing access through placement of portable blinds.
- Designate and develop an interpretive hiking trail and an observation deck.

Availability of Resources
Implementing new facilities outlined in the CCP is closely tied to funding requests in the form of refuge operation needs system (RONS) and maintenance management system (MMS) projects. Existing programs such as current refuge signs and brochures can be updated with available resources.

Determination

Wildlife observation and wildlife photography are compatible uses.

Stipulations necessary to Ensure Compatibility

- Restrict vehicles to designated roads and trails.
- Monitor use, regulate access, and maintain necessary facilities to prevent habitat degradation and minimize wildlife disturbance.

Justification

Based on the anticipated biological impacts, it is determined that wildlife observation and wildlife photography on the complex would not interfere with the habitat goals and objectives or purposes for which it was established.

Wildlife observation and wildlife photography are priority public uses listed in the Improvement Act. By facilitating these uses, visitors would gain knowledge and an appreciation of fish and wildlife which would lead to increased public stewardship of wildlife and their habitats. Increased public stewardship would support and complement the Service's actions in achieving the purposes of the complex and the mission of the refuge system.

Mandatory 15-year reevaluation date: 2021

4. Description of Use: Recreational Fishing

Continue to provide for recreational fishing at designated fishing areas in accordance with State regulations and expand programs to refuge and WPA areas where fish currently exist.

The primary game fish found in the complex are northern pike, walleye, and perch. Designated fishing areas on Long Lake NWR include Long Lake Creek and shore fishing access sites of unit 1. Boating is allowed only on Long Lake Creek and the period of use is May 1 through September 30. Boats are restricted to 25 horsepower. YMCAWPA and Adams WPA have the same fishery resources as Long Lake NWR because these waterfowl production areas are directly connected to the watershed.

Slade NWR and several waterfowl production areas, located in conjunction with large permanent wetlands, may have fishery resources which are not currently utilized. The CCP calls for an inventory of these areas and establishment of compatible fishery programs where they are found.

Fishing visitation is dependent on success, which is greatly influenced by weather cycles. Generally, fishing is good during wet cycles and poor during extended dry periods due to the marginal nature of the wetlands and lakes involved (shallow depths and harsh winters which subject wetlands of marginal depths to frequent winterkill of fish resources).

Availability of Resources

The current fishing program is administered using available resources. The CCP calls for the establishment of new fishing programs where game fish populations currently exist and where fishing activity can be provided in a manner, which is compatible with other objectives. Sufficient resources are available to maintain the existing recreational fishing program. When fishing programs are expanded to

new areas, the complex will need an increased law enforcement presence through additional law enforcement staffing and/or cooperative agreements for law enforcement coverage through the NDGF.

Anticipated Impacts of Use

Fishing and other human activities cause disturbance to wildlife. Restricting fishing to designated fishing areas minimizes the disturbance to migratory birds and other wildlife. In areas of relatively low use by migratory birds, such as large permanent lakes, fishing programs can provide recreation and have relatively little effect on other complex objectives and programs.

Determination
Recreational fishing is compatible.

Stipulations Necessary to Ensure Compatibility

- Require that fishing follow state and federal regulations.
- Confine fishing to designated fishing areas.
- Phase out the use of lead sinkers and lures over a 5-year period, as these present ingestion dangers for migratory birds.
- Monitor existing use to ensure that facilities are adequate and disturbance to wildlife continues to be minimal.
- Employ a "no wake zone" that includes all waters within 500 feet of the shoreline or emergent marsh areas, and/or restrict horsepower on boats used in confined areas and areas of limited depth, such as Long Lake Creek.

Justification
Based on the biological impacts addressed above and in the EA, it is determined that recreational fishing would not materially interfere with the habitat goals and objectives or purposes for refuge establishment.

Fishing is a priority public use as listed in the Improvement Act.

Mandatory 15-year Reevaluation Date: 2021

5. Description of Use: Recreational Hunting
Continue to provide recreational hunting and expand programs in refuge and waterfowl production areas where programs can be provided in a compatible manner.
Allow continued recreational hunting of deer, ring-necked pheasant, sharp-tailed grouse, Hungarian partridge, on Long Lake NWR.

The CCP calls for staff to evaluate and expand the Long Lake hunting program to include fox and coyote and waterfowl on designated portions of the refuge where compatible and with restrictions necessary to ensure that the activity does not materially interfere with the purposes of the refuge and/or the attainment of other refuge objectives.

Allow continued hunting of deer on Slade NWR.

The CCP calls for staff to evaluate and expand the Slade hunting program to include ring-necked pheasant, sharp-tailed grouse, Hungarian partridge, fox and coyote, where compatible and with restrictions necessary to ensure that the activity does not materially interfere with the purposes of the refuge and/or the attainment of other refuge objectives.

The CCP calls for staff to evaluate and provide deer, ring-necked pheasant, sharp-tailed grouse, Hungarian partridge, fox and coyote hunting at Florence Lake NWR where compatible and with restrictions necessary to ensure that the activity does not materially interfere with the purposes of the refuge and/or the attainment of other refuge objectives.

Continue to provide the hunting programs on waterfowl production areas as prescribed by legislation. The CCP calls for staff to evaluate and provide expanded access for boats in areas where their use augments fishing and hunting programs and can be provided in a compatible manner.

Availability of Resources
Sufficient resources are available to maintain the existing recreational hunting program. When the hunting programs are expanded, the complex will need to pursue additional law enforcement coverage through additional law enforcement staffing and/or cooperative agreements for law enforcement coverage through the NDGF.

Anticipated Impacts of Use
Some wildlife disturbance will occur during recreational hunting activities at the various units of the complex. Less than 5 percent of Long Lake NWR will be evaluated for hunting of migratory birds. This will ensure that adequate area remains undisturbed for the benefit of migratory birds. Approximately 15 percent of Long Lake NWR is closed to all hunting.

All hunting on Long Lake NWR and Slade NWR is seasonally scheduled so that it will not interfere with migratory birds' use of these refuges. This ensures adequate resting areas for migratory species during the fall migration.

Winter hunting for fox and coyote on refuge units (Long Lake NWR, Slade NWR, and Florence Lake NWR) administered by the complex is proposed by the CCP. Fox are primary nest predators and coyote have resulted in depredation complaints from neighboring landowners and resulted in the employment of USDA agents for control during each of the past 5 years. Hunting for these species after the waters have frozen would allow for population reductions at a time in the season when there would be little or no disturbance to most migratory birds. While any population reduction during the winter would be temporary, the opportunity provided by coyote and fox hunting would increase recreational opportunity and holds potential to reduce annual surplus of these species which have presented localized predation and depredation issues associated with these refuges. Hunting of fox and coyote is a recreational opportunity, which was approved by legislation on the 79 waterfowl production areas and one wildlife development area managed by the complex.

Other public use activities will be minimally impacted by the recreational hunting program changes proposed by the CCP.

Restricting vehicle use to designated purposes, times, and established roads, trails, and parking lots protects habitats from damage and minimizes disturbance to wildlife. Closed areas around residences and the headquarters area provide safety zones and reduce conflicts between hunters and visitors. Restrictions on the timing of seasons and areas open to hunting ensure that the proposed hunting activities do not materially interfere with the purposes of the refuge and/or the attainment of Refuge System objectives.

Determination
Recreational hunting is compatible.

Stipulations Necessary to Ensure Compatibility

- Require the use of nontoxic shot, in accordance with current regulations for migratory bird and upland game hunting.
- Limit use of motorized vehicles to designated parking areas, access trails, and public roads.
- Prohibit all-terrain vehicles (ATVs).
- Prohibit camping, overnight use, and fires.
- Require that hunting be conducted in accordance with federal and State regulations.
- Develop hunting programs with appropriate timing and area restrictions to avoid conflicts with other objectives (i.e. late season; upland gamebirds; winter; fox and coyote: upland areas distant from water roosting/loafing areas; waterfowl: etc.).

- Promote sound hunting practices for hunter safety and quality experiences.

Justification
Hunting on national wildlife refuges was identified as a priority public use in the Improvement Act. Hunting is a legitimate wildlife management tool that can be used to manage populations. Hunting harvests a small percentage of the renewable resources, which is in accordance with wildlife objectives and principles.

Based on the biological impacts anticipated above and in the EA, it is determined that recreational hunting at the complex would not materially interfere with or detract from the purposes for which this complex was established or the goals and objectives of the Refuge System.

Mandatory 15-year Reevaluation Date: 2021

6. Description of Use: Recreational Trapping and Predator Management
Provide for recreational trapping on complex lands along with spring predator trapping to improve upland nesting bird success in the complex
Recreational trapping on refuges administered by the complex is authorized through issuance of SUPs to trappers who are interested in removing surplus and problem animals as agents of management. The wetland management district's waterfowl production areas are legally open to trapping according to State regulations as per their establishing legislation and the federal code of regulations. In addition, the complex plans to pursue partnerships to affect predator control on select areas (waterfowl production areas and surrounding private lands where permission is obtained) where nesting success rates of waterfowl are suppressed due to high predation rates as described in the CCP.

Availability of Resources:
Currently there is sufficient funding and staffing to manage the recreational trapping and spring predator trapping in the complex at existing levels. When the trapping programs are expanded as is called for in this CCP, the complex will need to pursue additional law enforcement coverage through additional law enforcement staffing and/or cooperative agreements for law enforcement coverage through the NDGF. In addition, to administer a spring predator trapping program, additional biological science staff for monitoring of predator populations and upland bird production will be required. These needs are listed in the station's RONS list in appendix H. Staff will pursue partnerships to provide labor and funding assistance from various public and private organizations to manage predator populations in order to achieve acceptable nest success rates for waterfowl and other ground nesting migratory birds in select areas.

Anticipated Impacts of the Use:
Trapping removes individual animals from wildlife populations, which temporarily reduces predator populations up to and during the nesting season. Spring predator trapping increases the nesting success

of upland nesting birds. There would be direct mortality of target animals, some vegetation trampling by personnel, and some minor increase in general wildlife disturbance in trapping areas due to human and vehicular traffic. There is the possibility of injury to nontarget wildlife that are caught in traps such as an occasional rabbit, domestic dogs and feral cats. The complex staff anticipates that the combination of recreational trapping and predator management, which targets specific areas of high densities of waterfowl and low recruitment, caused primarily by high nest predation rates, will result in higher, more acceptable recruitment rates for waterfowl and other upland nesting birds. Recreational trapping and predator management activities are anticipated to yield less damage to complex infrastructure (i.e., roads, dikes, WCSs) and fewer domestic livestock depredation complaints from neighbors of the three refuges.

Determination:
Recreational trapping and predator management is compatible.

Stipulations Necessary to Ensure Compatibility:

- Trapping will be conducted in a manner that will remove only targeted species or species removed for public health and safety concerns.
- Recreational trapping will occur within regular State seasons and will not conflict with other public uses.
- Trapping for predators outside of regular season will be coordinated with the NDGF.
- Detailed trapping records will be maintained for refuge and staff trappers.
- No trapping will take place in areas of high public use areas unless done for health and safety reasons.
- No exposed bait will be placed near traps that might attract eagles or other raptors.
- Traps must be monitored at a minimum of every 24 hours.
- Nest Success will be monitored in areas targeted for predator removal to determine the program's effectiveness and the need for the following year's trapping (trapping will be conducted only when nest success falls below 30 percent).

Justification:
Recreational trapping removes excess individuals from targeted wildlife populations, provides recreational opportunity, and offers economic and wise use of surplus and renewable wildlife resources. Predator management will benefit upland nesting birds, including many species of waterfowl when predator populations are reduced during the nesting season. Combined recreational trapping and predator management activities reduce populations of specific species that depredate livestock, damage infrastructure, and/or suppress nest success of waterfowl and ground nesting birds.These management activities augment the complex's ability to efficiently and effectively accomplish primary resource objectives. Long-term negative effects to these predator populations will not occur as trapping activities cannot feasibly remove enough animals to permanently impact these populations.

Mandatory 15-year Re-evaluation Date: 2021

7. Description of Use: Research
Continue to provide opportunities for research

The complex receives periodic requests to conduct scientific research. Some requests are specific to Service lands administered by the complex, and others are part of a larger landscape-level project that requires authorization from multiple refuge field stations. In addition, the complex often partners with other agencies and/or private partners to conduct field research and/or studies that advance the attainment of primary refuge goals and objectives.

Recently, as more and more health threats arise (e.g., West Nile virus, CWD, avian influenza) research may be essential to prevent, or at least manage, disease outbreaks. Access to researchers and/or partners may be mandated in order to monitor and assess the prevalence, transmission, control, and specific characteristics of these and other potential threats to human health. In some cases, complex staff may become involved in the research and/or monitoring. In other cases, government personnel from another agency may take the lead in developing and following standard operating procedures, reducing the role of refuge staff. Coordination, however, will remain paramount to assure that any operation minimizes the impact to trust resources and their habitats to the extent possible.

In general, those proposals that involve multiple refuge field stations are coordinated by the DWG and approval is issued as a letter of authorization. Proposals which are specific to lands administered by the complex are reviewed and either authorized with a letter (if studies are simple, shorter than 1 year, and

only require access) or an SUP (if studies are more complex, will take longer than 1 year, and have potential to disturb, stress, or remove vegetation or individuals of a wildlife population). Those operations essential to maintaining human health and safety will be coordinated through an approved disease contingency plan. These threats are an exception to the normal process of authorizing and approving research on lands in the complex.

Absent those situations which involve emerging threats to human health and safety and which will be addressed in a separate disease contingency plan, priority would be given to research proposals that support the complex purposes, goals, and objectives. This would include, for example, studies that contribute to the enhancement, protection, use, preservation and management of native complex wildlife populations and their habitats, and would include cultural resources. Research applicants would submit a proposal that would outline: 1) objectives of the study; 2) justification for the study; 3) detailed methodology and schedule; 4) potential impacts on complex wildlife and/or habitat, including disturbance (short- and long-term), injury, or mortality; 5) personnel required; 6) costs to the complex, if any; and 7) end products (i.e. reports, publications). Research proposals would be reviewed by complex staff, the regional office branch of refuge biology and others, as appropriate. Evaluation criteria will include, but not be limited to, the following:

- Research that will contribute to priority management activities will have higher priority than other requests.
- Research that will conflict with higher priority research, monitoring, or management programs may not be granted.
- Research projects that can be done off-site, are less likely to be approved.
- Research which causes undue disturbance or is intrusive, will likely not be granted. Level and type of disturbance will be carefully weighed when evaluating a request.
- Research evaluation will determine if any effort has been made to minimize disturbance through study design, including considering adjusting location, timing, scope, number of permittees, study methods, number of study sites, etc.
- The complex staff may deny proposal when it is impossible for the complex to monitor researcher activity.
- The length of the project will be considered and agreed upon before approval. Projects will not be open-ended, and will be reviewed annually (at a minimum).

Availability of Resources:
Direct costs to administer research activities are primarily in the form of staff time and transportation. It is estimated that current staff is adequate to manage small and short-term research projects. Proposals will only be accepted if funding and personnel are available to adequately monitor all research activities.

Anticipated Impacts of Use:
Minimal impact to wildlife and habitats in the complex will be expected with research studies. Some level of disturbance is expected with all research activities since most researchers will be entering areas that are normally closed to the public and may be collecting samples or handling wildlife. SUP conditions will include special conditions to ensure that impact to wildlife and habitats are kept to a minimum.

Determination:
Research is compatible.

Stipulations Necessary to Ensure Compatibility:
- If the proposed research methods would impact or potentially impact complex resources (habitat or wildlife), it must be demonstrated that the research is necessary (i.e. critical to survival of a species, will enhance restoration activities of native species, will help in control of invasive

species or provide valuable information that will guide future complex activities), and the researcher must identify the issues in advance of the impact.

- Highly intrusive or manipulative research is generally not permitted in order to protect native wildlife populations and habitats in which they live.
- Research that does not involve birds will be conducted outside of the breeding season of avian species in all possible circumstances.
- Project leader can suspend/modify conditions/ terminate on-refuge research that is already permitted and in progress, should unacceptable impacts or issues arise or be noted.

Justification:
Research projects will contribute to the enhancement, protection, use, preservation, and management of native complex wildlife populations and their habitats. In view of the potential impacts research activities can have on the Service's ability to achieve complex purposes, sufficient restrictions would be placed on the researcher to ensure that disturbance is kept to a minimum. This program as described is determined to be compatible.

Mandatory 15-year Re-evaluation Date: 2021

Appendix B: Approved Programmatic Compatibility Determinations

1. COMPATIBILITY DETERMINATION for Authorized Curtilage Expansion or Structural Additions on Grassland Easements

Use: Authorized expansion or construction of additional buildings or structures on a grassland or FmHA easement. Examples of proposed uses include additions to farmstead buildings, livestock facilities, storage sheds, or the planting of farmstead windbreaks.

Station Names:

South Dakota Wetland Management Districts:

Lake Andes WMD, SD
Madison WMD, SD
Huron WMD, SD
Waubay WMD, SD
Sand Lake WMD, SD
Lacreek NWR, SD

North Dakota Wetland Management Districts:

Tewaukon WMD, ND
Kulm WMD, ND
Arrowwood WMD, ND
Valley City WMD, ND
Chase Lake WMD, ND
Audubon WMD, ND
Long Lake WMD, ND
J Clark Salyer WMD, ND
Devils Lake WMD, ND
Lostwood WMD, ND
Crosby WMD, ND

Montana Wetland Management Districts:

Northeast Montana WMD, MT
Bowdoin WMD, MT
Benton Lake WMD, MT
Northwest Montana WMD, MT
Charles M. Russell WMD, MT

Establishing and Acquisition Authorities:

Waterfowl Production Areas, Wetland Easements, Grassland Easements - The Migratory Bird Hunting and Conservation Stamp Act, March 16, 1934, (16 USC Sec. 718-718h, 48 Stat. 452) as amended August 1, 1958, (PL 85-585; 72 Stat. 486) for acquisition of AWaterfowl Production Areas@; the Wetlands Loan Act, October 4, 1961, as amended (16 USC 715k-3 - 715k-5, Stat. 813), funds appropriated under the Wetlands Loan Act are merged with duck stamp receipts in the fund

and appropriated to the Secretary for the acquisition of migratory bird refuges under the provisions of the Migratory Bird Conservation Act, February 18, 1929, (16 USC Sec. 715, 715d - 715r, as amended.

FmHA deed restricted properties - Consolidated Farm and Rural Development Act - (7 USC Para. 2002).

Tall Grass Prairie Tracts - Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460*l*-4 through 460*l*-11)

Refuge Purposes:

A...as Waterfowl Production Areas@ subject to A...all of the provisions of such Act [Migratory Bird Conservation Act] ...except the inviolate sanctuary provisions...@ 16 USC 718(c) (Migratory Bird Hunting and Conservation Stamp)

A...for any other management purpose, for migratory birds.@ 16 USC 715d (Migratory Bird Conservation Act)

A...for conservation purposes...@ 7 USC 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended) [16 USC 668(dd)-668(ee)].

Description of Use:

A landowner may have need to increase the size of his/her home and increase the size or number of buildings and facilities on the farm or ranch operation in order to more efficiently continue the agricultural operation of the property, or to plant and develop a windbreak planting of trees to protect the farm house or livestock facilities. Such an expansion may be requested on upland areas adjacent to the existing farmstead, the base of operations for the farm/ranch, or on a former building site where buildings are no longer present, on lands that are included within a grassland or FmHA conservation easement. In order to be permitted, such a request must be shown to be consistent with existing agricultural uses or practices on the property, have no other reasonable location or alternative, essential to the farm/ranch operation, not be able to be accommodated by a temporary (less than one year) permit, and be judged not to materially interfere with or detract from the easement or the purpose and mission of the Refuge System.

Availability of Resources:

Financial and staff resources are determined to be sufficient at each field station to administer these requests. Staff time will be needed to evaluate the proposed use, to prepare the site-specific permits, and to insure compliance with the permit authorization and stipulations necessary to insure compatibility.

