Comprehensive Conservation Plan

Long Lake National Wildlife Refuge Complex

September 2006

Prepared by the U.S. Fish and Wildlife Service

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Long Lake National Wildlife Refuge Complex

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Acronyms and Abbreviations

BBS	North American Breeding Bird Survey
botulism	avian botulism
BRD	Biological Resources Division
CCP	comprehensive conservation plan
CFR	Code of Federal Regulations
CRP	Conservation Reserve Program
CWD	chronic wasting disease
Delta	Delta Waterfowl Foundation
DNC	dense nesting cover
Duck Stamp Act	Migratory Bird Hunting and Conservation Stamp Act
DWG	Dakota Working Group
EA	environmental assessment
EO	executive order
GIS	geographic information system
FmHA	Farmers Home Administration
FONSI	finding of no significant impact
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
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
NWR or refuge	national wildlife refuge
PPJV	Prairie Pothole Joint Venture
PPR	Prairie Pothole Region

refuge complex	Long Lake National Wildlife Refuge Complex
Refuge System	National Wildlife Refuge System
RLGIS	refuge lands geographic information system extension
RONS	refuge operations needs system
Service or USFWS	U.S. Fish and Wildlife Service
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 structure
WDA	wildlife development area
WHSRN	Western Hemisphere Shorebird Reserve Network
WMD or district	wetland management district
WPA	waterfowl production area

Summary

Long Lake National Wildlife Refuge Complex (refuge complex) oversees management of three national wildlife refuges: Long Lake National Wildlife Refuge (NWR or refuge), Slade NWR, and Florence Lake NWR, and a three-county wetland management district (WMD or district), which consists of 78 waterfowl production areas and one wildlife development area in Burleigh, Emmons, and Kidder counties in south-central North Dakota, as well as conservation easements that protect approximately 147,000 acres. The district continues 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.)

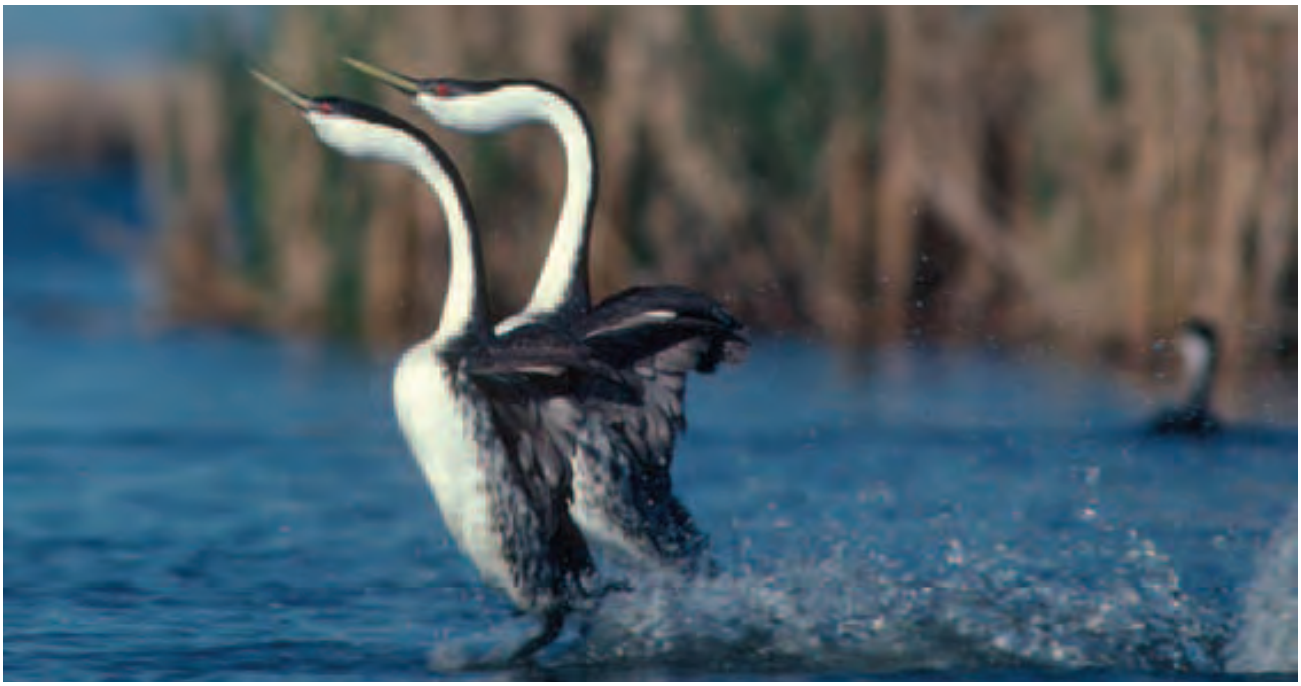
The refuge is located in south-central North Dakota in an area famous for its wealth of waterfowl-producing prairie potholes. Long Lake NWR is 22,310 acres in size and consists of approximately 15,000 acres of brackish to saline marsh and lake, 1,000 acres of other wetlands, and about 6,000 acres of 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 use 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 lands 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 refuge 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 that were formed by glacial action. Habitat centers around five semipermanent and



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Western Grebe

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 Long Lake WMD 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 district contains 1,036 perpetual wetland easement contracts, which protect 102,646 acres; 93 perpetual grassland easement contracts, which protect 41,181 acres; 16 Farmers Home Administration perpetual easements, which protect 669 wetland acres and 2,759 upland acres; one wildlife development area (Garrison Diversion Unit mitigation tract) totaling 794 acres; and 78 waterfowl production areas 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 (Service) for habitat 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.

USFWS

Bobolink

The 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." (This purpose statement was developed for all Region 6 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."

LONG LAKE NATIONAL WILDLIFE REFUGE COMPLEX VISIONS 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 refuge complex staff achieve the vision.

Visions

Long Lake National Wildlife Refuge

The echo of the sandhill cranes through 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 and appreciation of the mixed-grass prairie ecosystem and the mission of the National Wildlife Refuge System.

Florence Lake National Wildlife Refuge

A classic prairie pothole landscape, Florence Lake NWR provides a unique perspective of presettlement 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 NWR serves as a reference area for northern prairie ecosystems with ongoing restoration, monitoring, and research.

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.

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 and women, 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 contribute financially and physically to ensure a broad base of support so that quality habitats can be conserved.

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Wetlands at Long Lake NWR.

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 refuge complex to connect staff, visitors, and the community to the area's past.

Refuge Operations
Through effective communication and innovative technology, secure and efficiently use 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.

DECISION MADE

Based on the analysis document in the environmental assessment, the Service's regional director for Region 6 (Mountain–Prairie Region) chose the following scheme (alternative D of the draft comprehensive conservation plan and environmental assessment for the refuge complex) to manage the refuge complex for the next 15 years and achieve the above goals.

Target Species Group-level Modified Management
The refuge complex staff will engage in intensive upland and wetland management, where warranted in the refuge complex. Management objectives for particular tracts (i.e., NWR, waterfowl production areas) are based on fulfilling the life needs of a group 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., developed wetlands) are based on a compromised universal benefit concerning particular life needs of multiple wildlife groups.

Public use and environmental education and interpretation opportunities (e.g., increased hunting and fishing opportunities, additional environmental learning facilities and programs, increased interpretive signage) will be maximized to the extent compatible with habitat and wildlife objectives. Changes in the refuge complex's research and monitoring, staffing, operations, and infrastructure will ultimately be required to accomplish these 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, and education and outreach.

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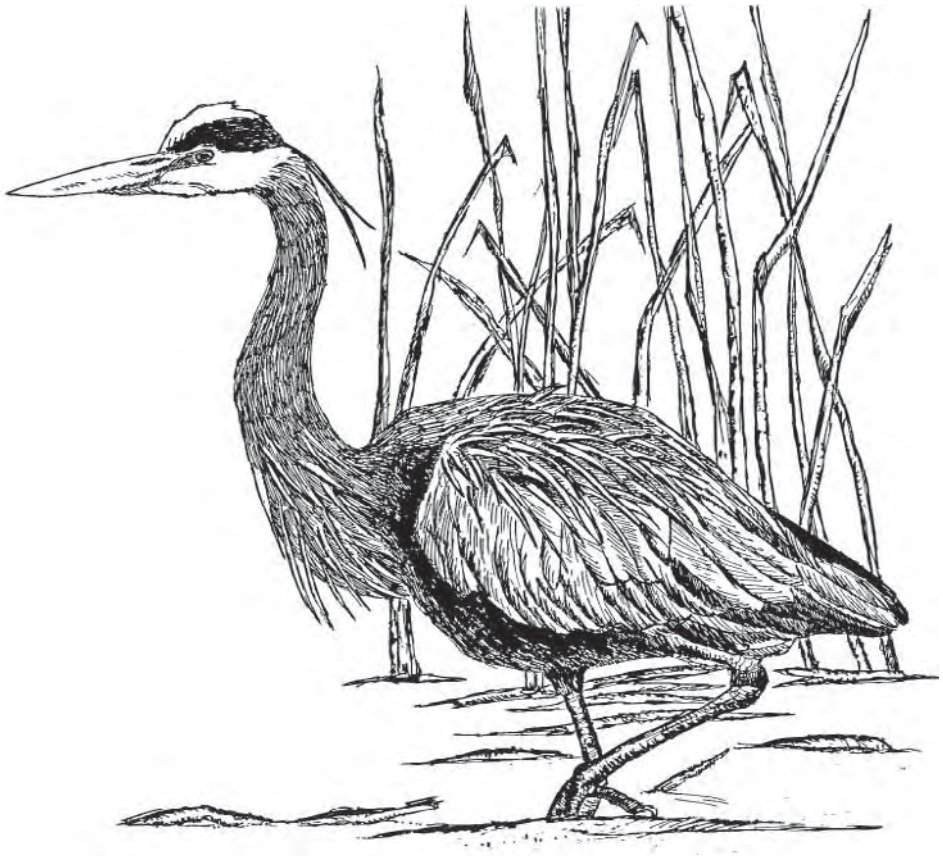
Environmental education at the refuge.

1 Purpose and Need



Great Blue Heron
Tom Kelley/USFWS

1 Purpose and Need

The refuge complex comprises Long Lake NWR, Slade NWR, Florence Lake NWR, and Long Lake WMD.

This comprehensive conservation plan (CCP) addresses management programs and actions for the entire refuge complex 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 visions and goals and the purposes of the refuge complex. Fish and wildlife and their habitats are the first priority in management of Service lands,whereas 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 refuge 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 addresses all significant issues while determining how best to achieve the intent and purposes of the refuge 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 CCP.

PURPOSE AND NEED FOR ACTION

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

- provide a clear statement of direction for the future management of the program;

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Geese on the frozen lake.

- 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 refuge complex's operational, maintenance, and capital improvement needs.