Anticipated Impacts of the Use:

Authorized use of easement protected grasslands for expanded farmstead, farm or ranch facilities, or a farmstead windbreak, will result in a loss or destruction of the grassland where the facilities are built. The remainder of the easement tract will not be affected. The disturbance caused by the expanded farmstead, additional buildings or facilities, new or expanded windbreak, on an existing building site or a former building site is not expected to be significantly greater than that caused by the previous structures, and will not contribute to the fragmentation of existing habitats.

The impacts associated with this authorized use will be minimal due to the relatively small size or acreage of the proposed facilities. If multiple requests are received from the same landowner or for the same easement by different or subsequent landowners, they will each be evaluated on its own merits. Each grassland easement may be authorized up to a threshold level of 8 acres of total impact, whether it occurs at one time or through different approved requests. Therefore, only up to 8 acres of potential grassland impact may be authorized for each grassland easement for authorized expansion or construction of additional buildings or structures, or a proposed tree planting for farmstead windbreak purposes.

In addition, there will be no secondary impacts allowed within this compatibility determination. Fragmentation of grasslands habitats is minimized by allowing curtilage expansion only on existing or former building sites, or for farm/ranch operations. If the potentially affected grassland provides habitat for wildlife species with management concerns, such as a grouse lek or burrowing owl nesting site, or some unique feature, the use may not be allowed, or it may be permitted only with stipulations that would eliminate the secondary or indirect impact. The region 6 states of South Dakota, North Dakota, and Montana have over 500,000 acres of grasslands protected by Service easements. It is anticipated that between five and ten requests annually may be received to allow curtilage expansion. Under this scenario, a maximum of between 40 and 80 acres annually could be affected. This is an immaterial impact to the acreage included within the grassland easement program.

If multiple requests are received from the same landowner, or on the same easement, each will be evaluated on its own merits. Each quarter-section (160 acres) of grassland easement may be authorized up to one threshold level (8.0 acres) of total impact, whether it occurs at one time or in different requests. Therefore, only 8.0 acres of encumbered grassland per 160 acres of easement may be authorized for curtilage expansion or other allowable uses.

Public Review and Comment:

The period of public review and comment began April 10, 2005 and ended April 17, 2005.

Posted notices were made in public places for each of the field stations listed on this compatibility determination. This method was selected because the proposed activity is considered minor, incidental, infrequent, with only minimal impacts. No comments were received as a result of the posted notices.

Determination:

Compatibility Threshold: In order to be compatible, this use must not exceed the upper threshold limit of 8 acres on grassland. To achieve compatibility, the proposed use must not interfere with nor detract from the mission or the purposed for which the easement areas were established.

_____ Use is Not Compatible

__XXX__ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Issuance of a permit does not preclude the requirements for obtaining necessary permits and/or approvals from other county, state, or federal agencies and from local landowners.

2. The permit is issued subject to the revocation and appeals procedure contained in Title 50, Part 25 of the Code of Federal Regulations.

3. Storage of building materials or disposal of fill material from the construction project will not be allowed on easement protected grassland areas.

4. Additional stipulations may be added or included to address specific concerns with individual projects or requests or to address any secondary impacts that may occur as a result of the proposed use.

Justification:

The expansion of curtilage or the construction of additional structures for agricultural or farmstead use is expected to be permitted only rarely, perhaps five to ten times per year for ALL the stations listed within this CD.

Data from the Habitat and Population Evaluation Team (HAPET) in the Bismarck Service office can be used to predict the waterfowl response to the permitted upland changes. Evaluating grassland loss from a waterfowl population perspective is not precise, because we are estimating the loss of productivity of a hen that may or may not nest on a grassland site because of a disturbance or a slightly smaller size. HAPET used the Mallard Model to evaluate the change in the productivity of the affected grassland habitat. The land cover composition of a grassland easement (160 acres) and 1990 acres of cropland within a 4-square mile landscape (2,560 acres), was incrementally reduced by the amount of grassland necessary to cause a production decline of two ducks (one pair). This size grassland easement was chosen because it represents the smallest individual tract to be considered for a stand-alone easement purchase, and the impact of grassland loss is proportionally greater on a smaller tract. The loss of two ducks produced equates to a replacement pair of ducks for the following breeding season. The average decrease in native grassland required to achieve a one pair reduction was 10 acres.

In a second modeling analysis, Breeding Bird Survey data were used to estimate the average breeding bird population on 160 acres of native grassland. A modeled loss of 5 acres of 160 acres of grassland showed no discernable change (positive or negative) in the breeding bird population of the 160 acre easement tract.

The working group proposes that the threshold level of grassland impact is 8 acres, in order to build in a margin of safety. The 8-acre figure (80% of the actual determination made by HAPET for nesting ducks) corresponds with the 80% value developed for the wetland threshold. In

conclusion, a proposed use that passes all the filters in the flowchart, and results in a grassland impact of 8 acres or less, may be determined to be less than a "material impact," which would interfere with or detract from the mission or the purpose for which the grassland easement was purchased.

Mandatory 10-Year Reevaluation Date: 10 years from the date of APPROVAL signature

Enter Re-evaluation date: _____.

Signatures:

Submitted:

_____ _____
Michael Bryant, Project Leader Date
Lake Andes WMD

_____ _____
Tom Tornow, Project Leader Date
Madison WMD

_____ _____
Harris Hoistad, Project Leader Date
Huron WMD

_____ _____
Larry Martin, Project Leader Date
Waubay WMD

_____ _____
Gene Williams, Project Leader Date
Sand Lake WMD

_____ _____
Tom Koerner, Project Leader Date
Lacreek NWR

_____ _____
Jack Lalor, Acting Project Leader Date
Tewaukon WMD

_____ _____
Dave Azure, Acting Project Leader Date
Kulm WMD

_____ _____
Kim D. Hanson, Project Leader Date
Arrowwood WMD
Chase Lake WMD

Valley City WMD

_____ _____

Gary Williams, Acting Project Leader
Audubon WMD — Date

_____ _____

Paul Van Ningen, Project Leader
Long Lake WMD — Date

_____ _____

Tedd Gutzke, Project Leader
J Clark Salyer WMD — Date

_____ _____

Roger Hollevoet, Project Leader
Devils Lake WMD — Date

_____ _____

Fred G. Giese, Project Leader
Lostwood WMD
Crosby WMD — Date

_____ _____

Michael Rabenberg, Acting Project Leader
Northeast Montana WMD — Date

_____ _____

Carmen Luna, Project Leader
Bowdoin WMD — Date

_____ _____

David Gillund, Project Leader
Benton Lake WMD — Date

_____ _____

Steve Kallan, Project Leader
NW Montana WMD — Date

_____ _____

Bill Berg, Acting Project Leader
CM Russell WMD — Date

Review: _____ _____

Lloyd Jones
Regional Compatibility Coordinator — Date

_____	_____
Rod Krey, Refuge Supervisor, ND, SD	Date

Approval:

_____	_____
Richard A. Coleman, Region 6 Chief of Refuges	Date

2. COMPATIBILITY DETERMINATION for Authorized Health and Safety Requests Associated with Service Wetland Easements Resulting in only Minor Impacts to the Easement Interest

Use: Requests to resolve a health and safety issue which cannot be resolved by temporary authorization, and which results in only a minor impact to the Service=s wetland easement interest. The use, if authorized, will result in non-material impacts to protected wetlands involving partial drainage and/or filling, both of which are acquired interests in the easement wetland.

Station Names:

South Dakota Wetland Management Districts:

Lake Andes WMD, SD
Madison WMD, SD
Huron WMD, SD
Waubay WMD, SD
Sand Lake WMD, SD
LaCreek NWR, SD

North Dakota Wetland Management Districts:

Tewaukon WMD, ND
Kulm WMD, ND
Arrowwood WMD, ND
Valley City WMD, ND
Chase Lake WMD, ND
Audubon WMD, ND
Long Lake WMD, ND
J Clark Salyer WMD, ND
Devils Lake WMD, ND
Lostwood WMD, ND
Crosby WMD, ND

Montana Wetland Management Districts:

Northeast Montana WMD, MT
Bowdoin WMD, MT
Benton Lake WMD, MT
Northwest Montana WMD, MT
Charles M. Russell WMD, MT

Establishing and Acquisition Authorities:

Waterfowl Production Areas, Wetland Easements, Grassland Easements - The Migratory Bird Hunting and Conservation Stamp Act, March 16, 1934, (16 USC Sec. 718-718h, 48 Stat. 452) as amended August 1, 1958, (PL 85-585; 72 Stat. 486) for acquisition of AWaterfowl Production Areas@; the Wetlands Loan Act, October 4, 1961, as amended (16 USC 715k-3 - 715k-5, Stat. 813), funds appropriated under the Wetlands Loan Act are merged with duck stamp receipts in the fund and appropriated to the Secretary for the acquisition of migratory bird refuges under the provisions of the Migratory Bird Conservation Act, February 18, 1929, (16 USC Sec. 715, 715d - 715r, as amended.

FmHA deed restricted properties - Consolidated Farm and Rural Development Act - (7 USC Para. 2002).

Tall Grass Prairie Tracts - Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460*l*-4 through 460*l*-11)

Refuge Purposes:

A...as Waterfowl Production Areas@ subject to A...all of the provisions of such Act [Migratory Bird Conservation Act] ...except the inviolate sanctuary provisions...@ 16 USC 718(c) (Migratory Bird Hunting and Conservation Stamp)

A...for any other management purpose, for migratory birds.@ 16 USC 715d (Migratory Bird Conservation Act)

A...for conservation purposes...@ 7 USC 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended) [16 USC 668(dd)-668(ee)].

Description of Use:

Wetland management districts frequently receive requests for use or modification of wetlands protected by easement which may affect the Service interest acquired in private property. The uses authorized under this CD are related to actions necessary to avert or resolve a health and safety issue involving a Service-protected wetland. Requests may be received by districts primarily from private property owners whom are experiencing difficulties associated with easement-protected wetlands. The Service has wetland easements in every county within the Prairie Pothole Region in the states of ND, SD, and MT.

Examples of the kinds of requests anticipated under this category include: the possible need to establish a sill elevation on a wetland to lower it slightly to avoid flooding a domestic sanitary system, building, basement, or existing private road; or the need to place fill material in a protected wetland to widen a driveway or farm approach to more safely transport equipment and/or loaded grain trucks, or to protect a foundation or footing for existing building or grain bins.

Lowering a wetland or adding fill to a wetland to remove water from cropland or hayland is not included in this CD.

All requested uses under this category will be evaluated using the right side of the Easement Permit Flowchart (Health and Safety) to evaluate the requested activity. If the proposal passes through the flowchart as a legitimate health and safety issue, then it becomes a request that the Service will try to honor as a necessary resolution to a hardship, which may be caused by the easement wetland.

At times, the requested use may impact Service easement interests. Managers will always try to resolve the issue or situation with temporary measures, meaning that the impact to Service interests will be only a temporary disturbance. If temporary relief measures will not resolve the issue, then a more permanent impact to Service lands or interests will likely result.

Region 6 has defined a "threshold" level of impact which may occur as a result of permitting the requested use, but will not materially interfere with, nor detract from, the purposes for which the easement interest was acquired. These levels of impact are defined more fully in the Justification section of this CD, and are based on years of scientific evaluation of prairie pothole-type habitat and how habitat impacts affect migratory bird populations. These threshold levels of potential impact for protected wetlands have been established at 0.4 acres of wetland, not to exceed 25% of the wetland basin. These levels have been established based on biological models developed by the Habitat and Population Evaluation Team (HAPET) in Bismarck, ND.

Threshold levels are NOT used in conjunction with highway improvement projects or any other activity evaluated by the left side of the flowchart (Public Service, Government or Corporate), so impacts which may result from this category of request will not be evaluated under this CD.

In order for this compatibility determination to be used, the use must: (1) be an action necessary to avert a threat to human health and safety or a major threat to public or private property not related to a public service or government-type request, and (2) result in an impact which is at or below the established threshold levels for protected wetlands habitats (see discussion in AAnticipated Impacts@ and AJustification@ sections below).

Availability of Resources:

Financial and staff resources are sufficient at each field station to administer these requests. Staff time will be needed to evaluate the proposed use, to prepare the site-specific permits, and to insure compliance with the permit authorization and stipulations, as well as checking for satisfactory restoration of any disturbed sites as necessary.

No specialized equipment will be necessary, as the work requirement associated with these projects is monitoring and compliance checking only. Actual work, including restoration needs if applicable, will be completed by the applicant.

Anticipated Impacts of the Use:

Most of the impacts will result from filling or partially draining parts of protected wetlands, the right to "fill" wetland areas protected by the easement being one of the acquired rights. Partial drainage, another acquired right, may also be authorized to resolve certain health and safety issues, it they cannot be resolved by temporary means.

If the only way to resolve the Health and Safety issue is to permit a portion of the wetland to be either filled or by lowering the wetland elevation by establishing an overflow sill, then there will be a long term impact to the wetland. However, the impact would be determined to be below a "material" impact or interference with the purposes of the unit or the mission of the Refuge System as described in the justification. These impacts are considered minor with respect to the entire scope of the small wetlands program within the Prairie Pothole Region of region 6.

Within this compatibility determination, there are no secondary impacts, or at least none that cannot be resolved with stipulations. No complete wetlands are drained or filled (the 25 percent condition), so although potentially reduced in size by 25 percent, or by up to 0.4 acres, the wetland still exists as the same type wetland that originally existed. If the potentially affected wetland contains a colonial bird nesting site or some unique feature, the use may not be allowed, or it may be allowed with stipulations that would eliminate the secondary or indirect impact.

The region 6 states of North Dakota, South Dakota and Montana have over 15,000 wetland easement contracts comprising over 1.2 million acres of wetlands. It is anticipated that between five and ten requests annually may be received to allow partial drainage or filling of protected wetlands. Cumulative impacts under this scenario may include up to 4.0 acres of impact annually out of 1.2 million acres of protected wetlands.

If multiple requests are received from the same landowner, each request will be evaluated on its own merit. Each easement contract may be authorized up to one threshold level of impact in total, whether it occurs all at one time, or in different authorizations. Therefore, only up to 0.4 acre of potential wetland impact may be authorized for each easement contract for resolution of legitimate health and safety issues, or for other authorized uses.

Public Review and Comment:

The period of public review and comment began _____ and ended _____.

Posted notices were made in public places for each of the field stations listed on this compatibility determination.

Determination:

Compatibility Threshold: Material Interference of Detraction from the Purposes and/or Mission of the Refuge System.

_____ Use is Not Compatible

__XXX__ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Issuance of a permit does not preclude the requirements for obtaining necessary permits and/or approvals from other county, state, or federal agencies and from local landowners.

2. The permit is issued subject to the revocation and appeals procedure contained in Title 50, Part 25 of the Code of Federal Regulations.

3. Regardless of the authorized threshold level, the permit will require the least amount of impact to the Service easement interest as is necessary to resolve the health and safety issue.
4. If the requested use passes the flowchart and is authorized, and results in minor impacts that are more than temporary, then the use will be subject to the terms and conditions of the easement permit.

5. If past authorizations for any reason have been granted for this easement, then the manager cannot authorize any use that will exceed the aggregate total authorization of 0.4 acres of wetland impact, including the past authorizations.

6. Site-specific stipulations may be added to the permit to address resolution of any potential secondary impacts.

Justification:

The administration of the Service's easement program in region 6 requires managers to make decisions regarding requested uses of private lands encumbered by Service easement interests. Managers will use the Easement Permit Request Flowchart to determine if the requested use should be authorized. If the requested use is authorized, then this compatibility determination will be used for the requests which have passed through the evaluation process and that fall within the established levels of impact authorized for easement wetlands to approve means to resolve legitimate health and safety issues. It is anticipated that no more than 5-10 authorizations will be granted each year for the entire PPR portion of region 6 (ND-SD-MT) which would require the use of this CD. Once again, the CD will only be used if temporary means cannot be used to resolve the issue.

Data provided by the Habitat and Population Evaluation Team (HAPET) have been used to predict the effect to waterfowl resources resulting from impacts to wetlands. When these habitat impacts occur on lands protected by Service easements, then a determination must be made as to whether these impacts represent a material interference or detraction from the purposes for which the easement area was established or from the mission of the Refuge System.

With the HAPET information about how waterfowl populations respond to habitat changes within the Prairie Pothole Region, managers may now use applied science and compelling data to quantify impacts resulting from wetland-altering activities, whereas before, they were using only a judgment. The level of wetland impact that corresponds with a "non-material" impact (as portrayed under compatibility standards) is defined as one pair of ducks, the lowest whole unit and functional common denominator.

The impacts of wetland loss on breeding duck pairs (i.e., mallard, northern pintail, gadwall, blue-winged teal, and northern shoveler comprising approximately 90% of the breeding ducks in North Dakota and South Dakota) were evaluated using models developed with data collected by the Service during the annual Four Square Mile Breeding Waterfowl Population (FSM) Survey. HAPET applied the models to all wetlands mapped by the National Wetland Inventory to predicted the average number of breeding duck pairs attracted to each wetland for 13 years (1987-99) of the FSM Survey. Summary of the model results indicate that temporary and seasonal wetlands, on average, attract about 1 duck pair per acre; while semipermanent wetlands attract about 1 pair for every 1.5 wetland acres. While the average breeding pair densities are as identified above, the highest density occurring on a single wetland district for a single class of wetlands was 1.98 pairs/acre or one pair for 0.5 acres (Sand LakeBtemporary wetlands). These estimates can be used as a foundation for identifying non-material levels of impact to wetlands. Wetland impacts which result in affecting less than one pair of breeding ducks is below a "material" impact relative to compatibility.

Even though the overall average for all classes of wetlands for all districts is approximately one pair of ducks for each wetland acre, and the highest density encountered is 1 pair per 0.5 acres, this proposal is to insure that any authorized use resulting in a wetland impact will not result in

the loss of one whole pair of ducks on the landscape, regardless of where it is within the region 6 PPR, and which class of wetland is affected. Therefore, the proposal to use 0.4 acre as the upper limit of impact to achieve compatibility inherently builds in an additional 20% margin of safety.

In addition, it is further determined that impacts must be less than 25% of the affected basin to be within these threshold criteria. This recommendation, combined with the wetland and duck pair relationship information provided by HAPET and outlined above, suggests that a wetland impact of 0.4 acre or less, and not including more than 25% of the wetland basin, will not materially interfere with nor detract from the purposes for which the wetland easement was acquired, nor will it detract from the mission of the Refuge System.

The not-to-exceed threshold levels of impact to easement-protected wetlands that are necessary to ensure compatibility are 0.4 acres or less, and not over 25% of the wetland basin. These levels were selected because (a) they result in built-in margins of safety (80%) from the actual figures determined by HAPET; (b) the represented levels are based on the best available science, the pair-wetland relationship model developed by HAPET and the Mallard Model, as well as many years of collected data from nearly the entire Prairie Pothole Region within Region 6; (c) the threshold levels of impact represent a biologically meaningful measure (i.e., one pair of ducks); (d) the levels establish a consistent, science-based method for managers to use when evaluating compatibility of proposed uses for less than fee-title land interests.

Mandatory 10-Year Reevaluation Date: 10 years from the date of APPROVAL signature

Enter Reevaluation Date:_____

Signatures:

Submitted:

_____	_____
Michael Bryant, Project Leader Lake Andes WMD	Date
_____	_____
Tom Tornow, Project Leader Madison WMD	Date
_____	_____
Harris Hoistad, Project Leader Huron WMD	Date
_____	_____
Larry Martin, Project Leader Waubay WMD	Date
_____	_____
Gene Williams, Project Leader Sand Lake WMD	Date
_____	_____
Tom Koerner, Project Leader	Date

Lacreek NWR

_____ _____
Jack Lalor, Acting Project Leader Date
Tewaukon WMD

_____ _____
Dave Azure, Acting Project Leader Date
Kulm WMD

_____ _____
Kim D. Hanson, Project Leader Date
Arrowwood WMD
Chase Lake WMD
Valley City WMD

_____ _____
Gary Williams, Acting Project Leader Date
Audubon WMD

_____ _____
Paul Van Ningen, Project Leader Date
Long Lake WMD

_____ _____
Tedd Gutzke, Project Leader Date
J Clark Salyer WMD

_____ _____
Roger Hollevoet, Project Leader Date
Devils Lake WMD

_____ _____
Fred G. Giese, Project Leader Date
Lostwood WMD
Crosby WMD

_____ _____
Michael Rabenberg, Acting Project Date
Leader
NE Montana WMD

_____ _____
Carmen Luna, Project Leader Date
Bowdoin WMD

_____ _____
David Gilland, Project Leader Date
Benton Lake WMD

	_____	_____
	Steve Kallan, Project Leader NW Montana WMD	Date
	_____	_____
	Bill Berg, Acting Project Leader C. M. Russell WMD	Date
Review:	_____	_____
	Lloyd Jones Regional Compatibility Coordinator	Date
	_____	_____
	Rod Krey Refuge Supervisor, ND-SD	Date
Approval:	_____	_____
	Ronald D. Shupe, Region 6 Acting Chief of Refuges	Date

3. COMPATIBILITY DETERMINATION for Authorized Early Haying of Grassland Easements for Management Purposes

Use: Authorized Early Haying of Grassland Easements and FmHA Easements.

Station Names:

South Dakota Wetland Management Districts:

Lake Andes WMD, SD
Madison WMD, SD
Huron WMD, SD
Waubay WMD, SD
Sand Lake WMD, SD
Lacreek NWR, SD

North Dakota Wetland Management Districts:

Tewaukon WMD, ND
Kulm WMD, ND
Arrowwood WMD, ND
Valley City WMD, ND
Chase Lake WMD, ND
Audubon WMD, ND
Long Lake WMD, ND
J Clark Salyer WMD, ND
Devils Lake WMD, ND
Lostwood WMD, ND
Crosby WMD, ND

Montana Wetland Management Districts:

Northeast Montana WMD, MT
Bowdoin WMD, MT
Benton Lake WMD, MT
Northwest Montana WMD, MT
Charles M. Russell WMD, MT

Establishing and Acquisition Authorities:

Waterfowl Production Areas, Wetland Easements, Grassland Easements - The Migratory Bird Hunting and Conservation Stamp Act, March 16, 1934, (16 USC Sec. 718-718h, 48 Stat. 452) as amended August 1, 1958, (PL 85-585; 72 Stat. 486) for acquisition of (Waterfowl Production Areas(; the Wetlands Loan Act, October 4, 1961, as amended (16 USC 715k-3 - 715k-5, Stat. 813), funds appropriated under the Wetlands Loan Act are merged with duck stamp receipts in the fund and appropriated to the Secretary for the acquisition of migratory bird refuges under the provisions of the Migratory Bird Conservation Act, February 18, 1929, (16 USC Sec. 715, 715d - 715r, as amended.

FmHA deed restricted properties - Consolidated Farm and Rural Development Act - (7 USC Para. 2002).

Tall Grass Prairie Tracts - Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460l-4 through 460l-11)

Refuge Purposes:

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

"...for any other management purpose, for migratory birds" (16 USC 715d (Migratory Bird Conservation Act)

"...for conservation purposes..." (7 USC 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended) [16 USC 668(dd)-668(ee)].

Description of Use:

Haying is the cutting and removal, by baling or stacking, and transport to an off-site location, of grass and/or forb species. Haying of grassland easement-protected properties is not restricted after July 15 each year. Landowners may hay their lands every year after this date without compromising the terms of the easement. However, the use described in this compatibility determination is to permit early haying (prior to July 15) of the uplands to accomplish some management purpose on the land. The control of noxious weeds is primarily the target of early haying agreements. The control of noxious weeds is a common purpose of early haying agreements. State law requires landowners to control noxious weeds on their property. Haying can be an effective tool in controlling the seed dispersal of some species, but it must be done before the flowers mature and the seeds become viable. In many years, the thistle plants have matured and dispersed their seeds prior to July 15, and haying after seed dispersal would not be effective as a management tool. Other noxious weed species may also be controlled by periodic early haying of grassland areas.

Periodic early haying may also be authorized to help improve the vigor and health of the grass stand. It is expected that the authorized use of early haying for this purpose will be used very infrequently.

Haying prior to July 15 to increase plant density is also a management tool occasionally used. This is primarily done the first few years after a new seeding to encourage tillering and to accelerate establishment. Haying (rather than just mowing) the plants helps to prevent shading caused by the mowed vegetation left in the field. Haying done just prior to seed head development will stimulate most grass plants to propagate vegetatively by rhizomes rather than by seed production. This generally encourages grass plants to fill in bare soil areas between plants, compete more favorably with invasive species, and shorten the overall establishment period on new grass seedings.

The extent of the area to be hayed will be limited to what is necessary to accomplish the specified management purpose

Availability of Resources:

Financial and staff resources are determined to be sufficient at each field station to administer these requests. Staff time will be needed to evaluate the proposed use, to prepare the site-specific permits, and to insure compliance with the permit authorization and stipulations necessary to insure compatibility.

Anticipated Impacts of the Use:

Authorized early haying of grassland easements may displace some wildlife species during the period the haying operation is being performed. It is possible, also, that some nesting migratory birds may be disturbed, and abandon their nests as a result of the haying operation. The decision to authorize early haying must weigh the potential benefits of legally required weed control, plant density management, and other management gains, against these short-term losses associated with the early haying.

Cutting and removal of standing grasses prior to July 15 will also result in short-term loss of habitat for those species requiring tall grasses for feeding and perching.

The impacts associated with this authorized use will be minimal since the area will likely be hayed after July 15 anyway, which is not prohibited by the easement agreement. Therefore, the impacts of the use are only between the time of authorized early haying, and July 16 in any given year.

There will be no permanent impacts to Service land interests; there will be no secondary or indirect impacts, and there will be no cumulative impacts. The result of the authorized use will contribute to the achievement of Refuge System mission and unit purposes.

Public Review and Comment:

The period of public review and comment began April 10, 2005 and ended April 17, 2005.

Posted notices were made in public places for each of the field stations listed on this compatibility determination. This method was selected because the proposed activity is considered minor, incidental, infrequent, with only short-term disturbance, and/or displacement of wildlife. No comments were received as a result of the posted notices.

Determination:

Compatibility Threshold: As this activity is an economic use, it must meet the compatibility threshold of contributing to the mission and purposes of the Refuge System and the refuge area.

_____ Use is Not Compatible

__XXX__ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Issuance of a permit does not preclude the requirements for obtaining necessary permits and/or approvals from other county, state, or federal agencies and from local landowners.

2. The permit is issued subject to the revocation and appeals procedure contained in Title 50, Part 25 of the Code of Federal Regulations.

3. Permits for early haying will not be issued in consecutive years for the same land.

4. If a permit is issued for weed control on tame grassland, a condition of the permit must include a required herbicide treatment of the regrown noxious weeds at the permittee(s expense when the noxious weeds are deemed to be most susceptible.

5. Bales or stacks must be removed from the area within two weeks after baling.

6. Early haying to encourage tillering on new grass seedings should leave at least 5" of stubble to ensure sufficient leaf area needed for the responding growth.

7. Additional stipulations may be added to address specific concerns with individual projects. Any secondary impacts as a result of the proposal will also be resolved through stipulation.

Justification:

The control of noxious weeds is required of every landowner by state law, even on grassland easement-encumbered property. If infestations are severe, then a measure of weed control can be achieved by haying the lands with the infestation to limit the seed dispersal. Seed dispersal in Canada thistle often happens prior to July 15, so knocking the plants down prior to seed maturation and dispersal can help control the invading plants.

Additionally, more effective weed control can be achieved by removing the overstory of grass, allowing the tap-rooted noxious weeds to regrow, then applying a herbicide treatment. The grass will not regrow as quickly as the forb (weed) species, and the spraying application will be more effective, especially going into the fall season when the thistle plants are storing their root reserves for the winter dormant period.

Early haying to encourage tillering can shorten the establishment period of new grass seedings. Obtaining the best stand of grass in the shortest period possible will increase wildlife use and minimize the need for weed control in subsequent years.

As such, it is concluded that the accrued benefits of more effective weed control and shorter establishment periods more than compensate for the potential short-term loss associated with

authorized weed control and plant density management accomplished by haying the grassland area prior to July 15.

Mandatory 10-Year Reevaluation Date:

10 years from the date of APPROVAL signature Enter date: _____

Signatures:

Submitted:

_____ _____
Michael Bryant, Project Leader Date
Lake Andes WMD

_____ _____
Tom Tornow, Project Leader Date
Madison WMD

_____ _____
Harris Hoistad, Project Leader Date
Huron WMD

_____ _____
Larry Martin, Project Leader Date
Waubay WMD

_____ _____
Gene Williams, Project Leader Date
Sand Lake WMD

_____ _____
Tom Koerner, Project Leader Date
Lacreek NWR

_____ _____
Jack Lalor, Acting Project Leader Date
Tewaukon WMD

_____ _____
Dave Azure, Acting Project Leader Date
Kulm WMD

_____ _____
Kim D. Hanson, Project Leader Date
Arrowwood WMD
Chase Lake WMD

Valley City WMD

_____ _____
Gary Williams, Acting Project Leader Date
Audubon WMD

_____ _____
Paul Van Ningen, Project Leader Date
Long Lake WMD

_____ _____
Tedd Gutzke, Project Leader Date
J Clark Salyer WMD

_____ _____
Roger Hollevoet, Project Leader Date
Devils Lake WMD

_____ _____
Fred G. Giese, Project Leader Date
Lostwood WMD
Crosby WMD

_____ _____
Michael Rabenberg, Acting Project Leader Date
Northeast Montana WMD

_____ _____
Carmen Luna, Project Leader Date
Bowdoin WMD

_____ _____
David Gilland, Project Leader Date
Benton Lake WMD

_____ _____
Steve Kallan, Project Leader Date
NW Montana WMD

_____ _____
Bill Berg, Acting Project Leader, Date
Charles M. Russell WMD

Review: _____ _____
Lloyd Jones Date
Regional Compatibility Coordinator

Approval: _____ _____

Ronald D. Shupe, Region 6 Date
Acting Chief of Refuges

4. COMPATIBILITY DETERMINATION for Authorized Health and Safety Needs Associated with Service Wetland Easements resulting in NO Permanent Impacts

Use: Approved requests to temporarily pump or drain an easement protected wetland which is causing a health and safety problem or a major threat to personal or public property, such as flooding a road, driveway, resulting in seepage in a basement, surface waters affecting a domestic well or a sanitation system, or surface waters affecting a feed storage area or feedlot. The landowner-s right to drain or otherwise alter the natural characteristics of the wetland is one of the rights the Service acquired with the easement. The use authorized under this CD is to permit temporary dewatering of protected wetlands which are posing a health and/or safety threat.

Station Names:

South Dakota Wetland Management Districts:

Lake Andes WMD, SD
Madison WMD, SD
Huron WMD, SD
Waubay WMD, SD
Sand Lake WMD, SD
Lacreek NWR, SD

North Dakota Wetland Management Districts:

Tewaukon WMD, ND
Kulm WMD, ND
Arrowwood WMD, ND
Valley City WMD, ND
Chase Lake WMD, ND
Audubon WMD, ND
Long Lake WMD, ND
J Clark Salyer WMD, ND
Devils Lake WMD, ND
Lostwood WMD, ND
Crosby WMD, ND

Montana Wetland Management Districts:

Northeast Montana WMD, MT
Bowdoin WMD, MT
Benton Lake WMD, MT
Northwest Montana WMD, MT
Charles M. Russell WMD, MT

Establishing and Acquisition Authorities:

Waterfowl Production Areas Wetland Easements, Grassland Easements - The Migratory Bird Hunting and Conservation Stamp Act, March 16, 1934, (16 USC Sec. 718-718h, 48 Stat. 452) as amended August 1, 1958, (PL 85-585; 72 Stat. 486) for acquisition of AWaterfowl Production Areas@; the Wetlands Loan Act, October 4, 1961, as amended (16 USC 715k-3 - 715k-5, Stat. 813), funds appropriated under the Wetlands Loan Act are merged with duck stamp receipts in the fund and appropriated to the Secretary for the acquisition of migratory bird refuges under the

provisions of the Migratory Bird Conservation Act, February 18, 1929, (16 USC Sec. 715, 715d - 715r, as amended.

FmHA deed restricted properties - Consolidated Farm and Rural Development Act - (7 USC Para. 2002).

Tall Grass Prairie Tracts - Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460*l*-4 through 460*l*-11)

Refuge Purposes:

A...as Waterfowl Production Areas@ subject to A...all of the provisions of such Act [Migratory Bird Conservation Act] ...except the inviolate sanctuary provisions...@ 16 USC 718(c) (Migratory Bird Hunting and Conservation Stamp)

A...for any other management purpose, for migratory birds.@ 16 USC 715d (Migratory Bird Conservation Act)

A...for conservation purposes...@ 7 USC 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended) [16 USC 668(dd)-668(ee)].

Description of Use:

During times of high water cycles or excessive runoff, prairie wetlands can temporarily swell to an oversized condition. The easement agreements provide for this natural fluctuation in wetland hydrology and relief is generally not authorized. However, when the over-full wetland basins result in situations, which involve health, safety, or major threats to public or landowner appurtenances which cannot be resolved without violating the easement and for which no reasonable alternative exists, then the Service is authorized to provide relief to nullify the health and safety threat. The use associated with this category of request results in either pumping or partially draining the problem-causing wetland, lowering its elevation to a point that the problem is resolved. Situations involving health and safety include major threats to buildings, roads, and infrastructure; basement flooding caused by high water in a nearby wetland, barnyard or feedlot flooding, driveway or other road flooding, or threat to domestic water supply or sewer system.

The use results in ONLY a temporary lowering of the wetland. If a drainage ditch was used to lower the wetland, it must be filled to the original contour of the land (at the applicant=s expense) after the wetland has been lowered, and the threat has subsided.

The use could occur in any of the wetland management districts listed within the CD, and would likely occur during or shortly after the spring runoff or after a large rainstorm event. These are the conditions, which sometimes result in the protected wetland basins becoming larger than the historic photo record would indicate.

Any requested use to lower the water levels of protected wetlands will result in ONLY temporary impacts, lasting a year or two.

Availability of Resources:

Financial and staff resources are determined to be sufficient at each field station to administer these requests. Staff time will be needed to evaluate the proposed use, to prepare the site-specific permits, and to insure compliance with the permit authorization and stipulations, as well as checking for satisfactory restoration of any disturbed sites after the wetland areas have returned to more historical elevations.

No specialized equipment will be necessary, as any work associated with these projects involves monitoring and compliance checking only. Actual work, including restoration needs, will be completed by the applicant as specified by the wetlands manager.

Anticipated Impacts of the Use:

Short-term Impacts:

Short-term impacts include the temporary loss of some wetlands habitat because of the authorized lowering of the wetland causing the health and safety problem. Since this is only a temporary authorization, limitations of the amount of lowering needed will not be imposed except to require the least amount necessary to resolve the issue. The length of time will be "until the situation is resolved," not to exceed 1 year. Permits can be extended if necessary.

After the situation has been resolved, the wetland-s hydrology will be restored, and if drainage was used to reduce the wetlands-s volume, then the drainage facilities will be restored to a "pre-work" condition.

Long-term Impacts:

There will be no long-term impacts associated with this authorization to resolve a health and safety issue.

Secondary/Cumulative Impacts:

There will be no secondary or cumulative impacts as a result of possible numerous authorizations because there are no permanent impacts. The authorization will be granted only to resolve the issue at hand.

Public Review and Comment:

The period of public review and comment began April 10, 2005 and ended April 17, 2005.

Posted notices were made in public places for each of the field stations listed on this compatibility determination. This method was selected because the proposed activity is considered minor, incidental, infrequent, with only short-term disturbance, and/or displacement of wildlife. No comments were received as a result of the posted notices.

Determination:

Compatibility Threshold: Material Interference or Detraction from the Purposes and/or Mission of the Refuge System.

_____ Use is Not Compatible

__XXX__ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Issuance of a permit does not preclude the requirements for obtaining necessary permits and/or approvals from other county, state, or federal agencies and from local landowners.

2. The permit is issued subject to the revocation and appeals procedure contained in Title 50, Part 25 of the Code of Federal Regulations.

3. When the health and safety threat has subsided, the wetland will be allowed to function under natural hydrological cycles. Any drainage facilities that were installed to lower the wetland will be restored, compacted, and rendered non-functional.

4. If the area is also protected with a Service grassland easement, then the backfilled ditch will also be reseeded to the specifications of the wetland manager.

5. Additional stipulations may be added to address specific concerns with individual projects. Any potential secondary impacts as a result of the proposal will also be resolved through stipulation.

Justification:

The proposed activity will result in only temporary disturbance to the wetland and possible grassland resources protected by the Service-s easement by this activity. The use will not detract from or materially interfere with the mission or purpose of the Refuge System. The uses covered by this CD are considered NOT to be an economic use under the guidelines found in 50CFR29.1.

Where possible, and without compromising any preservation program goal or objective, and without affecting (in the long term) any land interest held by the Service, it is critically important that field stations be able to accommodate these requested uses which are designed to avert a human health and/or safety issue or a major threat to personal or public property.

Mandatory 10-Year Reevaluation Date:

10 years from the date of APPROVAL signature. Enter Reevaluation Date:_____

Signatures:

Submitted: _____ _____

Michael Bryant, Project Leader Date
Lake Andes WMD

_____ _____

Tom Tornow, Project Leader Date

Madison WMD

_____ _____

Harris Hoistad, Project Leader Date
Huron WMD

_____ _____

Larry Martin, Project Leader Date
Waubay WMD

_____ _____

Gene Williams, Project Leader Date
Sand Lake WMD

_____ _____

Tom Koerner, Project Leader Date
Lacreek NWR

_____ _____

Jack Lalor, Acting Project Leader Date
Tewaukon WMD

_____ _____

Dave Azure, Acting Project Leader Date
Kulm WMD

_____ _____

Kim D. Hanson, Project Leader Date
Arrowwood WMD
Chase Lake WMD
Valley City WMD

_____ _____

Gary Williams, Acting Project Leader Date
Audubon WMD

_____ _____

Paul Van Ningen, Project Leader Date
Long Lake WMD

_____ _____

Tedd Gutzke, Project Leader Date
J Clark Salyer WMD

_____ _____

Roger Hollevoet, Project Leader Date
Devils Lake WMD

_____	_____
Fred G. Giese, Project Leader Lostwood WMD Crosby WMD	Date
_____	_____
Michael Rabenberg, Acting Project Leader Northeast Montana WMD	Date
_____	_____
Carmen Luna, Project Leader Bowdoin WMD	Date
_____	_____
David Gilland, Project Leader Benton Lake WMD	Date
_____	_____
Steve Kallan, Project Leader NW Montana WMD	Date
_____	_____
Bill Berg, Acting Project Leader Charles M. Russell WMD	Date

Review:

_____	_____
Lloyd Jones Regional Compatibility Coordinator	Date

Approval:

_____	_____
Ronald D. Shupe, Region 6 Acting Chief of Refuges	Date

5. COMPATIBILITY DETERMINATION for Public and Private Buried Utility Lines Occurring on Service Easement Properties or Fee-Owned WPAs

Use: Projects associated with buried utility lines and/or cables where impacts to Service lands and interests are only temporary and minor. Requests from utility companies, rural water systems, and minor impacts associated with some highway improvement projects, and certain requests from private landowners. The use covered by this compatibility determination is in conjunction with the Region 6 Policy Memorandum of April 5, 2002, entitled "Rights-of Way and Permits for Minor Disturbance Projects." See Exhibit XII-7 for a copy of the policy memorandum.Because oil and gas pipelines require a formal ROW to cross Service properties, this CD will not apply to the installation of oil and gas pipelines.