Perhaps the greatest needs of the Service are to build relationships with landowners and to communicate with the public and other partners 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 federal aid 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.

U.S. Fish and Wildlife 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 in the state and provides economic benefits, which are a result of the fishing, hunting, and wildlife observation and photography activities in the refuge 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 refuge complex.

The refuge complex employs eight full-time equivalent employees, with a current budget of $741,700. 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. Long Lake NWR has 10,000 visitors annually, while approximately 60,000 visitors use WPAs for recreation annually. Additionally, 997 volunteer hours are annually contributed to refuge 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). A substantial portion of the district is 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 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.

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Entrance sign to Long Lake NWR.

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 and 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 for the local communities that surround 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 refuge complex that will determine which public use activities do not interfere with the central mission of the Refuge System.

ECOSYSTEM DESCRIPTIONS AND THREATS

Central Flyway

The refuge complex is located in the Central Flyway, which is one of four administrative flyways in North America. 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, and 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 to 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 refuge 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

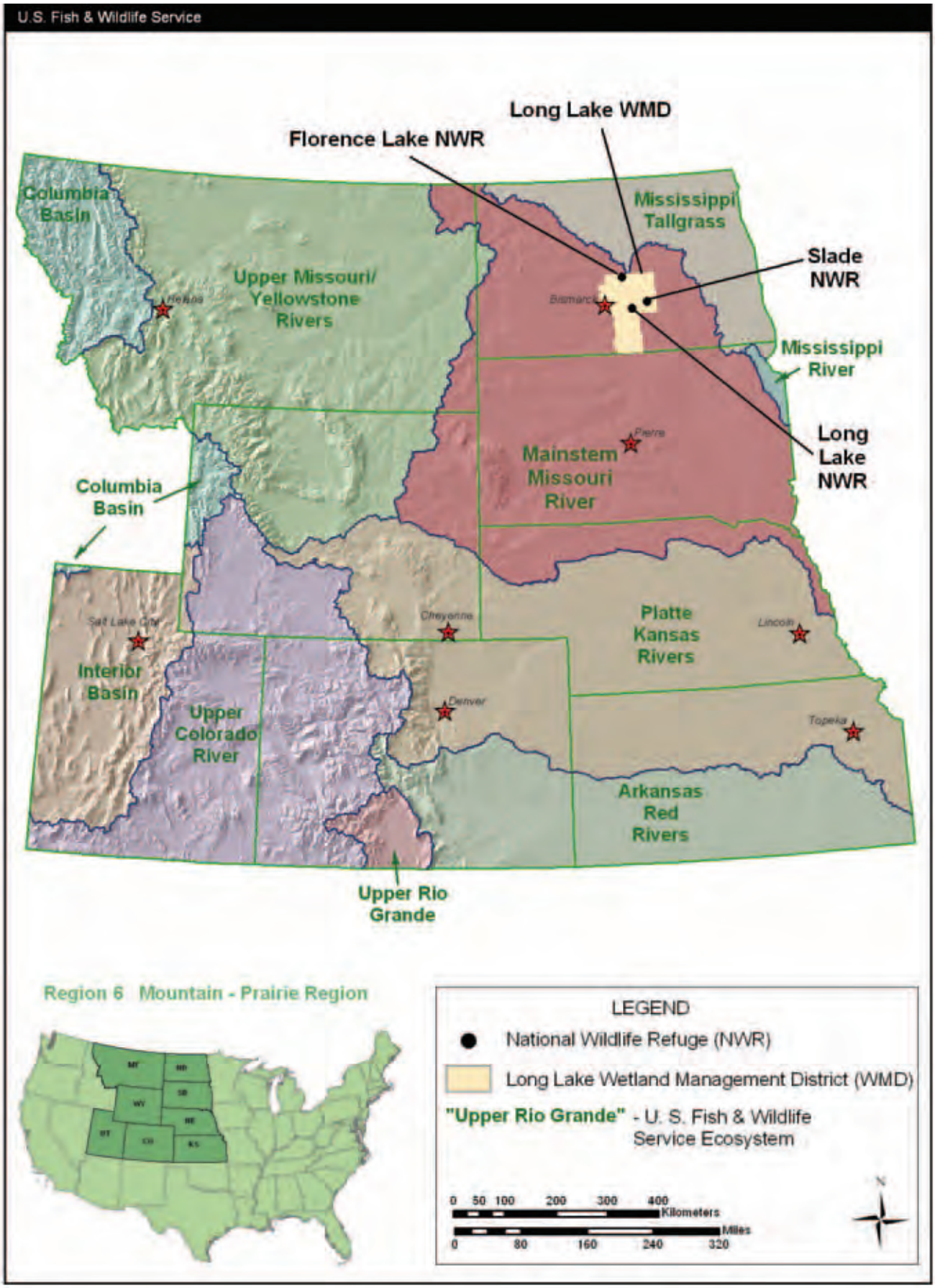


Figure 1. USFWS ecosystem map

USFWS

Wetlands of the Prairie Pothole Region.

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 participating entities have realized that they can achieve more through collaboration than 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 refuge complex is found in the Missouri River Ecosystem (see figure 1). 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 refuge 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 refuge complex.

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's and district's establishing authority and Improvement Act 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.

ESTABLISHMENT, ACQUISITION, AND MANAGEMENT HISTORY

The refuge complex oversees management of three refuges: Long Lake NWR, Slade NWR, Florence Lake NWR, and a three-county district, which consists of 78 WPAs and one WDA in Burleigh, Emmons, and Kidder counties in the south-central portion of the state, as well as conservation easements that protect approximately 147,000 acres. The 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 figure 2, location map and figure 3, Long Lake National Wildife Refuge 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 use refuge marshes during spring and fall migration periods.

A primary resource goal is to prevent, or at least manage, avian botulism (botulism), which has, on occasion, devastated migratory bird resources found in the refuge 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 year-round.

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 refuge 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 semipermanent and permanent wetlands and numerous other prairie potholes, which altogether total more than 900 wetland acres (see figure 4, Slade NWR 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 (see figure 5 Florence Lake NWR base map). 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 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 StampAct) 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 easement contracts, which protect 41,181 acres; 16 Farmers Home Administration (FmHA) perpetual easements, which protect 669 wetland acres and 2,759 upland acres, and one 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 (SUP) issued by the Service for habitat 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 NWR 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