Station Names:

South Dakota Wetland Management Districts:

Lake Andes WMD, SD
Madison WMD, SD
Huron WMD, SD
Waubay WMD, SD
Sand Lake WMD, SD
Lacreek NWR, SD

North Dakota Wetland Management Districts:

Tewaukon WMD, ND
Kulm WMD, ND
Arrowwood WMD, ND
Valley City WMD, ND
Chase Lake WMD, ND
Audubon WMD, ND
Long Lake WMD, ND
J Clark Salyer WMD, ND
Devils Lake WMD, ND
Lostwood WMD, ND
Crosby WMD, ND

Montana Wetland Management Districts:

Northeast Montana WMD, MT
Bowdoin WMD, MT
Benton Lake WMD, MT
Northwest Montana WMD, MT
Charles M. Russell WMD, MT

Establishing and Acquisition Authorities:

Waterfowl Production Areas Wetland Easements, Grassland Easements - The Migratory Bird Hunting and Conservation Stamp Act, March 16, 1934, (16 USC Sec. 718-718h, 48 Stat. 452) as amended August 1, 1958, (PL 85-585; 72 Stat. 486) for acquisition of AWaterfowl Production Areas@; the Wetlands Loan Act, October 4, 1961, as amended (16 USC 715k-3 - 715k-5, Stat. 813), funds appropriated under the Wetlands Loan Act are merged with duck stamp receipts in the

fund and appropriated to the Secretary for the acquisition of migratory bird refuges under the provisions of the Migratory Bird Conservation Act, February 18, 1929, (16 USC Sec. 715, 715d - 715r, as amended.

FmHA deed restricted properties - Consolidated Farm and Rural Development Act - (7 USC Para. 2002).

Tall Grass Prairie Tracts - Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460*l*-4 through 460*l*-11)

Refuge Purposes:

A...as Waterfowl Production Areas@ subject to A...all of the provisions of such Act [Migratory Bird Conservation Act] ...except the inviolate sanctuary provisions...@ 16 USC 718(c) (Migratory Bird Hunting and Conservation Stamp)

A...for any other management purpose, for migratory birds.@ 16 USC 715d (Migratory Bird Conservation Act)

A...for conservation purposes...@ 7 USC 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended) [16 USC 668(dd)-668(ee)].

Description of Use:

Wetland management districts receive frequent requests from utility companies to cross fee and easement properties with buried pipelines, electric cables, communications lines, natural gas lines, and/or rural or potable water lines or systems. These requests are generally part of an overall area-wide project to provide better services to the people residing in the area. When these types of projects are proposed in the Prairie Pothole Region, it may not be possible to avoid all Service land interests (fee and easement), and therefore, some Service property interests may be temporarily impacted during the construction period. This use includes requests for projects on wetland, grassland, FmHA easements, or fee-owned waterfowl production areas. Construction methods may include cable-plowing, utilizing a vibrating cable-plow, or narrow trenching equipment. In each case, the surface disturbance is minimal, and the temporary cable or trenching scar will grow over with grass or marsh vegetation within a year or two.

A second area covered by this compatibility determination is requests received to temporarily alter upland sites in conjunction with highway maintenance projects to improve highway safety. These activities may be outside the existing highway right-of-way, but a formal ROW expansion is not needed because of the only temporary impacts to Service interests. An example of this type of request is for back-sloping a hill adjacent to the ROW to remove a snow catch area. Construction methods here include stripping away the vegetation and topsoil, removing enough of the hill to satisfy the sloping requirements, re-spreading the topsoil, and reseeding the vegetation to the manager-s specifications.

It is expected that the use will be conducted as a one time event in the summer season when frost no longer exists and conditions have dried sufficiently to minimize grass disturbance. There is little to no future maintenance.

Availability of Resources:

Financial and staff resources are determined to be sufficient at each field station to administer these requests. Staff time will be needed to evaluate the proposed use, to prepare the site-specific permits, and to ensure compliance with the permit authorization and stipulations, as well as checking for satisfactory restoration of any disturbed sites after the reseeded areas have had a chance to grow in.

No specialized equipment will be necessary, as the work requirement associated with these projects is monitoring and compliance checking only. Actual work, including restoration needs, will be completed by the applicant as specified by the wetlands manager.

Anticipated Impacts of the Use:

The uses authorized under this compatibility determination must result in impacts that are only very minor and temporary in nature. In other words, there will be NO long-term negative impacts to Service land or water interests.

Examples of work authorized under this compatibility determination include:

$ trenched and backfilled areas to accommodate buried pipelines and cables

$ buried utility lines or PVC water lines using a cable plow

$ excavated trenches using a backhoe equipped with a Atrenching@ bucket (approximately 8-12 inches wide).

$ use of crawler-type equipment to shave hills and back-sloping associated with highway safety projects which may extend beyond the existing ROW.

Anticipated impacts are as follows:

$ temporary disturbance to the grassland area during and for a period of time following the backfilled trench

$ some wildlife may be temporarily displaced during the actual construction

$ water quality may be temporarily and slightly reduced due to possible silt deposition if a rainstorm washes the exposed areas for a short period of time after backfilling the trenches or washing of the exposed back-sloped areas.

There will be no long-term impacts nor will there be any secondary or indirect impacts, and there will be no cumulative impacts to Service lands or interests.

Public Review and Comment:

The period of public review and comment began April 10, 2005 and ended April 17, 2005.

Posted notices were made in public places for each of the field stations listed on this compatibility determination. This method was selected because the proposed activity is considered minor, incidental, infrequent, with only short-term disturbance, and/or displacement of wildlife. No comments were received as a result of the posted notices.

Determination:

Compatibility Threshold: Material Interference of Detraction from the Purposes and/or Mission of the Refuge System.

_____ Use is Not Compatible

__XXX__ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Issuance of a permit does not preclude the requirements for obtaining necessary permits and/or approvals from other county, state, or federal agencies and from local landowners.

2. The permit is issued subject to the revocation and appeals procedure contained in Title 50, Part 25 of the Code of Federal Regulations.

3. The proposed activity will result in no permanent impacts to wetlands protected by Service easements or on waterfowl production areas. No wetlands or any part thereof will be filled with any material, leveled by any equipment, drained by any means including pumping or by diverting water, or burned.

4. Any work within protected wetland basins will be backfilled and compacted to the normal contour of the wetland bottom. No excess, non-compacted fill will be permitted.

5. Upland impacts to areas protected by Service grassland easements or on waterfowl production areas will be only temporary. Any disturbed areas will be leveled, seeded, and restored to pre-work condition as specified by the refuge manager.

6. Additional stipulations may be added to address specific concerns with individual projects. Any potential secondary impacts as a result of the proposal will also be resolved through stipulation.

7. The authorization under the permit issued in accordance with this determination is for the initial construction only; any future maintenance or repairs will require additional consultation with the wetland management district office, and will require a supplemental permit issued prior to the initiation of any remedial work.

Justification:

There will be minimal and temporary disturbance to the wetland and grassland resources protected by the Service=s fee or easement by this activity. The use will not detract from or materially interfere with the mission or purpose of the Refuge System. The uses covered by this CD are considered NOT to be an economic use under the guidelines found in 50CFR29.1.

Prior to issuing any permit, the manager will have worked with the applicant to avoid as many impacts as possible, and then to minimize any impacts to Service interests. The impacts are deemed to be minor and only temporary, and complete site restoration will occur, usually with the next growing season.

Where possible, and without compromising any preservation program goal or objective, and without affecting (in the long term) any land interest held by the Service, it is critically important that field stations be able to accommodate these requested uses which are designed to improve highway safety or the quality of life in rural America.

Mandatory 10-Year Reevaluation Date:

10 years from the date of APPROVAL signature.

Enter Reevaluation Date:_____

Signatures:

Submitted:

_____	_____
Michael Bryant, Project Leader Lake Andes WMD	Date
_____	_____
Tom Tornow, Project Leader Madison WMD	Date
_____	_____
Harris Hoistad, Project Leader Huron WMD	Date
_____	_____
Larry Martin, Project Leader Waubay WMD	Date
_____	_____
Gene Williams, Project Leader Sand Lake WMD	Date
_____	_____
Tom Koerner, Project Leader Lacreek NWR	Date
_____	_____

Jack Lalor, Acting Project Leader — Date
Tewaukon WMD

_____ _____
Dave Azure, Acting Project Leader — Date
Kulm WMD

_____ _____
Kim D. Hanson, Project Leader — Date
Arrowwood WMD
Chase Lake WMD
Valley City WMD

_____ _____
Gary Williams, Acting Project Leader — Date
Audubon WMD

_____ _____
Paul Van Ningen, Project Leader — Date
Long Lake WMD

_____ _____
Tedd Gutzke, Project Leader — Date
J Clark Salyer WMD

_____ _____
Roger Hollevoet, Project Leader — Date
Devils Lake WMD

_____ _____
Fred G. Giese, Project Leader — Date
Lostwood WMD
Crosby WMD

_____ _____
Michael Rabenberg, Acting Project Leader — Date
Northeast Montana WMD

_____ _____
Carmen Luna, Project Leader — Date
Bowdoin WMD

_____ _____
David Gilland, Project Leader — Date
Benton Lake WMD

_____ _____
Steve Kallan, Project Leader — Date

NW Montana WMD

_____	_____
Bill Berg, Acting Project Leader, Charles M. Russell WMD	Date

Review:

_____	_____
Lloyd Jones Regional Compatibility Coordinator	Date

Approval:

_____	_____
Ronald D. Shupe, Region 6 Acting Chief of Refuges	Date

6. COMPATIBILITY DETERMINATION

Use: waterlines on grassland easements to provide livestock watering

Station Names:

Arrowwood Wetland Management District
Audubon Wetland Management District
Chase Lake Wetland Management District
Crosby Wetland Management District
Devils Lake Wetland Management District
Huron Wetland Management District
J. Clark Salyer Wetland Management District
Kulm Wetland Management District
Lake Andes Wetland Management District
Long Lake Wetland Management District
Lostwood Wetland Management District
Madison Wetland Management District
Sand Lake Wetland Management District
Tewaukon Wetland Management District
Valley City Wetland Management District
Waubay Wetland Management District

County: all counties within the districts

Establishing and Acquisition Authorities:

Consolidated Farm and Rural Development Act, Migratory Bird Conservation Act, Migratory Bird Hunting and Conservation Stamp Tax, North American Wetlands Conservation Act, Emergency Wetlands Resources Act

Refuge Purposes:

> A...as Waterfowl Production Areas@ subject to@ ...all of 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)
>
> A...for any other management purpose, for migratory birds.@ 16 U.S.C. ' 715d (Migratory Bird Conservation Act)
>
> A...for conservation purposes ... A7 U.S.C. ' 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

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

Description of Use:

What is the use? Is the use a wildlife-dependent public use?

The activity requested involves burying waterlines to provide for livestock watering on areas encumbered by Service grassland easements in North and South Dakota. The buried waterline is a new use of the grassland easement because of the surface grass disturbance, which would be considered an economic use. There are approximately 2,500 individual grassland contract holders in the two states. It is estimated that no more than 10% or 250 will ever make a request for a buried waterline. In those cases where additional water supplies are provided there is a better distribution of grazing on the easement tract and overall health and sustainability of the grass is improved. The waterlines are installed by either a chisel plow or narrow trenching (not exceeding 2 feet) equipment to a depth of 6-8 feet. Minor and very temporary disturbance to the grass is confined to an area no greater than 10 feet on either side of the pipe location. The waterlines are polyethylene pipe of approximately 2 inches in diameter. The disturbance to grass is minimal (generally not exceeding 1 acre of disturbance) in relation to the acreage involved in the easement tract (average 600 acres). The disturbance caused by the trench is immediately restored and with residual and seeded grasses, the activity disturbance is temporary within 1-2 years little to no evidence remains of the activity. The activity will be permitted with a special use permit and stipulations provided to ensure special and limiting conditions are adhered to and restoration is complete. The waterline will deliver water to a holding tank and gravel pad causing permanent disturbance to grass on an area of approximately 60 feet by 60 feet, representing less than one-tenth of one acre or less than 0.00001 percent of the average grassland easement tract.

Where would the use be conducted?

The use will be conducted on grassland easements in all the Wetland Management Districts listed including both North Dakota and South Dakota. Generally the grassland easement tracts are native grassland areas that are used predominately for cattle grazing. There will be minimal or non detected disturbance to wildlife as a result of the activity and what does occur will be very temporary. The disturbance to the average grassland easement tract will represent less than 0.002 percent of the average easement tract.

When would the use be conducted?

The use will be conducted as a one time event in the summer season when frost no longer exists and conditions have dried sufficiently to minimize grass disturbance. There is little to no future maintenance. How would the use be conducted?

The activity will be conducted with either trenching equipment such as a back hoe or a chisel plow. Disturbance will not exceed 2 feet in width or be less if the chisel plow is used.

Why is this use being proposed?

It will be the grassland easement holder requesting the use. The request will be to provide better water availability for improved grass utilization due to more equal grazing distribution. Buried waterlines for livestock watering is a cost effective and reliable alternative to traditional stock watering dams, especially in times of drought or low precipitation conditions.

Availability of Resources:

Resource involved in the administration and management of the use:

No additional management or administrative costs will be associated with this activity.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts:

There will be only temporary disturbance to the grass from the construction activities so all impacts will be short-term. In 1-2 years little to no evidence exists of the activity. There will be no indirect impacts associated with this activity.

Long-term impacts:

There will be no long term impacts associated with this activity.

Cumulative impacts:

The only cumulative direct impact will be the loss of grassland from the installation of water holding facilities, estimated to be approximately 360 square feet, representing 0.008 of an acre or 0.00001 percent of the average grassland easement (600 acres). There are no indirect impacts from the proposed activity.

Public Review and Comment:

The period of public review and comment began 8/9/2004 and ended 8/13/2004.

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

Posted notices in public places.

Why was this level of public review and comment selected?

The proposed activity is considered minor, incidental, one-time with minimal temporary disturbance.

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

No comments were received.

Determination:

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

1. Soil, if removed through trenching, will be replaced in the same soil profile as it was removed. Topsoil will be replaced and all soils compacted.

2. Activity will occur during the time when soils are dry and equipment activity will have reduced impact to grasses and soils.

3. Any areas that are disturbed will be reseeded to the appropriate grass mixture if determined necessary for reestablishment by the refuge manager.

Justification:

There will be minimal and temporary disturbance to the grassland resources protected by the Service=s easement by this activity. The use will not detract from or materially interfere with the mission or purpose of the Refuge System. It is an economic use and as such the activity will benefit the Service mission and purpose through better management of the grassland community by providing improved grazing distribution.

If the proposed use were an economic use of refuge natural resources, how would it contribute to the purposes of the refuge or the mission of the National Wildlife Refuge System?

The activity of providing water for livestock grazing will contribute to the mission by providing improved grazing distribution and better range management of the grassland resources protected by the Service=s easement.

Text of Public Notice:

The U.S. Fish and Wildlife Service (Service) is soliciting public comments on whether to allow buried waterlines to provide for livestock watering on Service Grassland Easements in North and South Dakota. The activity will cause minor and temporary disturbance to the grassland area. Restoration will be ensured through stipulations defined in a Special Use Permit agreed to by the landowner. Through better distribution of livestock grazing the health and sustainability to the grasslands will be better ensured. People wishing to provide comments can do so by August 13th by submitting them to the Wetland Habitat Office, 3425 Miriam Avenue, Bismarck, ND 58501. For more information, contact Lloyd Jones at (701) 355-8529.

Signatures:

Refuge Managers:

_____ _____
Kim Hanson, Arrowwood Wetland Management District Date

_____ _____
Mike McEnroe, Audubon Wetland Management District Date

_____ _____
Mick Erickson, Chase Lake Wetland Management District Date

_____ _____
Tim Kessler, Crosby Wetland Management District Date

_____ _____
Roger Hollevoet, Devils Lake Wetland Management District Date

_____ _____
Harris Hoistad, Huron Wetland Management District Date

_____ _____
Lee Albright, J. Clark Salyer Wetland Management District Date

_____ _____
Bob Vanden Berge, Kulm Wetland Management District Date

_____ _____
Mike Bryant, Lake Andes Wetland Management District Date

_____ _____
Paul VanNingen, Long Lake Wetland Management District Date

_____ _____
Todd Frerichs, Lostwood Wetland Management District Date

_____ _____
Thomas Turnow, Madison Wetland Management District Date

_____ _____
Gene Williams, Sand Lake Wetland Management District Date

_____ _____
Jack Lalor, Tewaukon Wetland Management District Date

_____ _____
Cory Richardson, Valley City Wetland Management District Date

_____ _____
Larry Martin, Waubay Wetland Management District Date

Review: Regional Compatibility Coordinator _____ _____
Lloyd Jones Date

Review: Zone Supervisor _____ _____
Rod Krey Date

Concurrence: Regional Chief _____ _____
Rick Coleman Date

Mandatory 10- or 15- year Re-Evaluation Date: 2019

Appendix C: Planning Team and Contributors

This document is the result of extensive, collaborative, and enthusiastic efforts by members of the planning team.

Team Member	*Position*	*Work Unit*
Natoma Buskness	*former* deputy project leader	Chase Lake National Wildlife Refuge, Woodworth, ND
Bernardo Garza	fish and wildlife biologist, planning team leader	USFWS, Region 6, Division of Planning, Lakewood, CO
Cheryl Jacobs	biological science technician	Long Lake National Wildlife Refuge Complex, Moffit, ND
Gregg Knutsen	refuge biologist	Long Lake National Wildlife Refuge Complex, Moffit, ND
Lynda Knutsen	outdoor recreation planner	Long Lake National Wildlife Refuge Complex, Moffit, ND
Randy Kreil	wildlife division chief	North Dakota Game and Fish Department, Bismarck, ND
Rachel Laubhan	wildlife biologist	USFWS, Northern Prairie Wildlife Research Center, Jamestown, ND
Murray Laubhan	research wildlife biologist	USGS, Northern Prairie Wildlife Research Center, Jamestown, ND
Adam Misztal	fish and wildlife biologist, *former* planning team leader	USFWS, Region 6, Colorado Field Office, Lakewood, CO
Richard Schroeder	ecologist	USGS – Biological Resources Division, Fort Collins, CO
Cindy Souders	outdoor recreation planner	USFWS, Region 6, Division of Education and Visitor Services Lakewood, CO
Meg Van Ness	regional archaeologist	USFWS, Region 6, Lakewood, CO
Paul Van Ningen	project leader	Long Lake National Wildlife Refuge Complex, Moffit, ND

Valuable support to the planning team was also provided by the individuals listed below.

Name	*Position*	*Work Unit*
Ned Euliss, Jr	research wildlife biologist	USGS, Northern Prairie Wildlife Research Center, Jamestown, ND
Robert Gleason	research wildlife biologist	USGS, Northern Prairie Wildlife Research Center, Jamestown, ND
Chuck Loesch	wildlife biologist	USFWS, HAPET Office, Bismarck, ND
Linda Kelly	chief, branch of comprehensive conservation planning	USFWS, Region 6, Division of Planning, Lakewood, CO
Neal Neimuth	wildlife biologist	USFWS, HAPET Office, Bismarck, ND
Ron Reynolds	project leader	USFWS, HAPET Office, Bismarck, ND

Additionally, the following Service staff from region 6 provided valuable input on earlier drafts of this document.

Name	*Position*
Bob Barrett	deputy refuge supervisor, ND/SD
Rick Coleman	assistant regional director
	fire management officer
Jeff Dion	fire management officer/ Arrowwood NWR Complex
John Esperance	chief of land protection planning branch
	chief of education and visitor services
Pete Finley	ROS/pilot
Galen Green	fire ecologist
	refuge planner
Todd King	maintenance worker
Laura King	refuge planner
Wayne King	biologist

	refuge supervisor, ND/SD
Tyrell Lauckner	maintenance worker
Michael Spratt	chief, division of refuge planning
Jason Wagner	supervisory range technician
Wendy Wollmuth	administrative officer
Harvey Wittmier	chief, division of realty

Appendix D: Key Legislation and Policies

This appendix briefly describes the guidance for the National Wildlife Refuge System and other policies and key legislation that guide the management of Long Lake National Wildlife Refuge Complex.

National Wildlife Refuge System

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (National Wildlife Refuge System Improvement Act of 1997).

Goals

- To fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.
- Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.
- Perpetuate migratory bird, inter-jurisdictional fish, and marine mammal populations.
- Conserve a diversity of fish, wildlife, and plants.
- Conserve and restore, where appropriate, representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.
- To foster understanding and instill appreciation of fish, wildlife, and plants, and their conservation, by providing the public with safe, high quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

Guiding Principles

There are four guiding principles for management and public use of the Refuge System established by Executive Order 12996 (1996):

- Public Use—The Refuge System provides important opportunities for compatible wildlife-dependent recreational activities involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation.
- Habitat—Fish and wildlife will not prosper without high quality habitat, and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges.
- Partnerships—America's sportsmen and women were the first partners who insisted on protecting valuable wildlife habitat within wildlife refuges. Conservation partnerships with other federal agencies, state agencies, tribes, organizations, industry, and the public can make significant contributions to the growth and management of the Refuge System.
- Public Involvement—The public should be given a full and open opportunity to participate in decisions regarding acquisition and management of our national wildlife refuges.

Legal and Policy Guidance

Management actions on national wildlife refuges are circumscribed by many mandates including laws and executive orders, the latest of which is the Volunteer and Community Partnership Enhancement Act of 1998. Regulations that affect refuge management the most are listed below.

American Indian Religious Freedom Act (1978)—Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act (1992)—Prohibits discrimination in public accommodations and services.

Antiquities Act (1906)—Authorizes the scientific investigation of antiquities on federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Archaeological and Historic Preservation Act (1974)—Directs the preservation of historic and archaeological data in federal construction projects.

Archaeological Resources Protection Act (1979), as amended—Protects materials of archaeological interest from unauthorized removal or destruction and requires federal managers to develop plans and schedules to locate archaeological resources.

Architectural Barriers Act (1968)—Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977)—Requires consultation with the U.S. Army Corps of Engineers (404 permits) for major wetland modifications.

Endangered Species Act (1973)—Requires all federal agencies to carry out programs for the conservation of endangered and threatened species.

Executive Order 7169 (1935)—Establishes Sand Lake National Wildlife Refuge "... as a refuge and breeding ground for migratory birds and other wild life... to effectuate further the purposes of the Migratory Bird Conservation Act…."

Executive Order 11988 (1977)—Requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the flood plains.

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)—Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the Refuge System.

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

Federal Noxious Weed Act (1990)—Requires the use of integrated management systems to control or contain undesirable plant species and an interdisciplinary approach with the cooperation of other federal and state agencies.

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

Fish and Wildlife Coordination Act (1958)—Allows the U.S. Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Migratory Bird Conservation Act (1929)—Establishes procedures for acquisition by purchase, rental, or gifts of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934)—Authorizes the opening of part of a refuge to waterfowl hunting.

Migratory Bird Treaty Act (1918)—Designates the protection of migratory birds as a federal responsibility; and enables the setting of seasons and other regulations, including the closing of areas, federal or non-federal, to the hunting of migratory birds.

National Environmental Policy Act (1969)—Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate this Act with other planning requirements, and prepare appropriate documents to facilitate better environmental decision making. [From the Code of Federal Regulations (CFR), 40 CFR 1500]

National Historic Preservation Act (1966), as amended—Establishes as policy that the Federal Government is to provide leadership in the preservation of the Nation's prehistoric and historical resources.

National Wildlife Refuge System Administration Act (1966)—Defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge, provided such use is compatible with the major purposes for which the refuge was established.

National Wildlife Refuge System Improvement Act of 1997—Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System; mandates comprehensive

conservation planning for all units of the Refuge System.

Native American Graves Protection and Repatriation Act (1990)—Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Refuge Recreation Act (1962)—Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Rehabilitation Act (1973)—Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the Federal Government to ensure that any person can participate in any program.

Rivers and Harbors Act (1899)—Section 10 of this Act requires the authorization of U.S. Army Corps of Engineers prior to any work in, on, over, or under navigable waters of the United States.

Volunteer and Community Partnership Enhancement Act (1998)—Encourages the use of volunteers to assist in the management of refuges within the Refuge System; facilitates partnerships between the Refuge System and non-federal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

Appendix E: Public Involvement

Public Involvement

The Service began the pre-planning process in November 2003. In January 2004, the Service contacted State and Tribal representatives to invite them to participate in the planning process for the Comprehensive Conservation Plan for the Long Lake National Wildlife Refuge Complex. A planning team comprised of Service personnel from the complex and the regional office, as well as of NDGF personnel (appendix B), was developed during the kickoff meeting in February 2004.

A Notice of Intent was published in the Federal Register on May 21, 2004. Five public open house meetings were held from 7:00 to 9:00 p.m. during consecutive nights from March 29 through April 2, 2004 at Steele (Community Center), Tappen (City Hall), Hazelton (Public School Cafeteria), Wing (Senior Center), and Bismarck (North Dakota Game and Fish Department Headquarters), respectively. Notification of dates and times of the public open houses was distributed through media press releases.

Attendance at these public meetings was sparse, with no more than 10 persons attending them all together. Those who attended provided both written and oral comments. They were informed that comprehensive planning was an open process and they could submit their comments at any time and by any means (i.e. letter, telephone, and internet) up until the time the CCP was final. Additional written comments were received by the planning team via mail.

Over the course of pre-planning and scoping, the planning team collected available information about the resources of the complex and the surrounding areas. This information is summarized under Chapter 4. Affected Environment.

Many of the public comments from the open houses and issue workbooks were general comments for all units of the complex being managed as part of the Refuge System.

Draft issues and qualities lists were developed during a workshop held in the U.S. Fish & Wildlife Service Bismarck office in late September 2004.

Mailing List

A mailing list was developed for this CCP. It includes the following:

Federal Officials

Federal Agencies

State Officials

State Agencies

Local Agencies

Media

Organizations, Businesses and Civic Groups

Universities and Colleges

Individuals

Appendix F: Long Lake NWR Complex—Fee-Title Tract Prioritization

Criteria for HIGH Priority Tracts

- H1.) ≥80 breeding duck pairs per square mile (mean density for entire tract) and a minimum of 40 upland acres
- H2.) ≥320ac in total size, with ≥100 upland acres
- H3.) ≥80ac native prairie
- H4.) Resource of concern designation (e.g., Piping Plover Critical Habitat, suitable Dakota skipper habitat).

Criteria for MODERATE Priority Tracts

- M1.) Between 20 and 79 breeding duck pairs per square mile (mean density for entire tract) and a minimum of 40 upland ac.
- M2.) Between 160 and 319ac in total size, with ≥50 upland ac.
- M3.) Between 25 and 79ac native prairie
- M4.) Tract lies entirely within a Type I Grassland Bird Conservation Area (core) and has ≥40 upland ac.

Criteria for LOW Priority Tracts

- L1.) All remaining tracts.

HIGH PRIORITY[1]

NWR or WPA	County	Qualifying Criteria
Rath/Wonnenburg	Burleigh	H1, H2, H3, H4
Long Lake NWR	Burleigh/Kidder	H2, H3, H4
Schiermeister	Emmons	H2, H3, H4
Sisco-Fallgatter	Emmons	H1, H2, H3
Almer	Kidder	H1, H3
Bechold	Kidder	H2, H3
Braun	Kidder	H1, H3
Crimmins	Burleigh	H2, H3
East Lost Lake	Burleigh	H2, H3
Florence Lake NWR	Burleigh	H2, H3
Goldsmith	Kidder	H2, H3
Monroe	Burleigh	H2, H3
Rachel/Hoff	Burleigh	H1, H4
Ryberg/Wonnenburg	Burleigh	H1, H3

NWR or WPA	County	Qualifying Criteria
Slade NWR	Kidder	H2, H3
Victor	Burleigh	H1, H2
Whitman	Kidder	H2, H3
Adams	Burleigh	H3
Albright	Kidder	H2
Basaraba	Burleigh	H2
BLM #1e3	Burleigh	H4
BLM #1f	Burleigh	H4
BLM #1g	Burleigh	H4
BLM #1h	Burleigh	H4
BLM #1i	Burleigh	H4
BLM #5	Kidder	H4
BLM #6	Kidder	H4
BLM #7	Kidder	H4
Clizbe	Burleigh	H1
Kleppe Lang	Kidder	H4
Kurtz	Emmons	H3
McKenzie	Burleigh	H1
N. Crimmins	Burleigh	H1
Oswald	Burleigh	H3
PDL/Trusty	Burleigh	H1
Rohrich/Walther/Weiszhaar	Emmons	H2
Thorstad	Burleigh	H1
Vogel	Kidder	H2
Wahl	Kidder	H3

MODERATE PRIORITY[1]

NWR or WPA	County	Qualifying Criteria
Bernhardt	Burleigh	M2, M3, M4
Personius	Kidder	M1, M2 , M4
Bertsch Morrison	Kidder	M2, M4
Kleppe East	Kidder	M3, M4
Martin	Kidder	M3, M4
Nelson	Kidder	M2, M4
Nuestal Whitman	Kidder	M2, M4
Rohrback	Burleigh	M3, M4
Schatz	Emmons	M1, M3
Schauer	Burleigh	M2, M4
Thacker	Kidder	M3, M4
Uhde	Burleigh	M3, M4
Berg Gellner	Burleigh	M3
Foell	Emmons	M3
Guthmiller	Kidder	M2
Morrison	Kidder	M3
PDL 1c	Kidder	M3
Seventh Day Adventist	Burleigh	M2
Small	Burleigh	M2
YMCA	Burleigh	M2

LOW PRIORITY

NWR or WPA	County
BLM #1	Burleigh
BLM #3	Kidder
BLM #4	Kidder
Bryan/Mohler	Burleigh
Delzer	Emmons
Gaub Hoots	Kidder
Goose Lake	Emmons
Haak	Emmons
Haid	Burleigh
Kleppe West	Kidder
Leno	Burleigh
Mattern	Emmons
Mayer	Kidder
North Dakota	Burleigh
PDL 1	Kidder
PDL 1a	Kidder
PDL 1b	Burleigh
PDL 1d	Kidder
Pleiness	Kidder
Schmidt	Kidder
Silvernagel	Emmons
Slovarp	Burleigh
Stark	Kidder

[1] *Application of any single criteria can qualify a tract as HIGH or MODERATE priority.*

Appendix G: Species List

Below is a list of resident and migrant wildlife species found on or adjacent to Long Lake NWR, as well as a list of plant species mentioned in this document.

This list includes all mammals, fish, and herpetofauna expected to occur on Long Lake NWR based on Refuge files, unpublished systematic survey data, and other relevant literature and data that pertain to south-central North Dakota. Bird species listed in this appendix are based on the Long Lake NWR Bird List (May 2002), as well as additional information from Refuge files (June 2002–May 2006).

Taxonomic order follows Banks et al. (1987; mammals, fish, amphibians, reptiles) and the Check-list of North American Birds (7th ed., 46th supplement; American Ornithologists' Union 2005).

Wildlife

Class Amphibia
Order Caudata
Tiger salamander (*Ambystoma tigrinum*)

Order Anura
Great Plains toad (*Bufo cognatus*)
Canadian toad (*Bufo hemiophrys*)
Woodhouse's toad (*Bufo woodhousei*)
Chorus frog (*Pseudacris triseriata*)
Northern leopard frog (*Rana pipiens*)
Plains spadefoot toad (*Scaphiopus bombifrons*)
Wood frog (*Rana sylvatica*)

Class Reptilia
Order Testudines
Common snapping turtle (*Chelydra serpentina*)
Western painted turtle (*Chrysemeys picta*)

Order Squamata
Northern red-bellied snake (*Storeria occipitomaculata*)
Plains garter snake (*Thamnophis radix*)
Smooth green snake (*Opheodrys vernalis*)
Bullsnake (*Pituophis catenifer*)
Western hognose snake (*Heterdon nasicus*)
Common garter snake (*Thmnophis sirtalis*)

Class Aves
Order Anseriformes
Greater white-fronted goose (*Anser albifrons*)
Snow goose (*Chen caerulescens*)
Ross's goose (*Chen rossii*)
Cackling goose (*Branta hutchinsii*)
Canada goose (*Branta canadensis*) – **B**
Brant (*Branta bernicla*) – **A**
Trumpeter swan (*Cygnus buccinator*)
Tundra swan (*Cygnus columbianus*)
Wood duck (*Aix sponsa*) – **B**
Gadwall (Anas strepara) – **B**
Eurasian Wigeon (*Anas penelope*) – **A**
American Wigeon (*Anas americana*) – **B**
American black duck (*Anas rubripes*)
Mallard (*Anas platyrhynchos*) – **B**
Blue-winged teal (*Anas discors*) – **B**
Cinnamon teal (*Anas cyanoptera*)
Northern shoveler (*Anas clypeata*) – **B**
Northern pintail (*Anas acuta*) – **B**
Gargany (*Anas querquedula*) - **A**
Green-winged teal (*Anas crecca*) – **B**
Canvasback (*Aythya valisineria*) – **B**
Redhead (*Aythya Americana*) – **B**
Ring-necked duck (*Aythya collaris*) – **B**
Greater scaup (*Aythya marila*)
Lesser scaup (*Aythya affinis*) – **B**
Common eider (*Somateria mollissima*) – **A**
Harlequin duck (*Histrionicus histrionicus*) – **A**
Surf scoter (*Melanitta perspicillata*) – **A**
White-winged scoter (*Melanitta fusca*)
Black scoter (*Melanitta nigra*) – **A**
Long-tailed duck (*Clangula hyemalis*) – **A**
Bufflehead (*Bucephala albeola*) – **B**
Common goldeneye (*Bucephala clangula*)
Barrow's goldeneye (*Bucephala islandica*) – **A**
Hooded merganser (*Lophodytes cucullatus*) – **B**
Common merganser (*Mergus merganser*)
Red-breasted merganser (*Mergus serrator*)
Ruddy duck (*Oxyura jamaicensis*) – **B**

Order Galliformes
Gray partridge (*Perdix perdix*) – **I, B**
Ring-necked pheasant (*Phasianus colchicus*) – **I, B**

Sharp-tailed grouse (*Tympanuchus phasianellus*) – **B**
Greater-prairie chicken (*Tympanuchus cupido*)
Wild turkey (*Meleagris gallopavo*) – **I, B**

Order Gaviiformes
Common loon (*Gavia immer*)

Order Podicepidiformes
Pied-billed grebe (*Podylimbus podiceps*) – **B**
Horned grebe (*Podiceps auritus*) – **B**
Red-necked grebe (*Podiceps grisegena*) – **B**
Eared grebe (*Podiceps nigricollis*) – **B**
Western grebe (*Aechmophorus occidentalis*) – **B**
Clark's grebe (*Aechmophorus clarkii*) – **B**

Order Pelicaniformes
American white pelican (*Pelecanus erythrocephalus*)
Double-crested cormorant (*Phalacrocorax auritus*) – **B**
Anhinga (*Anhinga anhinga*) – **A**

Order Ciconiiformes
American bittern (*Botaurus lentiginosus*) – **B**
Least bittern (*Ixobrychus exilis*)
Great blue heron (*Ardea Herodias*)
Great egret (*Ardea alba*) – **B**
Snowy egret (*Egretta caerulea*) – **B**
Little blue heron (*Egretta caerulea*)
Tri-colored heron (**Egretta tricolor**) – **A, B**
Cattle egret (*Bubulcus ibis*) – **B**
Green heron (*Boturides striatus*)
Black-crowned night-heron (*Nycticorax nycticorax*) – **B**
Yellow-crowned night-heron (*Nyctanassa violaceus*)
White ibis (*Eudocimus albus*) – **A**
White-faced ibis (*Plegadis chihi*) – **B**
Turkey vulture (*Cathartes aura*)

Order Falconiformes
Osprey (*Pandion haliaetus*)
Bald eagle (*Haliaeetus leucocephalus*) – **T**
Northern harrier (*Circus cyaneus*) – **B**
Sharp-shinned hawk (*Accipiter striatus*)
Cooper's hawk (*Accipiter cooperii*) – **B**
Northern goshawk (*Accipiter gentilis*)
Red-shouldered hawk (*Buteo lineatus*) – **A**
Broad-winged hawk (*Buteo platypterus*)
Swainson's hawk (*Buteo swainsoni*) – **B**
Red-tailed hawk (*Buteo jamaicensis*) – **B**
Ferruginous hawk (*Buteo regalis*) – **B**
Rough-legged hawk (*Buteo lagopus*)
Golden eagle (*Aquila chrysaetos*)
American kestrel (*Falco sparverius*) – **B**
Merlin (*Falco columbarius*)
Gyrfalcon (*Falco rusticolus*)
Peregrine falcon (*Falco peregrinus*)
Prairie falcon (*Falco mexicanus*)

Order Gruiformes
Yellow rail (*Coturnicops noveboracensis*) – **B**
Virginia rail (*Rallus limicola*) – **B**
Sora (*Porzana carolina*) – **B**
American coot (*Fulica Americana*) – **B**
Sandhill crane (*Grus canadensis*)
Whooping crane (*Grus americana*) – **E**

Order Charadriiformes
Black-bellied plover (*Pluvialis squatarola*)
American golden-plover (*Pluvialis dominica*)
Snowy plover (*Charadrius alexandrius*) – **A**
Semipalmated plover (*Charadrius semipalmatus*)
Piping plover (*Charadrius melodus*) – **T, B**
Killdeer (*Charadrius vociferous*) – **B**
Black-necked stilt (*Himantopus mexicanus*) – **A, B**
American avocet (*Recurvirostra americana*) – **B**
Greater yellowlegs (*Tringa melanoleuca*)
Lesser yellowlegs (*Tringa flavipes*)
Solitary sandpiper (*Tringa solitaria*)
Willet (*Catoptrophorus semipalmatus*) – **B**
Spotted sandpiper (*Actitis macularia*) – **B**
Upland sandpiper (*Bartamia longicauda*) – **B**
Whimbrel (*Numenius phaeopus*) – **A**
Long-billed curlew (*Numenius americanus*)
Hudsonian godwit (*Limosa haemastica*)
Marbled godwit (*Limosa fedoa*) – **B**
Ruddy turnstone (*Arenaria interpes*)
Red knot (*Calidris canutus*)
Sanderling (*Calidris alba*)
Semipalmated sandpiper (*Calidris pusilla*)
Western sandpiper (*Calidris mauri*)
Least sandpiper (*Calidris minutilla*)
White-rumped sandpiper (*Calidris fuscicollis*)
Baird's sandpiper (*Calidris bairdii*)
Pectoral sandpiper (*Calidris melanotos*)
Dunlin (*Calidris alpina*)
Stilt sandpiper (*Calidris himantopus*)
Buff-breasted sandpiper (*Tryngites subruficollis*)

Short-billed dowitcher (*Limnodromus griseus*)
Long-billed dowitcher (*Limnodromus scolopaceus*)
Wilson's snipe (*Gallinago delicata*) – **B**
American woodcock (*Scolopax minor*)
Wilson's phalarope (*Phalaropus tricolor*) – **B**
Red-necked phalarope (*Phalaropus lobatus*)
Red phalarope (*Phalaropus fulicaria*) – **A**
Parasitic jaeger (*Stercorarius parasiticus*) – **A**
Long-tailed jaeger (*Stercorarius longicaudus*) – **A**
Franklin's gull (*Larus pipixcan*) – **B**
Bonaparte's gull (*Larus philadelphia*)
Mew gull (*Larus canus*) – **A**
Ring-billed gull (*Larus delawarensis*) – **B**
California gull (*Larus californicus*) – **B**
Herring gull (*Larus argentatus*)
Thayer's gull (*Larus thayeri*) – **A**
Lesser black-backed gull (*Larus fuscus*)
Glaucous-winged gull (*Larus glaucescens*) – **A**
Glaucous gull (*Larus hyperboreus*) – **A**
Great black-backed gull (*Larus marinus*) – **A**
Sabine's gull (*Xema sabini*) – **A**
Black-legged kittiwake (*Rissa tridactyla*) – **A**
Caspian tern (*Sterna caspia*)
Common tern (*Sterna hirundo*) – **B**
Arctic tern (*Sterna paradisaea*) – **A**
Forster's tern (*Sterna forsteri*) – **B**
Least tern (*Sterna antillarum*) – **E**
Black tern (*Sterna niger*) – **B**