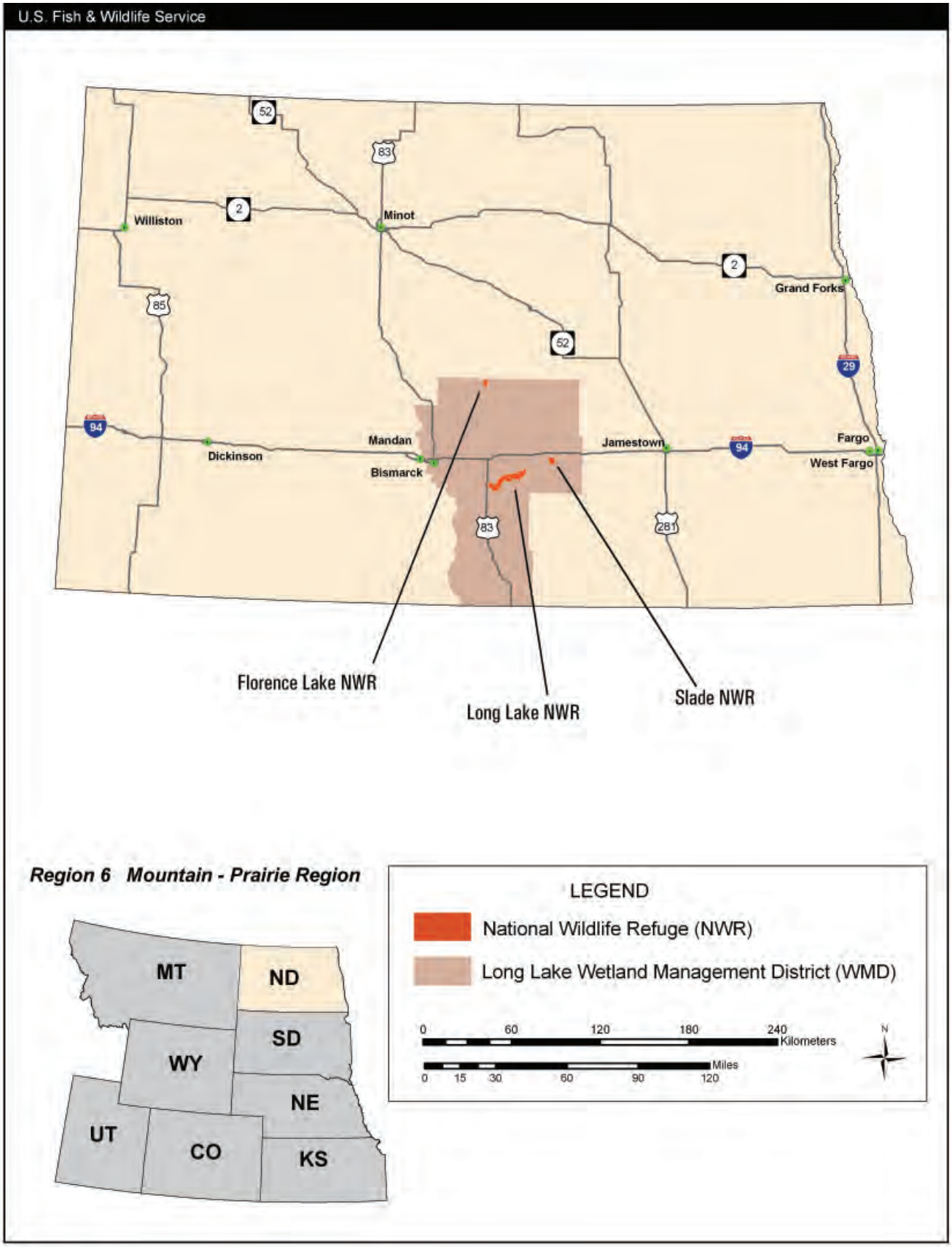


Figure 2. Location map

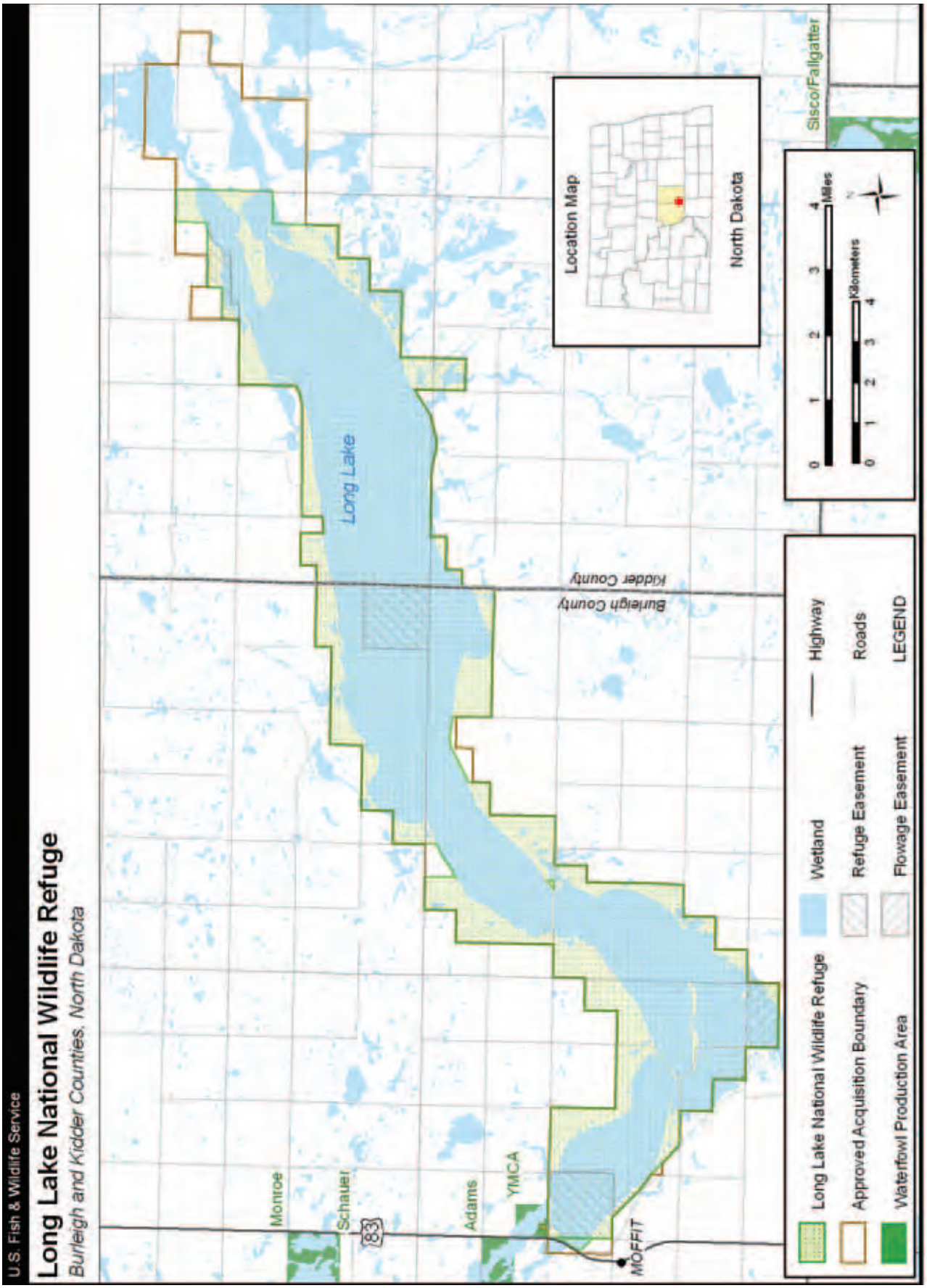


Figure 3. Long Lake National Wildlife Refuge base map

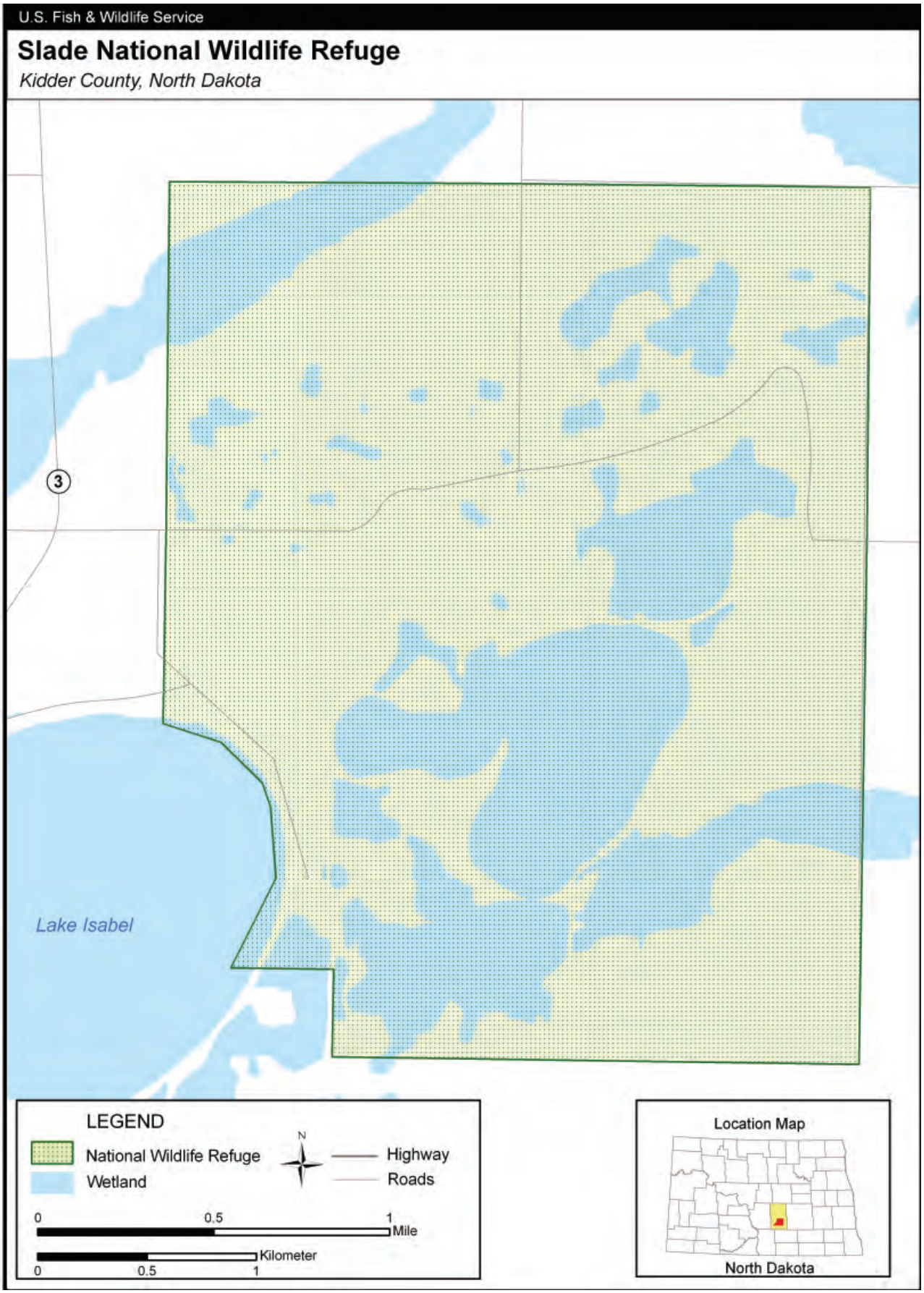


Figure 4. Slade National Wildlife Refuge base map

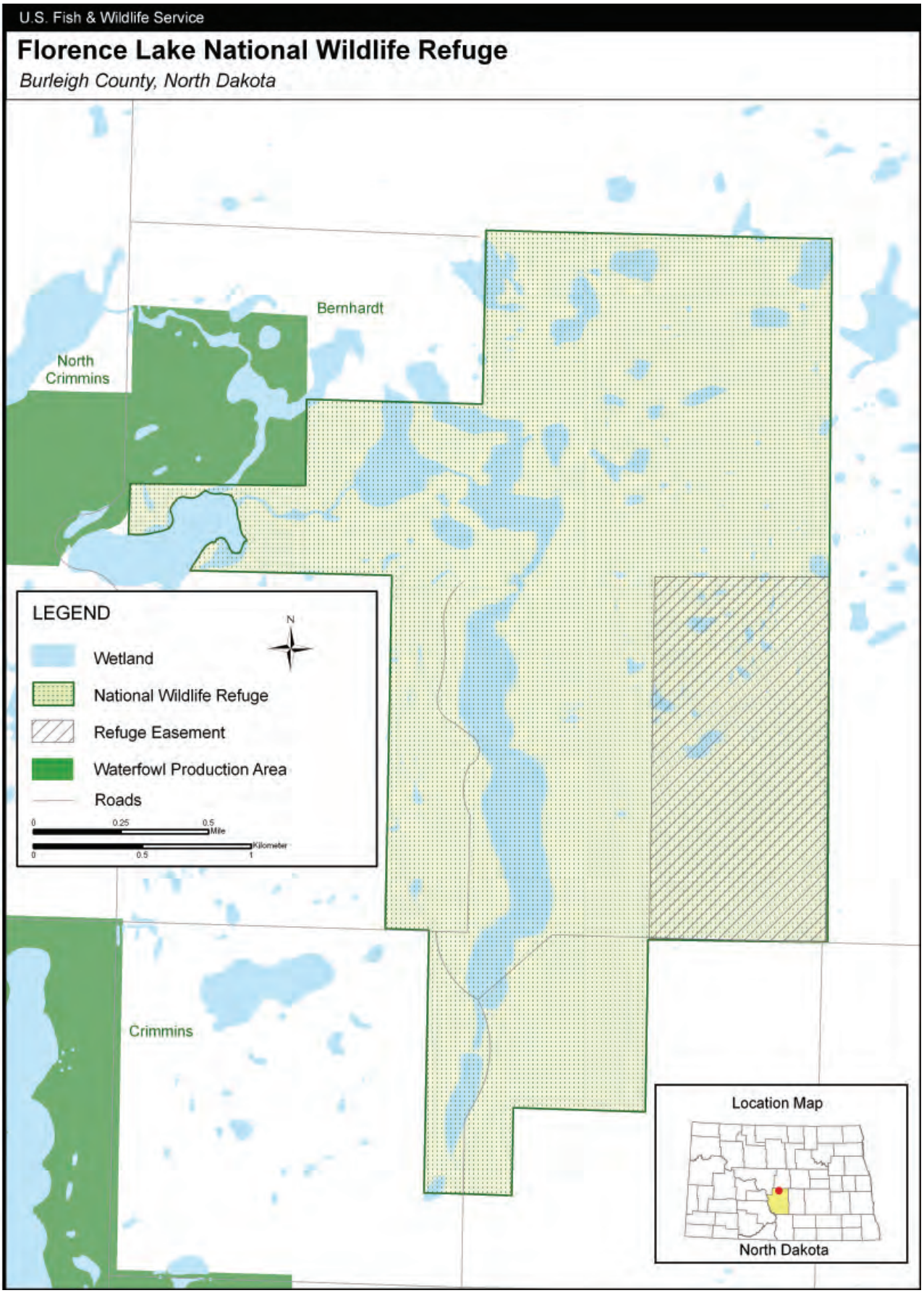


Figure 5. Florence Lake National Wildlife Refuge base map

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 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"

VISION AND GOALS

Vision for Long Lake National Wildlife Refuge

The echo of the sandhill cranes through 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 for Florence Lake National Wildlife Refuge

A classic prairie pothole landscape, Florence Lake NWR provides a unique perspective of presettlement 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 for 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 for 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 and women, conservationists, and others actively support and encourage the district'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 help the Service financially and physically to ensure a broad base of support, so that it can conserve 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 use 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, and to 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 refuge complex valuable for wildlife and for the American people. The refuge complex has the following attributes:

- It is comprised of a diverse natural environment of mixed-grass prairie with an abundance of palustrine and alkali wetlands.
- Refuge 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.

U.S. Fish & Wildlife Service

Long Lake Wetland Management District

Burleigh, Emmons, Kidder Counties, North Dakota

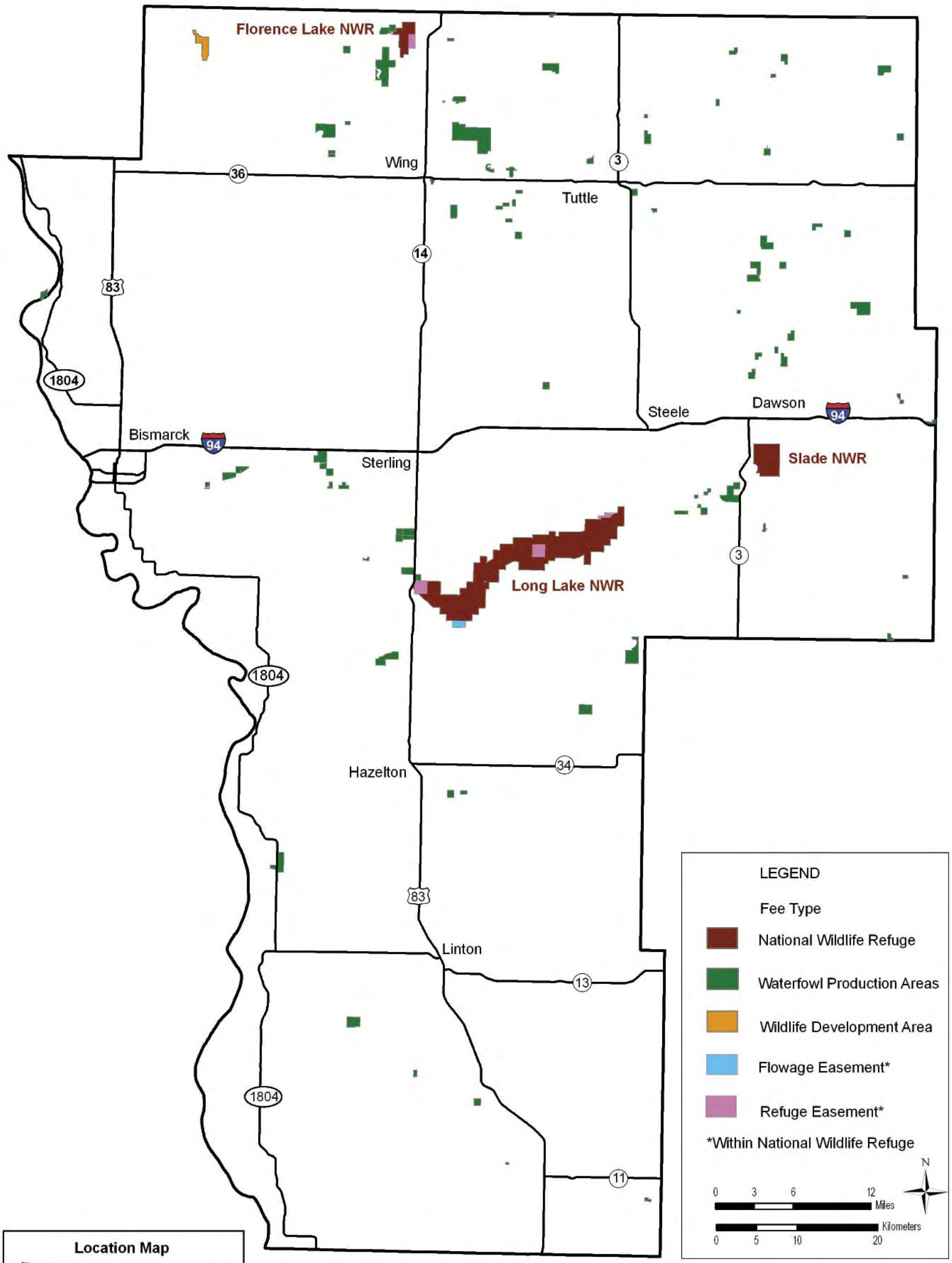
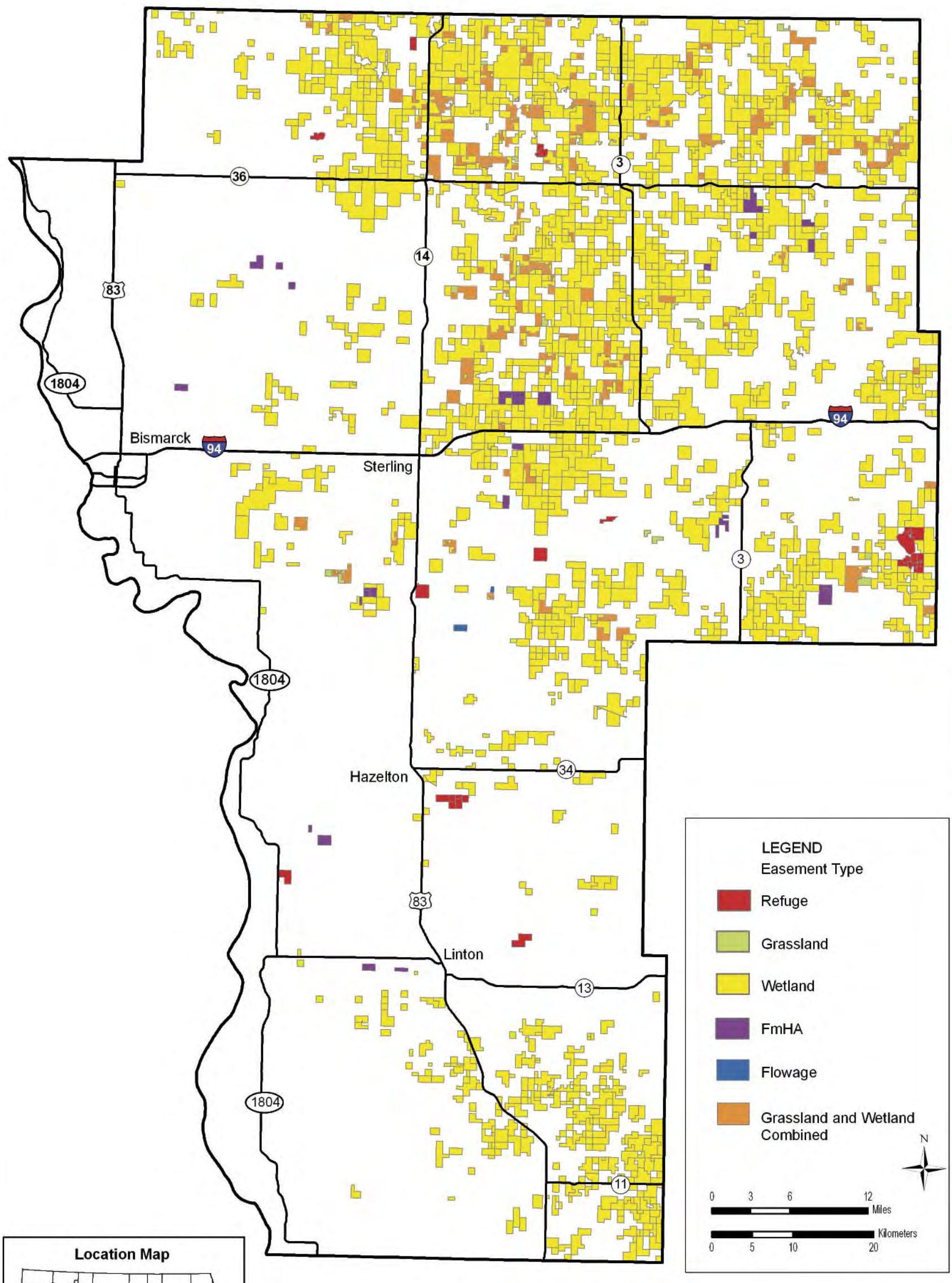


Figure 6. Long Lake Wetland Management District fee-title lands

U.S. Fish & Wildlife Service

Long Lake Wetland Management District

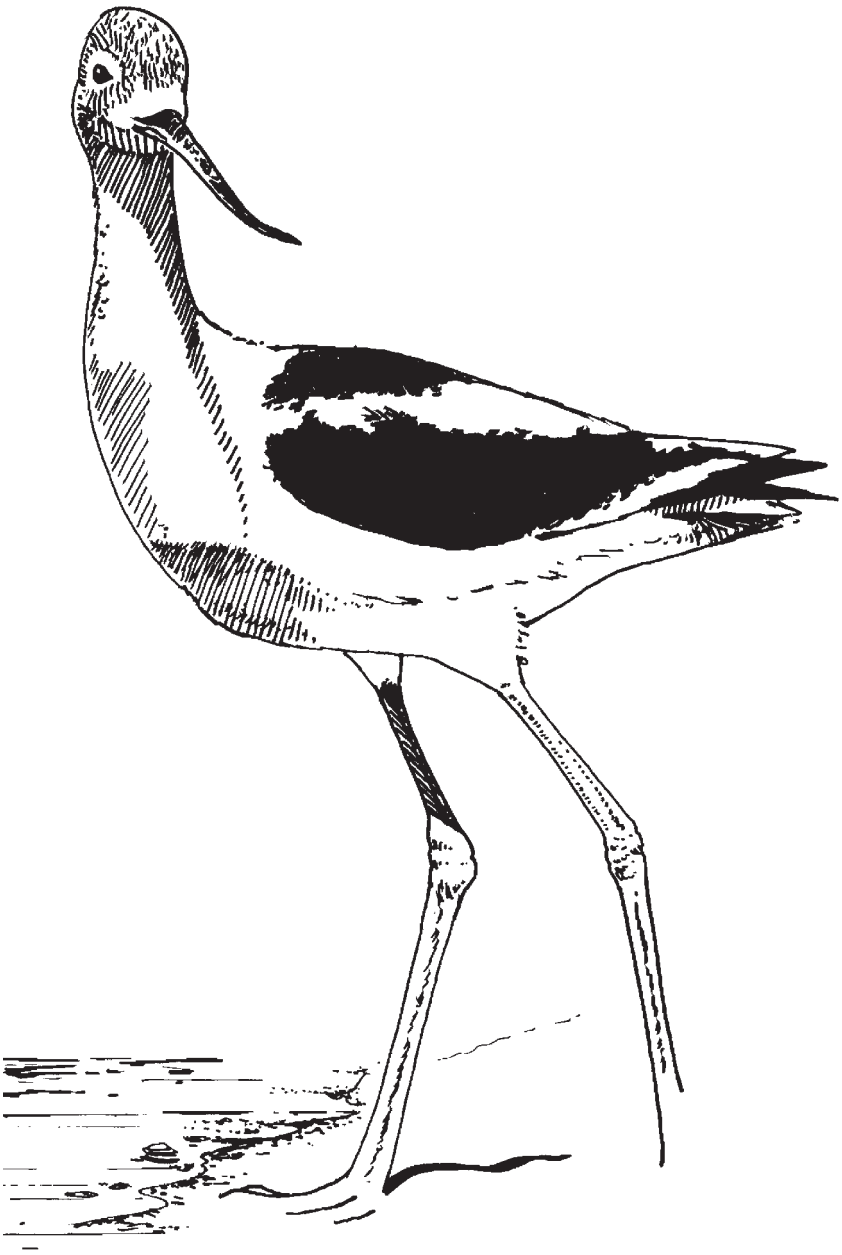
Burleigh, Emmons, Kidder Counties, North Dakota