Order Columbiformes
Rock pigeon (*Columba livia)* – **I, B**
Eurasian collared-dove (*Streptopelia decaocto*) – **I**
Mourning dove (*Zenaida macroura*) – **B**

Order Cuculiformes
Black-billed cuckoo (*Coccyzus erythropthalmus*) – **B**
Yellow-billed cuckoo (*Coccyzus americanus*)

Order Strigiformes
Barn owl (*Tyto alba*) – **A**
Eastern screech owl (*Otus asio*)
Great horned owl (*Bubo virginianus*) – **B**
Snowy owl (*Nyctea scandiaca*)
Northern hawk-owl (*Surnia ulula*) – **A**
Burrowing owl (*Athene cunicularia*)
Long-eared owl (*Asio otus*)
Short-eared owl (*Asio flammeus*) – **B**
Northern saw-whet owl (*Aegolius acadicus*)

Order Caprimulgiformes
Common nighthawk (*Chordeiles minor*) – **B**
Whip-poor-will (*Caprimulgus vociferous*)

Order Apodiformes
Chimney swift (*Chaetura pelagica*)
Ruby-throated hummingbird (*Archilochus colubris*)

Order Coraciiformes
Belted kingfisher (*Ceryle alcyon*)

Order Piciformes
Lewis' woodpecker (*Melanerpes lewis*) – **A**
Red-headed woodpecker (*Melanerpes erythrocephalus*) – **B**
Red-bellied woodpecker (*Melanerpes carolinus*)
Yellow-bellied sapsucker (*Sphyrapicus varius*)
Downy woodpecker (*Picoides pubescens*) – **B**
Hairy woodpecker (*Picoides villosus*) – **B**
Northern flicker (*Colaptes auratus*) – **B**

Order Passeriformes
Olive-sided flycatcher (*Contopus cooperi*)
Eastern wood-pewee (*Contopus virens*)
Yellow-bellied flycatcher (*Empidonax flaviventris*)
Alder flycatcher (*Empidonax alnorum*)
Willow flycatcher (*Empidonax traillii*) – **B**
Least flycatcher (*Empidonax minimus*) – **B**
Eastern phoebe (*Saynoris phoebe*) – **B**
Say's phoebe (*Saynoris saya*) – **B**
Great crested flycatcher (*Myiarchus crinitus*)
Western kingbird (*Tyrannus verticalis*) – **B**
Eastern kingbird (*Tyrannus forficatus*) – **B**
Loggerhead shrike (*Lanius ludovicianus*) – **B**
Northern shrike (*Lanius excubitor*)
Yellow-throated vireo (*Vireo flavifrons*)
Blue-headed vireo (*Vireo solitarius*)
Warbling vireo (*Vireo gilvus*) – **B**
Philadelphia vireo (*Vireo philadelphicus*)
Red-eyed vireo (*Vireo olivaceus*)
Blue jay (*Cyanocitta cristata*)
Black-billed magpie (*Pica hudsonia*) – **B**
American crow (*Corvus brachyrhynchos*) – **B**
Common raven (*Corvus corax*)
Horned lark (*Eremophila alpestris*) – **B**
Purple martin (*Progne subis*) – **B**
Tree swallow (*Tachycineta bicolor*) – **B**
Violet-green swallow (*Tachycineta thalassina*) – **A**

Northern rough-winged swallow (*Stelgidopteryx serripennis*) – **B**
Bank swallow (*Riparia riparia*) – **B**
Cliff swallow (*Petrochelidon pyrrhonota*) – **B**
Barn swallow (*Hirundo rustica*) – **B**
Black-capped chickadee (*Poecile atricappila*) – **B**
Red-breasted nuthatch (*Sitta canadensis*)
White-breasted nuthatch (*Sitta carolinensis*) – **B**
Brown creeper (*Certhia americana*)
House wren (*Troglodytes aedon*) – **B**
Winter wren (*Troglodytes troglodytes*)
Sedge wren (*Cistothorus platensis*) – **B**
Marsh wren (*Cistothorus palustris*) – **B**
Golden-crowned kinglet (*Regulus satrapa*)
Ruby-crowned kinglet (*Regulus calendula*)
Eastern bluebird (*Sialia sialis*)
Mountain bluebird (*Sialia currucoides*)
Townsend's solitaire (*Myadestes townsendi*)
Veery (*Catharus fuscescens*)
Gray-cheeked thrush (*Catharus minimus*)
Swainson's thrush (*Catharus ustulatus*)
Hermit thrush (*Catharus guttatus*)
American robin (*Turdus migratorius*) – **B**
Gray catbird (*Dumetella carolinensis*) – **B**
Northern mockingbird (*Mimus polyglottos*)
Brown thrasher (*Toostoma rufum*) – **B**
European starling (*Sturnus vulgaris*) – **I, B**
American pipit (*Anthus rubescens*)
Sprague's pipit (*Anthus spragueii*) – **B**
Bohemian waxwing (*Bombycilla garrulous*)
Cedar waxwing (*Bombycilla cedrorum*) – **B**
Tennessee warbler (*Vermivora peregrina*)
Orange-crowned warbler (*Vermivora celata*)
Nashville warbler (*Vermivora ruficapilla*)
Yellow warbler (*Dendroica petechia*) – **B**
Chestnut-sided warbler (*Dendroica pensylvanica*)
Magnolia warbler (*Dendroica magnolia*)
Cape may warbler (*Dendroica tigrina*)
Yellow-rumped warbler (*Dendroica coronata*)
Black-throated green warbler (*Dendroica virens*)
Blackburnian warbler (*Dendroica fusca*)
Prairie warbler (*Dendroica discolor*) – **A**
Palm warbler (*Dendroica palmarum*)
Bay-breasted warbler (*Dendroica castanea*)
Blackpoll warbler (*Dendroica striata*)
Black-and-white warbler (*Mniotilta varia*)
American redstart (*Setophaga ruticilla*)
Prothonotary warbler (*Protonotaria citrea*) – **A**
Ovenbird (*Seiurus aurocapillus*)
Northern waterthrush (*Seiurus noveboracensis*)
Connecticut warbler (*Oporornis agilis*)
Mourning warbler (*Oporornis philadelphia*)
MacGillivray's warbler (*Oporornis tolmiei*)
Common yellowthroat (*Geothlipis trichas*) – **B**
Wilson's warbler (*Wilsonia pusilla*)
Canada warbler (*Wilsonia Canadensis*)
Yellow-brested chat (*Icteria virens*)
Scarlet tanager (*Piranga olivavea*)
Spotted towhee (*Pipilo maculatus*)
Eastern towhee (*Pipilo erythrophthalmus*)
American tree sparrow (*Spizella arborea*)
Chipping sparrow (*Spizella passerina*) – **B**
Clay-colored sparrow (*Spizella pallida*) – **B**
Field sparrow (*Spizella pusilla*)
Vesper sparrow (*Pooecetes gramineus*) – **B**
Lark sparrow (*Chondestes grammacus*) – **B**
Lark bunting (*Calamospiza melanocorys*) – **B**
Savannah sparrow (Passerculus sandwichensis) – **B**
Grasshopper sparrow (*Ammodramus savannarum*) – **B**
Baird's sparrow (*Ammodramus bairdii*) – **B**
Henslow's sparrow (*Ammodramus henslowii*) – **B**
Le Conte's sparrow (*Ammodramus leconteii*) – **B**
Nelson's sharp-tailed sparrow (*Ammodramus nelsoni*) – **B**
Fox sparrow (*Passerelia iliaca*)
Song sparrow (*Melospiza melodia*) – **B**
Lincoln sparrow (*Melospiza lincolnii*)
Swamp sparrow (*Melospiza georgiana*)
White-throated sparrow (*Zonotrichia albicollis*)
Harris' sparrow (*Zonotrichia querula*)
White-crowned sparrow (*Zonotrichia laucophrys*)
Dark-eyed junco (*Junco hyemalis*)
McCown's longspur (*Calcarius mccownii*)
Lapland longspur (*Calcarius lapponicus*)
Smith's longspur (*Calcarius pictus*)
Chestnut-collared longspur (*Calcarius ornatus*) – **B**
Snow bunting (*Plectrophenax nivalis*)
Northern cardinal (*Cardinalis cardinalis*) – **A**
Rose-breasted grosbeak (*Pheucticus ludovicianus*)
Black-headed grosbeak (*Pheucticus melanocephalus*)
Blue grosbeak (*Guiraca caerulea*)

Lazuli bunting (*Passerina amoena*)
Indigo bunting (*Passerina ciris*)
Dickcissel (*Spiza Americana*) – **B**
Bobolink (*Dolichonyx oryzivorus*) – **B**
Red-winged blackbird (*Agelaius phoeniceus*) – **B**
Eastern meadowlark (*Sturnella magna*) – **A**
Western meadowlark (*Sturnella neglecta*) – **B**
Yellow-headed blackbird (*Xanthocephalus xanthocephalus*) – **B**
Rusty blackbird (*Euphagus carolinus*)
Brewer's blackbird (*Euphagus cyanocephalus*) – **B**
Common grackle (*Quiscalus quiscula*) – **B**
Great-tailed grackle (*Quiscalus mexicanus*) – **A**
Brown-headed cowbird (*Molothrus ater*) – **B**
Orchard oriole (*Icterus spurius*) – **B**
Bullock's oriole (*Icterus bullockii*)
Baltimore oriole (*Icterus galbula*) – **B**
Pine grosbeak (*Pinicola enucleator*)
Purple finch (*Carpodacus purpureus*)
House finch (*Carpodacus mexicanus*)
Red crossbill (*Loxia curvirostra*)
White-winged crossbill (*Loxia leucoptera*)
Common redpoll (*Carduelis flammea*)
Hoary redpoll (*Carduelis hornemanni*)
Pine siskin (*Carduelis pinus*)
American goldfinch (*Carduelis tristis*) – **B**
Evening grosbeak (*Coccothraustes vespertinus*)
House sparrow (*Passer domesticus*) – **I, B**

Class Mammalia

Order Insectivora
Northern short-tailed shrew (*Blarina brevicauda*)
Masked shrew (*Sorex cinereus*)
Arctic shrew (*Sorex arcticus*)

Order Chiroptera
Little brown bat (*Myotis lucifugus*)

Order Carnivora
Coyote (*Canis latrans*)
Red fox (*Vulpes vulpes*)
Raccoon (*Procyon lotor*)
Long-tailed weasel (*Mustela frenata*)
Least weasel (*Mustela nivalis*)
Mink (*Mustela vison*)
Badger (*Taxidea taxus*)
Striped skunk (*Mephitis mephitis*)

Order Artiodactyla
White-tailed deer (*Odocoileus virginianus*)
Mule deer (*Odocoileus hemionus*)
Pronghorn (*Antilocapra americana*)

Order Rodentia
Fox squirrel (*Sciurus niger*)
Franklin's ground squirrel (*Spermophilus franklinii*)
Richardson's ground squirrel (*Spermophilus richardsonii*)
Thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*)
Northern pocket gopher (*Thomomys talpoides*)
Beaver (*Castor canadensis*)
Northern grasshopper mouse (*Onychomys leuchogaster*)
White-footed mouse (*Peromyscus leucopus*)
Deer mouse (*Peromyscus maniculatus*)
Western harvest mouse (*Reithrodontomys megalotis*)
Meadow vole (*Microtus pennsylvanicus*)
Muskrat (*Ondatra zibethicus*)
House mouse (*Mus musculus*)
Norway rat (*Rattus norvegicus*)
Meadow jumping mouse (*Zapus hudsonius*)
Porcupine (*Erethizon dorsatum*)

Order Lagomorpha
Eastern cottontail (*Sylvilagus floridanus*)
Nuttall's cottontail (*Sylvilagus nuttallii*)
White-tailed jackrabbit (*Lepus townsendii*)

Class Osteichthyes

Order Salmoniformes
Northern pike (*Esox lucius*)

Order Cypriniformes
Common carp (*Cyprinus carpio*)
Fathead minnow (*Pimephales promelas*)
White sucker (*Catostomus commersoni*)

Order Siluriformes
Black bullhead (*Ameiurus melas*)

Order Perciformes
Yellow perch (*Perca flavescens*)
Walleye (*Stizostedion vitreum*)

B = denotes a strong evidence of nesting for a bird species

A = a bird species that has been seen once or only a few times and the Refuge is outside of its normal range
I = bird or plant species not native to North America
T = a bird species classified as federally threatened
E = a bird species classified as federally endangered

Plants[1]

Absinth Wormwood (*Artemisia absinthium)*
Alfalfa (*Medicago* spp.)
American Plum (*Prunus Americana)*
Aspen spp. (*Populus* spp.)
Barley (*Hordeum vulgare)*
Beans -
Beggarticks spp. (*Bidens* spp.)
Big Bluestem (*Andropogon gerardii)*
Blacksamson Echinacea (*Echinacea ngustifolia)*
Blanket Flower (*Gaillardia aristata)*
Blazing Star (*Liatris punctata*)
Blue Grama (*Bouteloua gracilis)*
Bouteloua (genus) (*Bouteloua* spp.)
Breadroot Scurfpea (*Psoralea esculenta)*
Buffaloberry (*Shepherdia argentea)*
Bulrush spp. (*Schoenoplectus* spp.)
Burreed (*Sparganium* spp.)
Canada Thistle (*Cirsium arvense)*
Caragana (*Caragana arborescens)*
Carex (genus) (*Carex* spp.)
Cattails spp. (*Typha* spp.)
Chokecherry (*Prunus virginiana)*
Clubmoss (*Lycopodium* spp.)
Common Bladderwort (*Utricularia vulgaris)*
Common Reed (*Phragmites australis)*
Common Spikerush (*Eleocharis palustris)*
Common Yarrow (*Achillea millefolium)*
Coontail (*Ceratophyllum demersum)*
Corn (*Zea mays)*
Cosmopolitan Bulrush (*Schoenoplectus maritimus)*
Cottonwood (*Populus deltoides)*
Crested Wheatgrass (*Agropyron cristatum)*
Curlyleaf Pondweed (*Potamogeton crispus)*
Dotted Blazingstar (*Liatris punctata)*
Durum Wheat -
Duckweed (*Lemna* spp.*)*
Durum Wheat (*Triticum durum)*
Eurasian Watermilfoil (*Myriophyllum spicatum)*
Fendler Threeawn (*Aristida purpurea)*
Field Pennycress (*Thlaspi arvense)*
Flatspine Stickseed (*Lappula occidentalis*)
Flax (*Linum* spp.)
Foxtail Barley (*Hordeum jubatum*)
Goldenrod spp. (*Solidago* spp.)
Green Ash (*Fraxinus pennsylvanica)*
Green Foxtail (*Setaria viridis*)
Green Needlegrass (*Nassella viridula)*
Groundplum Milkvetch (*Astragalus crassicarpus)*
Hoary Puccoon (*Lithospermum canescens)*
Inland Saltgrass (*Distichlis spicata)*
Intermediate Wheatgrass (*Thinopyrum intermedium)*
Juneberry (*Amelanchier arborea)*
Kentucky Bluegrass (*Poa pratensis)*
Lead Plant (*Amorpha canescens)*
Leafy Spurge (*Euphorbia esula)*
Lichens spp. (*Lycopodium* spp.*)*
Little Bluestem (*Schizachyrium scoparium)*
Lotus Milkvetch (*Astragalus lotiflorus)*
Narrowleaf Goosefoot (*Chenopodium leptophyllum)*
Needle and Thread (*Stipa comata)*
Needleleaf Sedge (*Carex duriuscula)*
Nuttall's Alkaligrass (*Puccinellia nuttalliana)*
Oats -
Pasture Sage (*Artemisia ludoviciana)*
Pinto Beans -
Porcupine Grass (*Stipa spartea)*
Potatoes -
Prairie Coneflower (*Ratibida columnifera)*
Prairie Cordgrass (*Spartina pectinata)*
Prairie Junegrass (*Koeleria macrantha)*
Prairie Sagewort (*Artemisia frigida)*
Prairie Sandreed (*Calamovilfa longifolia)*
Prairie Smoke (*Geum triflorum)*
Prairie Wild Rose (*Rosa setigera)*
Purple Coneflower (*Echinacea angustifolia)*
Purple Loosestrife (*Lythrum salicaria)*
Reed Canary Grass (*Phalaris arundinacea)*
Rush spp. (*Juncus* spp.*)*
Russian Olive (*Elaeagnus angustifolia)*
Sago Pondweed (*Stuckenia pectinata)*
Salt Cedar (*Tamarix ramosissima)*
Sandberg Bluegrass (*Poa secunda)*
Scarlet Beeblossom (*Gaura coccinea)*
Seaside Arrowgrass (*Triglochin maritima)*
Sedge spp. (*Carex* spp.*)*

Siberian Elm (*Ulmus pumila)*
Sideoats Grama (*Bouteloua curtipendula)*
Silverberry (*Elaeagnus commutata)*
Silverleaf Scurfpea (*Psoralea argophylla)*
Slender Wheatgrass (*Elymus trachycaulus)*
Sloughgrass (*Beckmannia syzigachne)*
Smartweed spp. (*Polygonum* spp.*)*
Smooth Brome (*Bromus inermis)*
Softstem Bulrush (*Schoenoplectus tabernaemontani)*
Spiny Phlox (*Phlox hoodii)*
Spring Wheat -
Stiffstem Flax (*Linum rigidum)*
Stipa (genus) (*Stipa* spp.*)*
Sugar Beets-
Sunflowers -
Sun Sedge (*Carex inops)*
Sweet Clover (*Melilotus* spp. *)*
Switchgrass (*Panicum virgatum)*
Tall Wheatgrass (*Thinopyrum ponticum)*
Tarragon (*Artemisia dracunculus)*
Threadleaf Sedge (*Carex filifolia)*
Three-square Bulrush *(Schoenoplectus americanus*
Tule Bulrush *(Schoenoplectus lacustris)*
Western Snowberry (*Symphoricarpos occidentalis)*
Western Wheatgrass (*Pascopyrum smithii)*
White Milkwort (*Polygala alba)*
White Prairie Clover (*Dalea candida)*
White Sagebrush (*Artemisia ludoviciana)*
Woolly Plantain (*Plantago patagonica)*

[1]Scientific names are not listed for domestic agricultural species.