DISCLAIMER: Areas depicting easement lands of the U.S. Fish and Wildlife Service, National Wildlife Refuge System, are for illustrative purposes only and do not represent the acreage of wetland or grassland resources included in easement contracts.

Figure 7. Long Lake Wetland Management District easement lands

2 Planning Process



American Avocet
Bob Hines/USFWS

2 Planning Process

THE PLANNING PROCESS

This CCP is 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 8):

- Form a planning team and conduct preplanning;
- 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.
- Review plan (every 5 years) and revise (every 15 years).

The Service began the preplanning process for the refuge complex in November 2003 (see appendix E). A planning team comprised of Service personnel from the refuge 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 preplanning and scoping, the planning team collected available information about the resources of the refuge complex and the surrounding areas. This information is summarized in chapter 3: Refuge Resources and Description.

This CCP provides long-term guidance for management decisions; sets forth goals, objectives, and strategies needed to accomplish the refuge complex's 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

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Godwits over the lake at sunset.

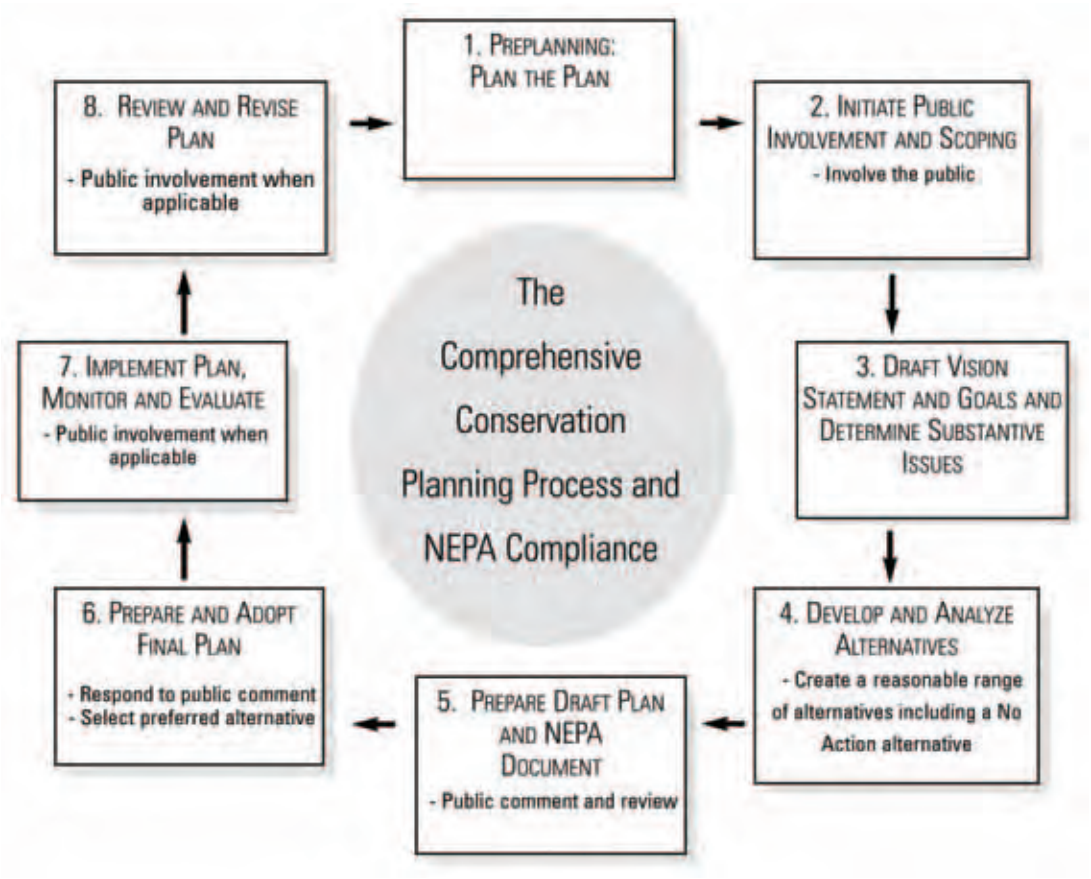


Figure 8. The steps in the CCP process

not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

PLANNING ISSUES

Upland Habitat Management

The refuge 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 the refuge complex's goals and objectives, aggressive upland habitat management must be conducted. The refuge complex includes uplands that were previously farmed and have since been restored to various mixes of tame and native grasses interspersed with native prairie areas, 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 forb species include leafy spurge, Canada thistle, and absinth wormwood. Kentucky bluegrass and smooth brome are primary invasive grass species. Western snowberry and silverberry are native shrubs that have greatly expanded their coverage in some areas where the 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 refuge 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 (e.g., salt cedar, purple loosestrife) pose additional threats to lands in the refuge complex. 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 refuge complex, early detection is a primary issue but is often unachievable.

Tamegrass (i.e., exotic grasses) 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 refuge 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 wetlands in the refuge complex are impounded by earthen dams, most 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 refuge 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 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 programs in the refuge complex, and managing botulism. Severe disease years consume substantial staff time, reducing the refuge complex's capacity to attain other goals and objectives.

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

Long Lake Hydrology and Water Quality

Development of dikes and WCSs to manage waters at increased levels 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 the need to periodically lower and dewater refuge units and thus the capability to do so was never developed. This has severely limited Long Lake NWR's ability to manage water effectively.

There are questions regarding the altered hydrology and the 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. With this knowledge, staff will be better able to prescribe viable alternatives to address and avoid potential productivity declines of refuge marshes and/or a catastrophic collapse of the system.

Predator Management

Predators on the refuge 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, 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 refuge complex, primarily by preying upon the nests of numerous grassland-nesting bird species.

Despite a substantial investment in land protection and habitat management, breeding migratory bird recruitment rates that are not high enough to sustain and/or increase populations of trust bird species have been documented on Service lands within the refuge complex. Unacceptable predation

rates must be addressed through management of predator populations.

Additionally, the protection provided by the refuges allows predators that hunt domestic livestock (e.g., coyotes) adjacent to the refuges to continue to grow unchecked, perpetuating depredation problems and economic losses to the refuges' neighbors.

Lake Isabel Recreation Area

The Lake Isabel Recreation Area, which is adjacent to Slade NWR, provides the only public access for Lake Isabel. This 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 uses that 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 (e.g., fishing).

Habitat Protection and Acquisition

Urbanization, development, and conversion of native prairies for agricultural crop production continue to threaten this ecosystem and the support capability for native wildlife. Additional grassland and wetland habitat needs to be protected in order to achieve the Service's goals and objectives.

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

Over 60 percent of all grassland area in the refuge complex remains intact (i.e., native sod); however, most of it is in degraded condition due to invasive exotic plants, grasses, and woody vegetation, and annual use for livestock production. Native prairies 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 species with narrow habitat requirements (e.g., marbled godwit, chestnut collared longspur).

USFWS

Piping Plover

Budget and Staffing

Budget and staffing is not sufficient to fulfill the purposes and goals of the refuge complex. Identifying priorities and directing resources efficiently will always be an issue for the refuge 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 refuge 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 refuge complex.

Threatened and Endangered Species

Breeding piping plovers occur in small numbers on numerous alkali wetlands, which are characteristic to portions of the refuge complex.

The refuge 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 portions of Long Lake NWR.

Additionally, throughout the refuge 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 that hold potential for these species and that will promote increased recruitment or population protection to secure and increase their populations.

The Biological Integrity, Diversity, and Environmental Heath 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."

Refuge complex staff reviewed all threatened and endangered species with historical ranges on or near lands in the refuge complex 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, refuge complex staff has consulted with ecological services staff and evaluated habitats as to their present and future potential to support this species. The refuge complex has adopted interim guidelines targeting management for Dakota skippers, resulting from those consultations.