Appendix H: Long Lake NWR Complex Upland Plant Associations

- Based on ≥50% canopy cover dominance, unless otherwise specified
- Modified from Grant et al. 2004

SHRUB and TREE TYPES

low shrub (generally <1.5m tall)

11 snowberry dense (other low shrub species total 0-25%); *other plants few or none*
12 snowberry (and other low shrub spp.); remainder mostly NATIVE grass-forb types
13 snowberry (and other low shrub spp.); remainder mostly Kentucky bluegrass
14 snowberry (and other low shrub spp.); remainder mostly smooth brome (or quackgrass)
15 silverberry; add modifier 15[2] = NATIVE grass-forb, 15[3] = KY bluegrass, 15[4] = brome (or quack)
18 meadowsweet; add modifier as above 18[2], 18[3], or 18[4]

tall shrub/tree (generally ≥1.5m tall)

21 chokecherry, buffaloberry, hawthorn, willow
23 exotic shrub: caraganna, Russian olive, Siberian elm
33 shade-tolerant woodland tree: green ash, box elder, elm

NATIVE GRASS-FORB and FORB TYPES (*>95% dominance by native herbaceous plants, including forbs*)[a, b]

41 dry cool season (sedges, green needlegrass, needle-and-thread, wheatgrass spp., prairie junegrass, forbs)
42 dry warm season (little bluestem, prairie sandreed, blue gramma, frobs)
43 mesic cool-warm mix (big bluestem, switchgrass, porcupine grass, prairie dropseed, forbs)
47 cactus
48 clubmoss

EXOTIC and INVADED NATIVE GRASS-FORB TYPES[a, b]

51 Kentucky bluegrass >*95%* (or >50% if mixed with other non-natives)
52 Kentucky bluegrass and NATIVE grass-forbs, *KY bluegrass 50-95%*
53 NATIVE grass-forbs and Kentucky bluegrass, *KY bluegrass 5-50%*
61 smooth brome (or quackgrass) >*95%* (or >50% if mixed with other non-natives)
62 smooth brome (or quackgrass) and NATIVE grass-forbs, *brome 50-95%*
63 NATIVE grass-forbs and smooth brome (or quackgrass), *brome 5-50%*
71 crested wheatgrass >*95%* (or >50% if mixed with other non-natives)
72 crested wheatgrass and NATIVE grass-forbs, *crested wheatgrass 50-95%*
73 NATIVE grass-forbs and crested wheatgrass, *crested wheatgrass 5-50%*
78 tall, intermediate, or pubescent wheatgrass
98 tall exotic legume: sweet clover of alfalfa

NOXIOUS WEED TYPES

81 leafy spruge
85 Canada thistle
87 wormwood
88 other noxious weeds (user-defined)

OTHER

99 other – user defined
91 barren/unvegetated (e.g., rock, anthill, bare soil); dead, horizontal/flattened litter layer only
00 wetland vegetation (e.g., wet-meadow or shallow marsh plants)

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[a]Prairie rose is considered a native forb with respect to these categories.
[b]For any of the below categories, if the native forb composition is >50%, add a "9" as a modifier (e.g., 41 = 41**9**)
in the event of an apparent 50:50 mix of KY bluegrass and smooth brome – consider as code **61

Appendix I: Tier II Dakota Skipper Habitat Suitability Criteria (Murphy 2005)

Definition of a Tier II Tract:
Service tract with ≥80 acres of native prairie and that does not meet Tier I criteria (i.e., *Service tract where a Dakota skipper has been documented, or a Service tract having native prairie that covers ≥10 contiguous acres and that is <1 mile from where the Dakota skipper has been documented*), except that a given tract is exempted if floristic surveys suggest the habitat is unsuitable for the Dakota skipper (see below regarding minimum floristics criteria for Tier II).

Floristic Surveys:
Vegetation composition on native prairie areas should be quantitatively examined, at least on a coarse level, to assess suitability of a tract for Dakota skippers. Such assessments need not be intensive, species-level botanical investigations. Frequency methods such as belt transects (Grant et al. 2004) or canopy cover methods (Daubenmire 1959) that focus simply on plant species groups of management concern for Dakota skipper are efficient and sufficient. Ideally, a general floristic assessment will serve multiple inventory or monitoring purposes. The following are minimum criteria for Dakota skipper habitat in dry-mesic mixed-grass prairie types where they potentially occur.

DRY-MESIC MIXED-GRASS PRAIRIE (e.g., rolling to hilly moraine and outwash sites; applies to most potential skipper habitat in North Dakota):

The following could be particularly negative for the skipper if dominant or co-dominant throughout an area: broad-leaved introduced grasses (e.g., smooth brome, quackgrass); low shrubs (e.g., western snowberry, silverberry); noxious weeds (e.g., leafy spurge). Below are conservative criteria for determining whether a northern mixed-grass prairie might be suitable for the Dakota skipper, based on an expert Lepidopterist-s subjective view of possibly suitable versus clearly unsuitable prairie management units at Lostwood NWR in North Dakota. These criteria assume that herbaceous (grass-forb) vegetation dominated by native species includes native forbs important to Dakota skipper as nectar sources (e.g., purple coneflower, harebell, and purple prairie clover), as well as abundant larval food plants (e.g., little bluestem). These broad criteria should be refined as species-habitat data become available from across the Dakota skipper-s range.

Criteria for characterizing dry-mesic mixed-grass prairie as *possibly suitable* for the Dakota skipper:

1) average >50% occurrence by native herbaceous plant groups (types 41, 42, and 43 in Grant et al. [2004]; or by native herbaceous plants mixed with lesser amounts of Kentucky bluegrass; type 53); and
2) average <20% occurrence by smooth brome-dominated and noxious weed-dominated types (types 61, 62, and 80s, collectively); and
3) average <30% occurrence by low shrub-dominated types (types 11-18).

Other Habitat Suitability Criteria

A possible alternative for initially assessing and classifying tracts is to use Ahabitat classification@ mapping data collected on the ground for use with RLGIS (version 3.0, Habitat and Population Evaluation Team [HAPET], Bismarck, ND). For dry-mesic mixed-grass prairie, for example, the following RLGIS habitat subclasses might characterize dry-mesic mixed-grass prairie as possibly suitable for Dakota skipper:

1) average >50% occurrence comprised by two grass-forb subclasses: A >95% native grasses/forbs,@ and Anative/non-native mix with natives dominant (>50%).@
2) average <20% occurrence by smooth brome-dominated and noxious weed-dominated types: Asmooth brome monotype [>95%]@ plus any noxious weed subclass.
3) average <30% occurrence by two low shrub-dominated types: Asnowberry [>25%]@ and Asilverberry [>25%].@

Appendix J: North Dakota Species of Conservation Priority

Below is a list of the wildlife species (e.g., birds, mammals, reptiles, amphibians, fish) which are listed as North Dakota Species of Conservation Priority (Hagen et al. 2005) that are known or expected to occur on Service lands within Long Lake NWR Complex. North Dakota "Species of Conservation Concern" are separated into three different categories (levels 1, 2, and 3), giving priority to species that need conservation the most.

Level 1 *(24 of 29 species)*

Horned grebe
American white pelican
American bittern
Swainson's hawk
Ferruginous hawk
Yellow rail
Willet
Upland sandpiper
Long-billed curlew[1]
Marbled godwit
Wilson's phalarope
Franklin's gull
Black tern
Black-billed cuckoo
Sprague's pipit
Grasshopper sparrow
Baird's sparrow
Nelson's sharp-tailed sparrow
Lark bunting
Chestnut-colored longspur
Canadian toad
Plains spadefoot toad
Smooth green snake
Western hognose snake

Level 2 *(23 of 41 species)*

Northern pintail
Canvasback
Redhead
Northern harrier
Golden eagle
Bald eagle
Prairie falcon
Sharp-tailed grouse
Greater-prairie chicken[1]
Piping plover
American avocet
Least tern
Short-eared owl
Burrowing owl[1]
Red-headed woodpecker
Loggerhead shrike
Sedge wren
Dickcissel
Le Conte's sparrow
Bobolink
Common snapping turtle
Northern red-bellied snake
Richardson's ground squirrel

Level 3 *(4 of 30 species)*

Whooping crane
Peregrine falcon
McCown's longspur[1]
Arctic shrew

[1]The historical range of these species included parts of Long Lake NWR Complex and they have been documented on Service lands within the complex, but it is not likely that they presently occur on Service lands within the complex.

Appendix K: Secondary (Target) Species

In addition to the 22 bird species designated as primary "target" species for the complex , these secondary "target" species also stand to benefit from some or all habitat management outlined in this CCP's biological objectives. These species presently utilize lands in the complex for either nesting or as migratory stopover areas and are considered either common or uncommon during at least one season (e.g., spring, fall).

SWANS, DUCKS, and GEESE
Greater white-fronted goose (DW, UW)[1]
Snow goose (DW, UW)
Ross' goose (DW, UW)
Canada goose[2] (DW, UW)
Cackling goose (DW, UW)
Tundra swan (DW, UW)
Gadwall (DW, UW)
Wood duck (UW)
American wigeon (DW, UW)
Blue-winged teal (DW, UW, NP, OC)
Northern shoveler (DW, UW, NP, OC)
Northern pintail (DW, UW, NP, OC)
Green-winged teal (DW, UW)
Canvasback (DW, UW)
Ring-necked duck (DW, UW)
Lesser scaup (DW, UW, NP, OC)
Bufflehead (DW, UW)
Common goldeneye (DW, UW)
Hooded merganser (DW, UW)
Common merganser (DW, UW)
Ruddy duck (DW, UW)

GALLINACEOUS BIRDS
Ring-necked pheasant (DW, UW, NP, OC, WV)

GREBES
Pied-billed grebe (DW, UW)
Horned grebe (DW, UW)
Red-necked grebe (UW)
Eared grebe (DW, UW)
Clark's grebe (DW, UW)

PELICANS
American white pelican (DW, UW)

CORMORANTS
Double-crested cormorant (DW, UW)

HERONS, and EGRETS
Great blue heron (DW, UW)
Great egret (DW, UW)
Snowy egret (DW, UW)
Cattle egret (DW, UW)
Black-crowned night-heron (DW, UW)

IBISES
White-faced ibis (DW, UW)

HAWKS and EAGLES
Bald eagle (DW, UW)
Swainson's hawk (NP, OC, WV)
Red-tailed hawk (NP, OC, WV)
Ferruginous hawk (NP, OC, WV)
Rough-legged hawk (NP, OC, WV)
Golden eagle (NP, OC, WV)

FALCONS
American kestrel (NP, OC, WV)
Merlin (NP, OC, WV)
Peregrine falcon (DW, UW, NP, OC, WV)
Prairie falcon (NP, OC, WV)

RAILS
Virginia rail (DW, UW)
Sora (DW, UW)
American coot (DW, UW)

CRANES
Whooping crane (DW, UW)

PLOVERS
Semipalmated plover (DW, UW)
Killdeer (DW, UW)

SANDPIPERS and PHALAROPES
Greater yellowlegs (DW, UW)
Lesser yellowlegs (DW, UW)
Willet (DW, UW)
Spotted sandpiper (DW, UW)
Sanderling (DW, UW)
Semipalmated sandpiper (DW, UW)
Least sandpiper (DW, UW)
White-rumped sandpiper (DW, UW)
Pectoral sandpiper (DW, UW)
Stilt sandpiper (DW, UW)
Short-billed dowitcher (DW, UW)
Long-billed dowitcher (DW, UW)

Wilson's snipe (DW, UW)
Red-necked phalarope (DW, UW)

GULLS and TERNS
Ring-billed gull (DW, UW)
California gull (DW, UW)
Herring gull (DW, UW)
Common tern (DW, UW)
Forster's tern (DW, UW)

DOVES
Mourning dove (NP, OC, WV)

TYPICAL OWLS
Snowy owl (NP, OC, WV)
Short-eared owl (NP, OC, WV)

NIGHTJARS
Common nighthawk (NP, OC, WV)

TYRANT FLYCATCHERS
Say's phoebe (NP, OC, WV)
Western kingbird (NP, OC, WV)
Eastern kingbird (NP, OC, WV)

SHRIKES
Loggerhead shrike (NP, OC, WV)
Northern shrike (NP, OC, WV)

MAGPIES
Black-billed magpie (NP, OC, WV)

LARKS
Horned lark (NP, OC, WV)

SWALLOWS
Tree swallow (DW, UW, NP, OC, WV)
Northern rough-winged swallow (DW, UW)
Bank swallow (DW, UW, NP, OC, WV)
Cliff swallow (NP, OC, WV)
Barn swallow (NP, OC, WV)

WRENS
Sedge wren (DW, UW, NP, OC, WV)
Marsh wren (DW, UW)

THRUSHES
Mountain bluebird (NP, OC, WV)

WAGTAILS and PIPITS
American pipit (DW, UW)
Sprague's pipit (NP, OC, WV)

WOOD WARBLERS
Common yellowthroat (DW, UW, NP, OC, WV)

SPARROWS
American tree sparrow (NP, OC, WV)
Clay-colored sparrow (NP, OC, WV)
Field sparrow (NP, OC, WV)
Vesper sparrpw (NP, OC, WV)
Lark bunting (NP, OC, WV)
Savannah sparrow (NP, OC, WV)
Baird's sparrow (NP, OC, WV)
Le Conte's sparrow (DW, UW, NP, OC, WV)
Nelson's sharp-tailed sparrow (DW, UW, NP, OC, WV)
Swamp sparrow (DW, UW)
Lapland longspur (NP, OC, WV)
Snow bunting (NP, OC, WV)

CARDINALS, GROSBEAKS, and ALLIES
Dickcissel (NP, OC, WV)

BLACKBIRDS and ORIOLES
Red-winged blackbird (DW, UW, NP, OC, WV)
Yellow-headed blackbird (DW, UW, NP, OC, WV)
Brewer's blackbird (DW, UW, NP, OC, WV)
Common grackle (DW, UW, NP, OC, WV)

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[1]Indicates the habitat type(s) that will most often be used by each species on lands in the complex if this CCP's biological objectives are met (DW = developed wetlands; UW = undeveloped wetlands; NP = native prairie; OC = old cropfields; WV = planted and exotic woody vegetation).
[2]Species names in **bold** indicate those that presently nest on lands in the complex.

Appendix L: Long Lake NWR Complex Habitat Cover Type (Subclass) List

Habitat cover types used when classifying vegetative cover on all Long Lake NWR Complex fee-title lands between 2003 and 2006. All cover types were mapped at ≥0.25 acres, except leafy spurge and wetland areas that were mapped at any size.

System[1]	Subsystem[2]	Subclass[3]	NVCS[4]
Grass	Natural	native grasses/forbs >95%	V HD V A 5 N
Grass	Planted	native grasses/forbs >95%	V HD V A 5 C
Grass	Natural	native/non-native mix, natives >50%	V HD V A 5 N
Grass	Planted	native/non-native mix, natives >50%	V HD V A 5 C
Grass	Natural	non-native/native mix, non-natives >50%	V HD V A 5 N
Grass	Planted	non-native/native mix, non-natives >50%	V HD V A 5 C
Grass	Natural	non-native grasses/forbs >95%	V HD V A 5 N
Grass	Natural	smooth brome monotype	V HD V A 5 N c
Grass	Natural	crested wheatgrass monotype	V HD V A 5 N f
Grass	Planted	introduced cools season grasses and legumes (DNC)	V HD V A 5 C a
Grass	Natural	other weeds or undesirable plants ≥ 50%	
Grass	Natural	absinth wormwood ≥ 50%	V HD V A 5 N b
Grass	Natural	Canada thistle ≥ 50%	V HD V A 5 N b
Grass	Natural	leafy spurge ≥ 50%	V HD V B 2 N a
Shrub	Natural	silverberry >25%	V SD III B 2 N a
Shrub	Natural	western snowberry >25%	V SD III B 2 N a
Shrub	Natural	narrow-leaved meadowsweet >25%	
Shrub	Natural	other low deciduous shrubs >25%	
Shrub	Natural	unknown low deciduous shrub(s) >25%	
Shrub	Planted	unknown low deciduous shrub(s) >25%	
Shrub	Natural	buffaloberry >25%	V SD III B 2 N a
Shrub	Natural	chokecherry, juneberry, hawthorn association >25%	V SD III B 2 N a
Shrub	Natural	caragana >25%	V SD III B 2 N a
Shrub	Planted	caragana >25%	V SD III B 2 C
Shrub	Natural	rocky mountain juniper >25%	V SD III A 3 N a
Shrub	Natural	Russian olive >25%	V SD III A 4 N b
Shrub	Planted	Russian olive >25%	V SD III B 2 C
Shrub	Natural	willow >25%	V SD III B 2 N c
Shrub	Planted	other non-native shrubs, lilac, etc >25%	V SD III B 2 C
Shrub	Natural	other tall deciduous shrubs >25%	
Shrub	Planted	other tall deciduous shrubs >25%	
Shrub	Natural	other tall evergreen shrubs >25%	
Shrub	Planted	other tall evergreen shrubs >25%	
Shrub	Natural	unknown tall deciduous shrub(s) >25%	
Shrub	Planted	unknown tall deciduous shrub(s) >25%	
Shrub	Natural	unknown tall evergreen shrub(s) >25%	
Shrub	Planted	unknown tall evergreen shrub(s) >25%	
Woodland	Natural	cottonwood between 25% and 60%	V TD II B 2 N a
Woodland	Planted	cottonwood between 25% and 60%	V TD II B 2 C
Woodland	Natural	deciduous tree(s) between 25% and 60%	V TD II B 2 N a
Woodland	Planted	deciduous tree(s) between 25% and 60%	V TD II B 2 C
Woodland	Natural	dead tree(s) between 25% and 60%	

System[1]	Subsystem[2]	Subclass[3]	NVCS[4]
Woodland	Planted	dead tree(s) between 25% and 60%	
Woodland	Natural	elm, ash, hackberry association between 25% and 60%	V TD II B 2 N a
Woodland	Planted	elm, ash, hackberry association between 25% and 60%	V TD II B 2 C
Woodland	Natural	evergreen tree(s) between 25% and 60%	
Woodland	Planted	evergreen tree(s) between 25% and 60%	
Woodland	Natural	green ash, box elder, elm association between 25% and 60%	V TD II B 2 N a
Woodland	Planted	green ash, box elder, elm association between 25% and 60%	V TD II B 2 C
Woodland	Planted	mix of trees and tall shrubs between 25% and 60%	
Woodland	Natural	mixed evergreen and deciduous trees between 25% and 60%	V TD II C 3 N a
Woodland	Planted	mixed evergreen and deciduous trees between 25% and 60%	V TD II C 3 C
Woodland	Natural	other deciduous trees between 25% and 60%	
Woodland	Planted	other deciduous trees between 25% and 60%	
Woodland	Natural	other evergreen trees between 25% and 60%	
Woodland	Planted	other evergreen trees between 25% and 60%	
Woodland	Natural	unknown deciduous tree(s) between 25% and 60%	
Woodland	Planted	unknown deciduous tree(s) between 25% and 60%	
Woodland	Natural	unknown evergreen tree(s) between 25% and 60%	
Woodland	Planted	unknown evergreen tree(s) between 25% and 60%	
Forest	Natural	cottonwood >60%	V TD I B 2 N a
Forest	Planted	cottonwood >60%	V TD I B 2 C
Forest	Natural	deciduous tree(s) >60%	V TD I B 2 N a
Forest	Planted	deciduous tree(s) >60%	V TD I B 2 C
Forest	Natural	dead tree(s) >60%	
Forest	Planted	dead tree(s) >60%	
Forest	Natural	elm, ash, hackberry association >60%	V TD I B 2 N a
Forest	Planted	elm, ash, hackberry association >60%	V TD I B 2 C
Forest	Natural	evergreen tree(s) >60%	
Forest	Planted	evergreen tree(s) >60%	
Forest	Natural	green ash, box elder, elm association >60%	V TD I B 2 N a
Forest	Planted	green ash, box elder, elm association >60%	V TD I B 2 C
Forest	Planted	mixed evergreen and deciduous trees >60%	V TD I C 3 C
Forest	Planted	mix of trees and tall shrubs >60%	
Forest	Natural	other deciduous trees >60%	
Forest	Planted	other deciduous trees >60%	
Forest	Natural	other evergreen trees >60%	
Forest	Planted	other evergreen trees >60%	
Forest	Natural	unknown deciduous tree(s) >60%	
Forest	Planted	unknown deciduous tree(s) >60%	
Forest	Natural	unknown evergreen tree(s) >60%	
Forest	Planted	unknown evergreen tree(s) >60%	
Crop	Planted	bare soil crop field	V HD V D 2 C
Crop	Planted	fallow crop field	V HD V D 2 C
Crop	Planted	row crop	V HD V D 2 C
Crop	Planted	small grain crop	V HD V D 2 C
Wetland		lake	
Wetland		riverine	
Wetland		semipermanent	
Wetland		seasonal	

System[1]	Subsystem[2]	Subclass[3]	NVCS[4]
Wetland		temporary	
Wetland		other wetland area	
Barren		bare soil	
Barren		beach - mud	
Barren		beach - gravel	
Barren		beach/sand bar	
Barren		blow-out	
Barren		headquarters/infrastructure	
Barren		paved road	
Barren		gravel road/trail	
Barren		gravel pit	
Barren		wildfire area	

[1] System – General vegetation type category.
[2] Subsystem – Natural (naturally occurring vegetation) or planted (vegetation intentionally planted by humans).
[3] Subclass – Most habitat cover types can be cross-walked into the National Vegetation Classification System.
[4] NVCS – National Vegetation Classification System.