Prioritization of Lands in the Long Lake National Wildlife Refuge Complex

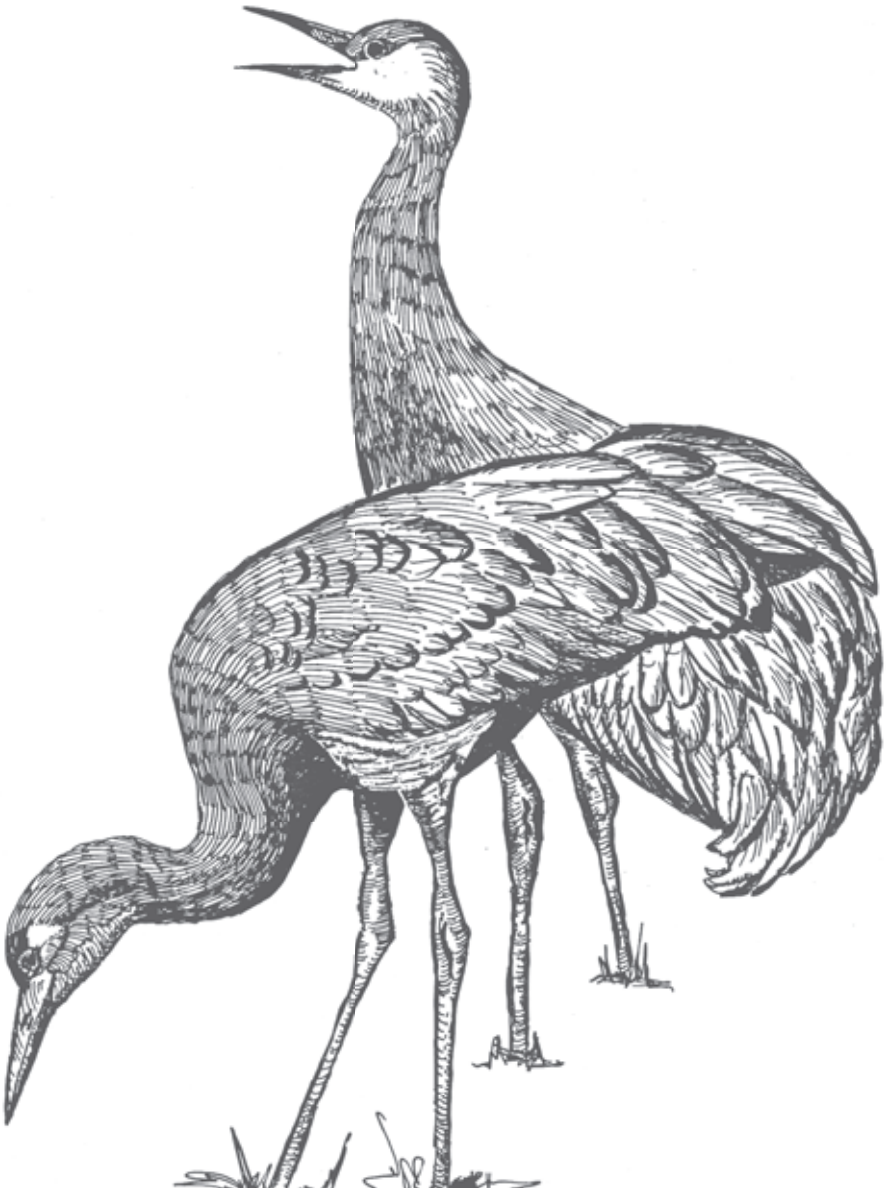
Refuge complex staff is charged with managing habitat and protecting trust resources (e.g., migratory birds, threatened and endangered species) on 82 different tracts of fee-title land, which are scattered throughout a three-county area that spans 7,490 square miles. Limited staff, budgets, and other resources require that lands are prioritized and those with the greatest management potential and/or most vulnerable resources are recognized.

Refuge complex staff used a number of important criteria to classify all fee-title lands in the refuge 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, and; 4) proximity to Grassland Bird Conservation Areas (type I), with a minimum upland acreage, and; 5) 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 that 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 urban areas 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.

3 Refuge Complex Resources and Description



Sandhill Cranes
Tom Kelley/USFWS

3 Refuge Complex Resources and Description

The Refuge complex includes three refuges, 78 WPAs, and one WDA scattered throughout Burleigh, Emmons, and Kidder counties. Long Lake NWR serves as the refuge complex's headquarters and is the 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. Long Lake NWR refuge complex consists of gently rolling native prairie, tamegrass fields, scattered tree plantings, and numerous temporary, seasonal, and semipermanent wetlands, in addition to a 16,000-acre impoundment. Refuge complex 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 refuge complex's environmental resources that may be affected by the implementation of the CCP.

The refuge 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 refuge 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 refuge 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 varies somewhat between the refuge complex's two physiographic regions and four ecoregions, the same principal wildlife species occur across all Service lands throughout the refuge complex.

The area included in the refuge 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

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Mallard Ducks

winter temperatures may drop to -30ºF, with wind chills as low as -100ºF. The annual average number of days with maximum and minimum temperatures of 90ºF and 32ºF is 25 and 73, respectively. The growing season, defined as the long-term average number of consecutive days in which the minimum temperature does not fall below 32ºF, ranges from 99–147, 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, and 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 9 subgroups (Stout et al. 1974, Seelig and Gulsvig 1988). The 20 soil 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 refuge complex and a subsequent semiarid designation. Water levels in refuge impoundments are greatly dependent on spring runoff.

A series of dikes with WCSs impound approximately 16,000 acres of wetlands in three water management units when at capacity (see figure 9). These impoundments have a maximum depth of 6 feet and an average depth of less than 3 feet. Gaging stations operated by United States Geological Survey (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.

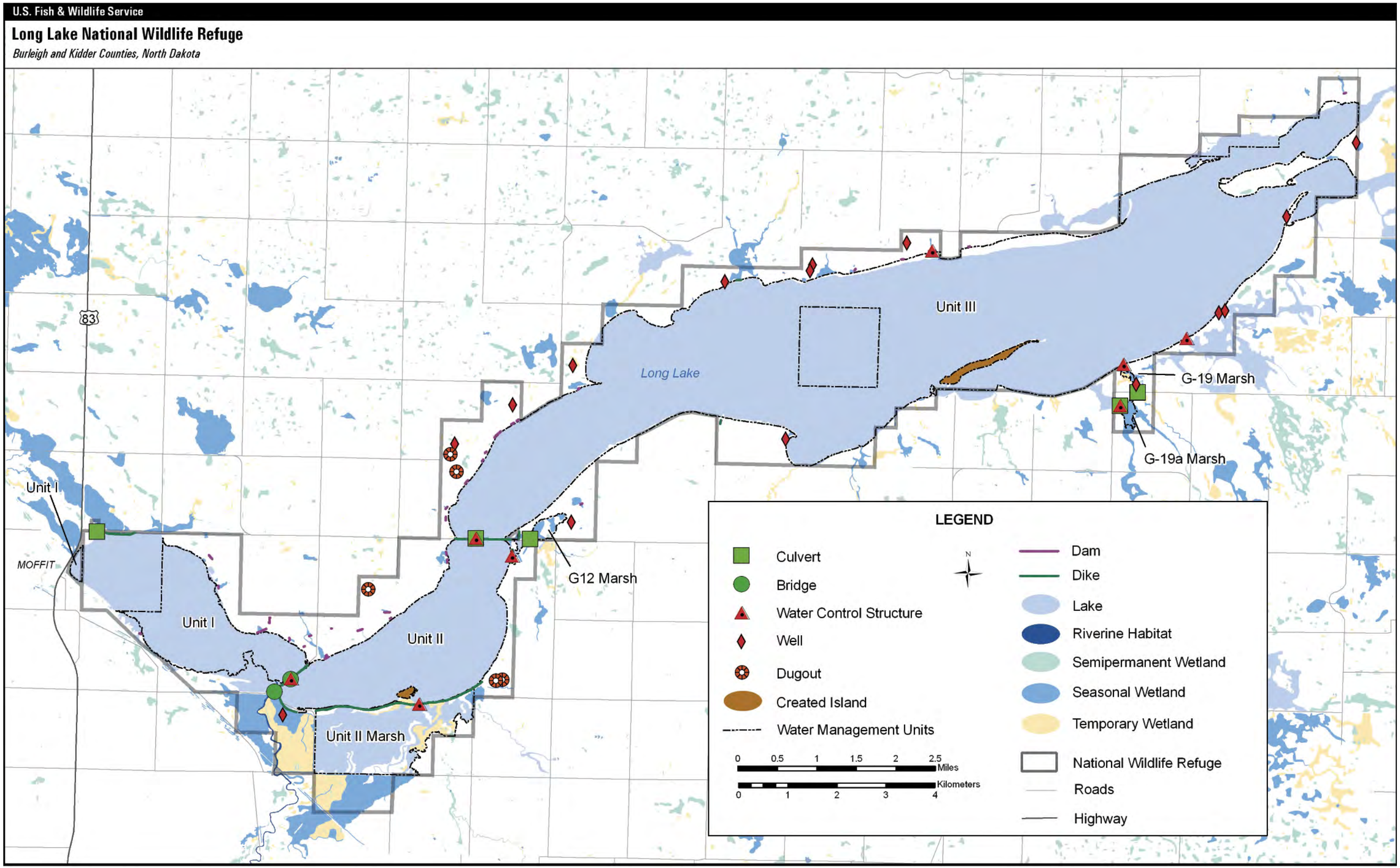

Figure 9. Water control structures and water management facilities

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 refuge 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 mean sea level [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 refuge is hydrologic alteration aimed at reducing the occurrence of botulism. In the mid-1930s, the Civilian Conservation Corps built three earthen dikes to improve the water management capability of Long Lake. At their present level (1,720 feet above MSL), these dikes have raised the full pool level more than 3 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 this increase in potato production has 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 in 2001 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 changed from a groundwater 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 (Dahl 1990). By the mid-1970s, only 46 percent of the original acreage remained (Tiner 1984). Wetlands now cover about 5 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.
- Semipermanently 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 refuge complex. Wetlands within the refuge complex occur in a diverse distribution of sizes, types, locations, and associations. The National Wetland Inventory identified 396,105 wetland acres in the district.

The chemistry of surface waters in wetlands tends to be dynamic because of refuge 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 (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 semipermanently 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 refuge 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 lands in the refuge complex:

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 refuge 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 refuge 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 semipermanent. Dominant plants include cattail, bulrush, submergent or floating plants, and submergent vascular plants, but this zone also may be devoid of vegetation if bottom sediments are unconsolidated. Shallow marsh zones are usually

USFWS

Wetlands

dominated by emergent grasses, sedges, and some forbs, but submergent or floating vascular plants also may occur. Wet meadow zones also are typically dominated by grasses, rushes, and sedges, whereas submergent or floating plants are absent.

Management of wetlands in the refuge 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 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 geographic information system (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 10, 11, and 12; Long Lake NWR, Florence NWR, and Slade NWR habitat maps).

Uplands and Associated Vegetative Communities

Upland vegetation is essential 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 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 that is in optimal condition. The refuge 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 (DNC) for waterfowl. Several areas on the refuge complex were planted to grass species such as tall and intermediate wheatgrass, sweetclover, 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 refuge 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 3 or more years to eliminate exotic cool-season grass seeds and rhizomes, control Canada thistle and other invasive plants, and prepare a seed bed for planting native grass seed.