Appendix M: Refuge Operating Needs System

Project #	Station	Project Title	Cost Estimate (1000s) First Year Need	Personnel FTE	Recurring Annual Need (1000s)
96011	LNL NWR	Expand Integrated Pest Management to Biologically Address Invasive Species Control Problems	$128	1.0	$63
96038	LNL NWR	Provide Station Support Services Addressing Six Priority Public (Outdoor Recreation Planner)	$140	1.0	$75
98019	LNL NWR	Provide station data analysis capability through technical support (GIS/ADP Biologist)	$154	1.0	$89
96004	LNL NWR	Reduce Resource Losses to Disease by Enhancing Monitoring and Disease Control (Biological Technician)	$128	1.0	$63
96043	LNL NWR	Protect Refuge Water Rights by Completing Essential Area Capacity Study/Evaluation	$164		$10
96030	LNL NWR	Native prairie restoration through focused prescribed fire application (Fire Management Officer)	$154	1.0	$89
98001	LNL WMD	Easement mapping and enforcement assistance to address mandates and resource protection needs (Biologist)	$128	1.0	$63
96002	LNL WMD	Initiate essential resource inventory and accelerate adaptive management (Biologist)	$154	1.0	$89
99001	LNL WMD	Address Essential Visitor Safety and Resource Protection (Law Enforcement Officer)	$140	1.0	$75
98025	LNL WMD	Enhance satellite refuge management capability (Refuge manager)	$140	1.0	$75
99002	LNL WMD	Address essential administrative operations and functions (Administrative assistant)	$123	1.0	$58
96015	LNL WMD	Develop water resources and wetland habitats across WMD by providing essential heavy equipment	$159		$10
98015	SLD NWR	Develop on-site management capability on Slade NWR (Refuge Manager)	$140	1.0	$75
00002	SLD NWR	Develop essential refuge maintenance capability for Slade NWR (Maintenance Worker)	$128	1.0	$64
00001	SLD NWR	Convert Slade NWR Tame grass to mixed grass prairie	$65		$25
98014	SLD NWR	Monitor water supply and contaminant threats to Slade NWR due to adjacent irrigation pivot irrigation	$71		$25

Project #	Station	Project Title	Cost Estimate (1000s) First Year Need	Personnel FTE	Recurring Annual Need (1000s)
96023	LNL NWR	Construct Concrete Emergency Spillways for Access and Flood Management	$505		$20
04001	LNL NWR	Develop walking trails and auto tour route	$358		$8
96018	LNL NWR	Provide Grassland Management Equipment Building to Increase Longevity of Service	$124		$7
96037	LNL NWR	Gage and Monitor Refuge Water Inflow and Discharge to Protect Refuge Water Rights	$112		$35
98016	LNL NWR	Monitor Critical Refuge Aquatic Resources to Evaluate Habitat Condition and Guide Water Management	$98		$10
00014	LNL NWR	Develop Refuge Low Level Water Management Capability by Constructing Outlet Water Control Structure	$440		$10
00012	LNL NWR	Develop Water Management Capability by Constructing Unit 3 Pumping Station Facility	$290		$15
00013	LNL NWR	Develop Water Management Capability by Constructing Unit 2 Pumping Station Facility	$290		$15
98029	LNL NWR	Create Predator Exclusion - Convert Pintail Point to Island	$105		$5
98028	LNL NWR	Create Predator Exclusion - Convert East Peninsula to Island	$126		$2
00010	LNL NWR	Purchase Aircraft to Conduct Aerial Surveys of Habitats and Populations in North Dakota	$290		$20
98018	LNL NWR	Develop Moist-Soil Units to Increase Migratory Bird Support Capability by Constructing New Levees	$342		$14
96000	LNL NWR	Develop Dikes and Water Control Structures to Increase Freshwater Wetland Habitat	$442		$15
96035	LNL NWR	Enhance Refuge Waterfowl Recruitment by Constructing Secure Long-Term Nesting Islands	$200		$20
96040	LNL NWR	Initiate Drinking Water Monitoring Program to Meet Agency and Environmental Mandates and Public Safety	$23		$4
00005	LNL NWR	Provide Complex Fire Program Mission Support Identified in Approved Fire Management Plan	$205		$30
00006	LNL NWR	Acquire GIS Computer, Software, and Digital Data to Support Station Decisions and Planning	$88		$13
96039	LNL NWR	Support Essential Fire Protection and Fire Program Activities by Providing a Hydrant Water Supply	$26		$2
96001	LNL NWR	Address Watershed Management Needs by Improving Water Management Facilities	$320		$40
96029	LNL NWR	Enhance Seasonal Support of Refuge Mission by Providing Temporary Quarters	$132		$7
03000	LNL NWR	Provide Law Enforcement Officer to Achieve Full Deployment Needs of Full Time Officers	$142		$71
00008	LNL NWR	Locate All Real Property Developments With Global Position Coordinates for Database Tracking	$26		$1

Project #	Station	Project Title	Cost Estimate (1000s) First Year Need	Personnel FTE	Recurring Annual Need (1000s)
96026	LNL WMD	Enhance WMD Visitor Services/Outreach by Developing Essential Promotional/Informational Guides	$58		$4
98012	LNL WMD	Conduct Habitat/Wildlife Use Surveys to Guide Management Decisions	$44		$10
98007	LNL WMD	Determine Population Status of Emphasis Species by Conducting Systematic WMD Survey	$75		$30
98008	LNL WMD	Conduct Annual Survey of Colonial Nesting Bird Colonies in WMD to Develop Population Information	$37		$15
96034	LNL WMD	Improve Transport Logistics for Managing WPAs by Purchasing a Transport Truck with Tilt Trailer	$97		$5
96020	LNL WMD	Increase Prairie Management Capability by Providing Fencing and Water Development	$227		$25
96021	LNL WMD	Enhance Mixed Grass Prairie Management Capability by Providing Essential Real Property Improvements	$121		$121
98013	LNL WMD	Conduct Complex-wide Qualitative and Quantitative Floristic Survey/Documentation	$34		$7
96033	LNL WMD	Support Easement Enforcement by Obtaining Easement Tract Photos	$24		$3
96010	LNL WMD	Support Management and Administration of WPAs and Easements by Acquiring Aerial Photo Coverage	$68		$3
96008	LNL WMD	Conduct Cultural Resource Inventories to Assist in Identification and Preservation of Significant Resources	$59		0
96045	LNL WMD	Provide User Friendly Public Use Facilities and Program Focus Through Enhanced Fabrication Capability	$106		$33
98011	LNL WMD	Support Priority Public Uses on Select WPAs by Developing Access Approaches, Lanes and Parking Areas	$81		$10
98009	LNL WMD	Strategically Increase Waterfowl Recruitment by Managing WMD Islands, Peninsulas, and Barrier Areas	$57		$13
96009	LNL WMD	Address Universal Hunting Access Issues by Providing Accessible Blind	$76		$10
98003	LNL WMD	Protect Service Water Rights - Initiate Study on Effects of Pivot Ground Water Withdrawal on Surface Wetlands	$123		$10
96042	LNL WMD	Address Enforcement and Management Problems on Identified WPAs Through Benchmark Establishment	$65		0
96016	LNL WMD	Address Waterfowl Production Limiting Factors by Placing Nesting Culverts on Targeted WPAs	$103		$10
96036	LNL WMD	Mitigate Low Waterfowl Recruitment in High Pair Zones by Providing Secure WMD Nesting Islands	$200		$20
98002	LNL WMD	Provide Logistical Support for WMD Habitat Development by Purchasing a Semi-Tractor/Trailer	$162		$10
98010	LNL WMD	Provide WMD (Remote) Logistical Maintenance Support Capability by Acquiring a Maintenance Vehicle	$54		$5

Project #	Station	Project Title	Cost Estimate (1000s) First Year Need	Personnel FTE	Recurring Annual Need (1000s)
98023	LNL WMD	Increase Migratory Bird Resource Support by Developing Levees on Adams WPA	$140		$10
98026	LNL WMD	Develop Consistent, Reliable Access to Guthmiller WPA to Aid Management and Public Use	$24		$2
98027	LNL WMD	Develop Consistent, Reliable Access To Sisco-Fallgaeter WPA to Aid Management and Public Use	$35		$2
98020	LNL WMD	Increase Snow Goose Issue Awareness and Increase Harvest Opportunity	$22		$5
98021	LNL WMD	Increase Migratory Bird Resource Support by Developing Impoundment on Schiermeister WPA	$173		$10
96031	LNL WMD	Address Disease Control (Avian Botulism) Carcass Disposal Needs by Providing Mobile Incinerator	$29		$2
98022	LNL WMD	Increase Migratory Bird Resource Support by Developing Levees on Schauer WPA	$151		$10
00011	SLD NWR	Provide Equipment to Address Invasive Species Threat to Refuge Uplands	$66		$13
00004	SLD NWR	Provide Slade NWR Basic Daily Operations Equipment	$381		$20

*LNL is Long Lake; SLD is Slade

Appendix N: Maintenance Management System

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
LNL WMD	Replace 10 miles of deteriorated WPA fence	$55	00105967
LNL WMD	Replace 10 miles of deteriorated WPA fence	$60	00105968
LNL WMD	Replace 10 miles of deteriorated WPA fence	$60	00105969
SLD NWR	Construct Office/Shop	$835	00110656
LNL NWR	Replace worn forklift	$50	00105920
LNL WMD	Replace 10 miles of deteriorated WPA fence	$60	00105970
LNL WMD	Replace 10 miles of deteriorated WPA fence	$60	00105971
LNL NWR	Provide Complex Fire Program Mission Support Identified in Approved Fire Mgmt Plan	$216	00123546
LNL NWR	Rehabilitate well and water lines to Q-14 and old office/temporary Quarters	$35	00105922
FCL NWR	Replace 5 Miles of Florence Lake NWR Fence	$35	00105972
FCL NWR	Replace 5 Miles of Florence Lake NWR Fence	$30	00105973
FCL NWR	Replace 5 Miles of Florence Lake NWR Fence	$30	00105974
SLD NWR	Replace 5 Miles of Slade NWR Fence	$35	00105975
SLD NWR	Replace 5 Miles of Slade NWR Fence	$30	00105976
SLD NWR	Replace 5 Miles of Slade NWR Fence	$30	00105977
LNL NWR	Develop Water Management Capability by Constructing Unit 3 Pumping Station Facility	$303	00123562
LNL NWR	Replace 7.5 miles of Long Lake NWR Fence	$46	00105979
LNL NWR	Develop Water Management Capability by Constructing Unit 2 Pumping Station Facility	$303	00123565
LNL NWR	Replace 7.5 miles of Long Lake NWR Fence	$46	00105980
LNL NWR	Replace 7.5 miles of Long Lake NWR Fence	$46	00105981
LNL NWR	Replace 7.5 miles of Long Lake NWR Fence	$46	00105982
LNL WMD	Rehab Small WPA Interpretive Foot Trail	$60	00105984
LNL NWR	Repair Quarters 140	$50	00105987
LNL WMD	Repair Rath WPA Islands	$30	01114916
LNL WMD	Repair Sisco-Fallgaeter WPA Island	$30	01114931
LNL WMD	Repair Thacker WPA Island	$30	01114940

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
LNL WMD	Repair Almer WPA Island	$30	01114946
LNL WMD	Repair PDL-1D WPA Island	$30	01114951
LNL NWR	Repair Schauer WPA Islands	$30	01114959
LNL WMD	Repair Rath WPA 79 Acre Impoundment	$70	01114969
LNL NWR	Replace Polaris four wheeler	$6	01115411
LNL NWR	Replace Bombardier Four Wheeler	$6	01115481
LNL NWR	Replace 350HP Airboat	$31	01115493
LNL NWR	Replace 350/400HP Airboat	$25	01115503
LNL NWR	Replace grass drill	$16	01115538
LNL NWR	Replace no till grass drill	$16	01115550
LNL NWR	Replace water control pump	$30	01115696
LNL NWR	Replace Power Plant Generator	$15	01115698
LNL NWR	Replace worn road grader	$190	01115707
LNL NWR	Replace worn Bobcat	$26	01115710
LNL NWR	Replace worn 1993 Sickle Bar Mower	$5	01115717
LNL NWR	Replace incinerator	$10	01115722
LNL NWR	Replace JD Rotary Mower	$10	01115728
LNL NWR	Replace worn riding lawn mower	$15	01115745
LNL NWR	Replace worn Garden Tractor	$13	01115750
LNL NWR	Replace worn 1992 Lawn Tractor	$15	01115754
LNL NWR	Replace worn 1992 Farm Tractor	$85	01115755
LNL NWR	Replace Pulvi-Mulcher	$10	01115833
LNL NWR	Replace outdated worn fire equipment	$21	01115840
LNL NWR	Replace 52 Pumper Unit	$21	01115865
LNL NWR	Replace worn Snowmobile	$6	01115874
LNL NWR	Replace Implement Sprayer	$8	01115876
LNL NWR	Replace Pickup Sprayer	$6	01115879
LNL NWR	Replace Cat Dozer	$95	01115883

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
LNL NWR	Replace worn JD Tractor	$25	01115887
LNL NWR	Replace JD Tractor with Loader (7710)	$96	01115892
LNL NWR	Replace worn trailer	$11	01115897
LNL NWR	Replace worn trailer	$37	01115901
LNL NWR	Replace worn heavy equipment trailer	$37	01115903
LNL NWR	Replace worn wetliner	0	01116088
LNL NWR	Replace worn Ford pickup	$31	01116093
LNL NWR	Replace worn Dodge 4X4 pickup	$31	01116095
LNL NWR	Replace worn maintenance truck	$37	01116098
LNL NWR	Replace Dump truck	$93	01116114
LNL NWR	Replace Semi-tractor	$81	01116115
LNL NWR	Replace Dodge Pickup	$28	01116125
LNL NWR	Replace Dodge Spray truck	$31	01116129
LNL NWR	Replace Chevy Tahoe	$31	01116166
LNL NWR	Replace Jeep Wrangler Nest Searching Vehicle	$26	01116168
LNL NWR	Replace Jeep Wrangler Nest Searching Vehicle	$26	01116171
LNL NWR	Replace 1993 Chevy Surburban	$34	01116174
LNL NWR	Replace Polaris Sportsman 500 four wheeler	$6	01116208
LNL NWR	Replace worn snowblower	$8	01116230
LNL NWR	Replace outdated and worn implement disc	$7	01116236
LNL NWR	Replace obsolete cultivator	$7	01116240
LNL WMD	CN (Rte 103-105, 2.1 Mi, Parking lots 903-910)	$1100	02120118
LNL WMD	PE (Rte 103-105, 2.1 Mi, Parking lots 903-910)	$104	02120156
LNL WMD	CN (Rte 100-102, 2.3Mi, Parking lots 900-902, 904)	$1100	02120163
LNL NWR	PE 5 roads, 5 parking areas (Routes 10, 11, 100-103, 900-903, 910; 10.2 mi)	0	02120191
LNL NWR	CN 5 roads, 5 parking areas (Routes 10, 11, 100-103, 900-903, 910; 10.2 mi)	$365	02120236
LNL WMD	PE (Rte 100-102, 2.3Mi, Parking lots 900-902, 904)	$104	02120243
LNL WMD	Repair East Lost Lake Dam #2	$35	02120282

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
LNL NWR	Repair G-19a Dam	$30	02120290
LNL NWR	Repair G-19 dam	$28	02120296
LNL NWR	Replace 2002 Dodge Pickup	$24	02120613
LNL NWR	Repair East Courtyard Rockwork	$40	03126846
LNL WMD	Construct iosks	$113	03130765
LNL NWR	Replace unsafe maintenance shop	$420	03126912
LNL NWR	Construct vehicle cold storage shed	$144	03126915
LNL NWR	Replace 2003 Chevy pickup	$22	03127090
LNL NWR	Replace 2003 Chevy pickup	$22	03127091
LNL NWR	Replace 2003 Ford crew cab	$35	03127094
LNL NWR	Replace 2002 550 Ford Fire Truck (#275)	$33	03127102
LNL NWR	Replace 2001 550 Ford Fire pickup	$33	03127103
LNL NWR	Replace 2002 52 Pumper Unit	$21	03127104
LNL NWR	Replace Wishek 12' Disk	$14	03127105
LNL NWR	Replace 2002 Polaris 4x4 Ranger	$8	03127107
LNL NWR	Replace 2002 Polaris 4X4 Ranger	$8	03127108
LNL NWR	Replace Storage building	$256	04133791
LNL NWR	Repair/Rehab Old Refuge Headquarters for use as visitor center	$275	04133795
LNL NWR	Replace Red Honda ATV	$5	04133804
LNL NWR	Replace 2003 yellow Honda ATV	$5	04133806
LNL NWR	Replace Type 4 Model 52 Unit (frieghtliner)	$44	04133815
LNL NWR	Replace 2003 Chevy crew cab	$24	04133818
LNL NWR	Replace Freightliner truck used for water transport	$69	04133819
LNL NWR	Replace 2003 Honda ATV Rancher	$5	04133824
LNL NWR	Replace Zone LEO Chevy Tahoe	0	05139499
LNL NWR	Repair Springwater NWR Dam	$235	05137382
LNL NWR	Replace Heating System in Headquarter Office	$28	05138269
LNL NWR	Replace electrical and plumbing Maintenance Shop	$75	05138271

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
LNL NWR	Repair Sunburst Low hazard Dam	$26	05138274
LNL NWR	Replace 2004 JD Payloader	$105	05138304
LNL NWR	Replace Zone LEO Chevy Tahoe	$34	05139498
LNL NWR	Rehab Unit 2 Marsh dike	$80	92105949
LNL NWR	Rehabilitate Equipment Storage Freeze Protection System	$60	93109662
LNL NWR	Rehabilitate public use area	$60	93105950
LNL NWR	Rehabilitate oil and paint storage building	$30	93105928
LNL NWR	Repair artesian well	$30	93105929
LNL NWR	Replace Residence Heating Systems	$31	94105930
LNL NWR	Rehabilitate the "B" dike spillway	$35	94105951
LNL NWR	Repair access road to east peninsula	$150	94105953
LNL NWR	Replace worn transport trailer	$50	95105934
LNL NWR	Construct "D" Dike	$1298	96109814
LNL NWR	Provide Grassland Management Equipment Building to Increase Longevity of Service	$131	96123567
LNL WMD	Enhance WMD Visitor Services/Outreach by Developing Vistor Contact Station	$61	96123854
LNL NWR	Increase Refuge Mission Support Capability by Expanding Office Space	$654	96110662
LNL NWR	Enhance Refuge Wildlife-Oriented Rec. Opp. by Developing Refuge Interpretive Trail	$179	96123851
LNL WMD	Provide Fabrication Shop Facility	$111	96123547
LNL NWR	Replace flatbed/grain truck	$86	97105965
LNL NWR	Replace badly worn dump truck	$77	97105935
LNL NWR	Replace septic system	$30	97105936
LNL NWR	Repair sewage treatment system for office/HDQ facility	$35	97105937
LNL NWR	Replace sewer lines	$30	97105938
LNL NWR	Replace HDQ office/residence exterior sewer lines	$30	97105939
LNL NWR	Replace interior plumbing in residence #14 and temp quarters #16	$30	97105940
LNL NWR	Enhance Visitor Services Through Development of Refuge Vistor Contact Station	$90	98123853
LNL NWR	Replace Large Refuge Recognition Signs	$38	98105942
LNL NWR	Dev. Moist-Soil Units to Increase Mig. Bird Support Capability by Const. New Levees	$357	98123564

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
LNL WMD	Increase Migratory Bird Resource Support by Developing Levees on Adams WPA	$146	98123571
LNL NWR	Outlet/Drawdown for Long Lake - Phase I [p/d]	$710	98110272
LNL NWR	Outlet/Drawdown for Long Lake - Phase II (c)	$2088	98110543
LNL WMD	Develop Consistent, Reliable Access to Sisco-Fallgaeter WPA to Aid Mgmt and Pub. Use	$123	98123569
LNL NWR	Enhance Pub. Use Fac. & Promote Visitation in Conjunction with Lewis & Clark Bicentennial	$64	99123622

**LNL is Long Lake; SLD is Slade; FCL is Florence Lake*

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