Uplands throughout the refuge complex 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 gramma, 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 gramma/needle-and-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,

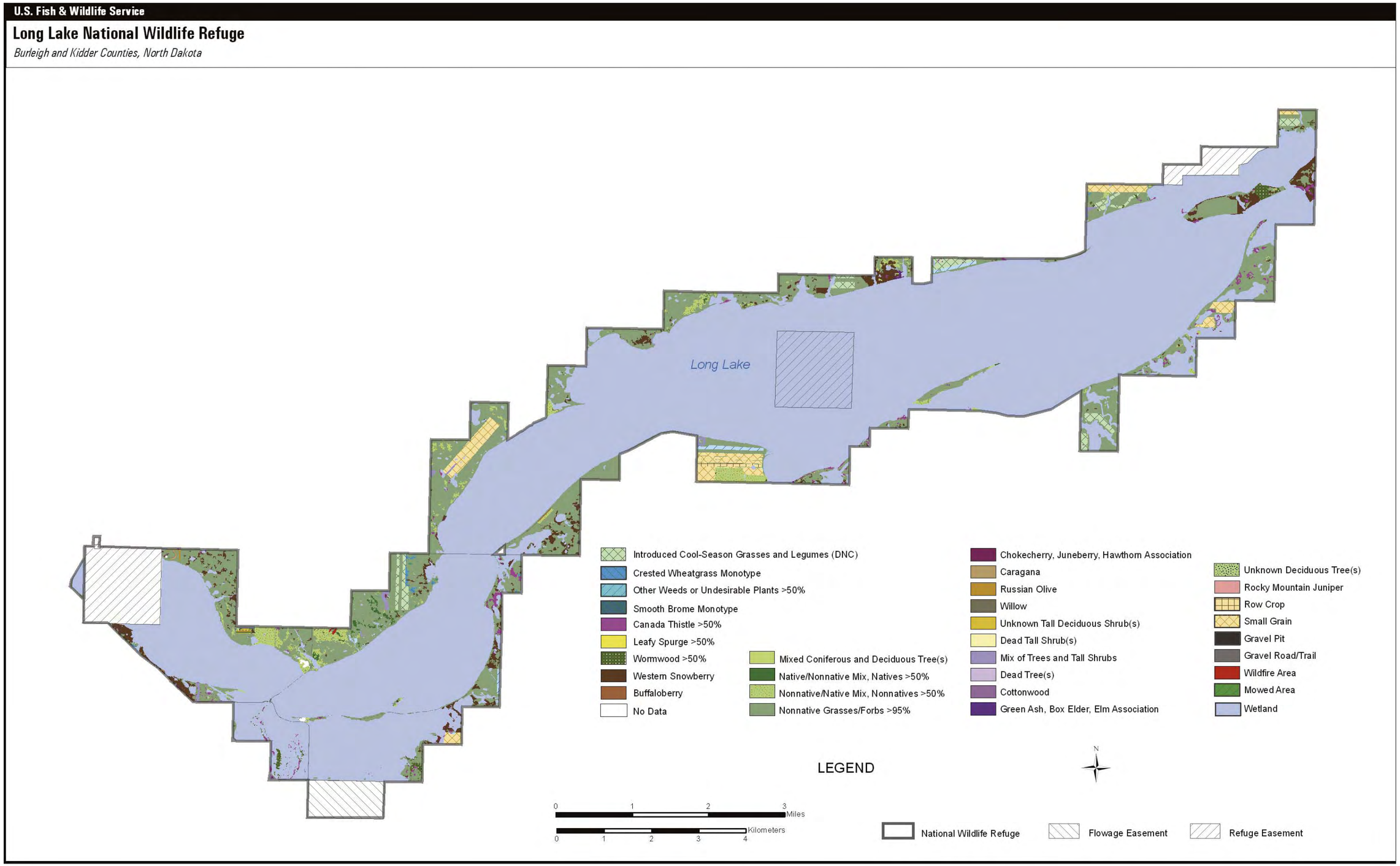

Figure 10. Long Lake National Wildlife Refuge habitat (2003)

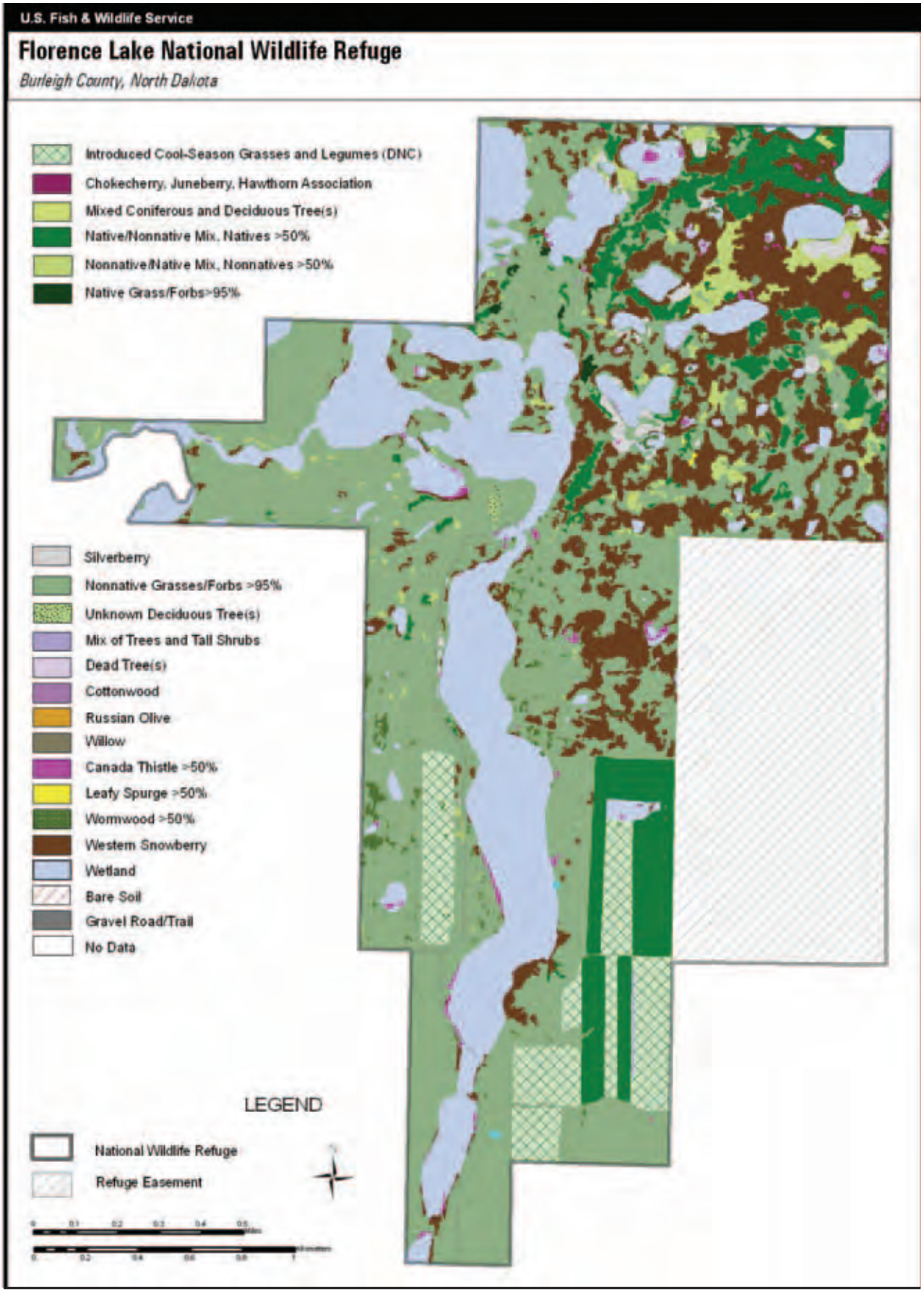

Figure 11. Florence Lake National Wildlife Refuge habitat (2004)

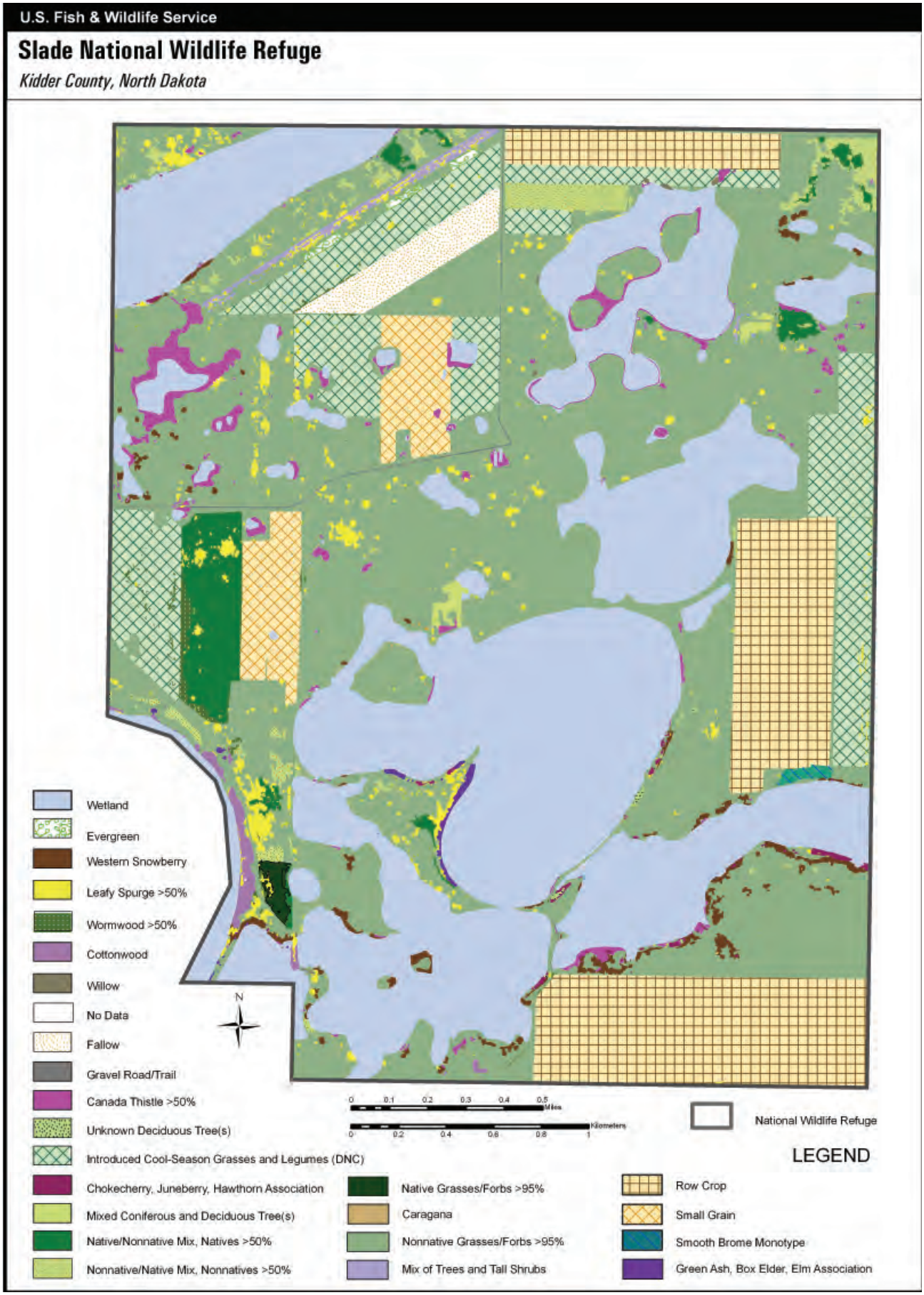

Figure 12. Slade National Wildlife Refuge habitat (2005)

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 the 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 refuge complex has scattered tree rows, shelterbelts, and block plantings of shrubs and trees. By Service policy, trees are no longer planted, except for shelterbelts, which are allowed near refuge housing and other buildings to provide protection from the wind. As time and funding allow, current management direction targets removing 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 silverberry are native shrubs that sometimes dominate native grassland areas and can become management problems or considerations when fire 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 district.

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

WILDLIFE

Mammals

Representative species for the refuge 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. Refuge complex staff anticipates that 34 mammal species likely occur regularly or periodically on lands in the refuge complex (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 refuge complex staff on Service lands in the refuge 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 (e.g., 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 refuge complex. Additionally, refuge complex staff has received unconfirmed reports of mountain lions and gray wolves on Service lands within the refuge 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 edge 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

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

From 2001 to 2003, refuge 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, which began when a group of Minnesota junior high school students discovered numerous malformed frogs in a local wetland in 1995 (Meteyer 2000). In 2001, refuge 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 refuge complex (appendix G). The Long Lake NWR Bird List (circa 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 as both a Globally Important Bird Area and as a regional shorebird site in the Western Hemisphere Shorebird Reserve Network (WHSRN) in 2002. Additionally, the diversity of birdlife in the refuge 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.

Dave Menke/USFWS

Northern Pintail

Twenty-three species of waterfowl are considered either common or uncommon species throughout the refuge complex, with several other waterfowl species being occasional visitors (e.g, greater scaup, American black duck, red-breasted merganser, white-winged scoter. Seventeen waterfowl species breed in the refuge 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 refuge 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 the 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 refuge 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, refuge complex staff has investigated upland waterfowl nesting success at both Long Lake NWR and on select WPAs in the refuge 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, refuge complex staff surveyed nesting activity on seven Long Lake NWR management

units. Each site was searched three times and 78 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 refuge complex (Cowardin et al. 1985, Klett et al. 1988).

During the fall migration, on 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 use 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 refuge 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 refuge 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 is likely 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 refuge complex has recently been designated as a priority fall migration staging area as part of the Marbled Godwit Conservation Plan (Melcher et al. 2006). Twenty-five WPAs and two refuges are included within the boundaries of this conservation area.

The importance of Service lands in the refuge complex to colonial-nesting waterbirds was recently investigated. In 2003, refuge complex staff conducted an extensive survey of waterbird colonies on fee-title lands throughout the refuge complex to determine the distribution and estimate the abundance of breeding colonial waterbirds, and also develop a monitoring protocol that could be followed in subsequent years with reduced effort. An aerial survey of all wetland basins (n = 864) on fee title lands in the refuge 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, avian 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 colonies— ranging from two to nine. Twenty-four (60.0 percent) of the 40 colonies consisted of only one bird 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 used 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 refuge complex that had a low variance and provided an accurate estimate of the use of Service lands during 2003.

Service lands throughout the refuge 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, refuge 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 1), three (Baird's sparrow, Nelson's sharp-tailed sparrow, Sprague's pipit) were detected during 2 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 prairie 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 than 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 refuge 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. Refuge 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 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 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 refuge complex staff anticipates that seven species of fish occur in Service-owned wetlands in the refuge complex (appendix G). Although systematic fishery inventories have not been completed on Service lands within the refuge complex, wetland habitat capable of supporting populations of certain fish species is present, at least during nondrought periods, on several tracts throughout the refuge 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 refuge 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 refuge complex.

The piping plover breeds on the shoreline of the large, alkaline lakes that are common throughout the northeastern one-third of the refuge complex.

In the summer of 2002, the Service's Ecological Services Division designated 11 different tracts of land, of which at least portions are owned by the Service and administered by the refuge 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 refuge complex staff regularly 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 preferred breeding areas.

The bald eagle is a relatively common migrant during the spring and fall migrations. Bald eagle observations on the refuge 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 refuge 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 grounds in the Northwest Territories in the spring and their wintering grounds 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

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Bald Eagle

using Long Lake NWR. Additionally, during recent years, whooping cranes have been documented on WPAs in the refuge complex (e.g., Seventh Day Adventist, spring 2003). The refuge complex biologist serves as the Service's key whooping crane contact for North Dakota observations. Additionally, refuge complex staff follows guidelines presented in the Whooping Crane Contingency Plan (Service 2001) to minimize risks to whooping cranes that use lands within the refuge 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 refuge 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 refuge complex staff classified the degree of Dakota skipper habitat potential that presently

Table 1. Relative abundance, estimated breeding pairs per 247 acres (100 hectares), and frequency of occurrence for 15 grassland/wetland edge-nesting passerines on Long Lake National Wildlife Refuge, 2001–2004

	Relative Abundance[1]				*Estimated Pairs/ 247 acres (100ha)*				*Frequency of Occurrence*			
Species	*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).*

exists on Service lands within the refuge 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 refuge complex are listed in appendix K.

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 refuge 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 locations 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 6 acres for a tour road in 1992 resulted in no cultural resources being recorded (Lewis 1992). In 2001, cultural resources inventories of four borrow areas and two peninsula cutoffs totaling 74 acres at Long Lake NWR (Olson 2001) resulted in the recording of a prehistoric site lead (32KDX69) at Pintail Point. A subsequent inventory of approximately 21 acres for the proposed borrow area on Pintail Point recorded the lead as prehistoric archaeological site 32KD82 (Morrison 2001).

Six sites have been recorded on 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:

- Canfield Lake NWR (easement national wildlife refuge)and Long Lake NWR
- Lake George NWR (easement national wildlife refuge)

- Florence Lake
- Slade NWR

The priority order for conducting tract inventories in the district is:

- Kurtz WPA
- Wahl WPA
- Braun WPA

Other WPAs (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 WPAs (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. Only two are 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 Globally Important Bird Area by the American Bird Conservancy.

A number of colonial-nesting waterbird colonies are distributed throughout the refuge 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 refuge 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. It identifies these six priority public uses: hunting, fishing, wildlife observation and photography, and 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 refuge 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 district are open to hunting for a variety of game, including migratory birds. Only federally approved nontoxic shot is permitted on WPAs. All other state regulations apply on WPAs.

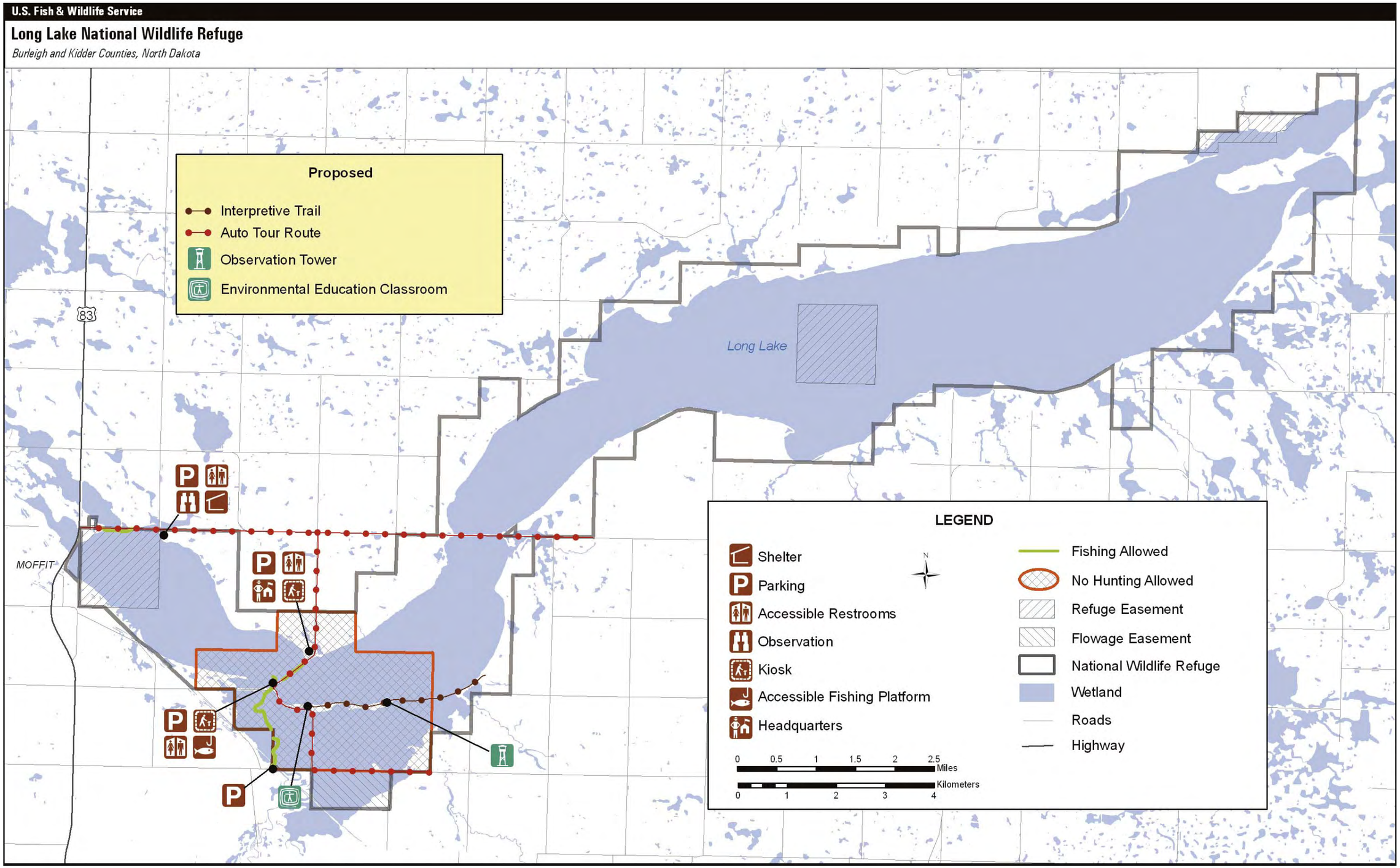

Figure 13. Long Lake National Wildlife Refuge public use map

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A hands-on environmental education experience.

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 (see figure 13).

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 kills can 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, an accessible rest room, table, and an 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 three exhibits and a variety of informational pamphlets about the Service, the Refuge System, the refuge 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 refuge complex. Refuge staff provides educational talks and tours for schools and other groups, upon request. The refuge complex's environmental education and outreach program expands beyond the boundaries of the refuge complex. The staff is involved in local, regional, and statewide programs.

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 lands in the refuge complex. 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 complex. 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 refuge complex policy to control all wildfires occurring on Service lands.

The refuge complex staff now uses prescribed fire to simulate the historical influence wildfire had on the plant communities. Prescribed fires 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 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 the refuge complex 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 dogs 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 refuge 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 refuge complex. Their grazing, trampling, trailing, and

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Prescribed burning is used to reduce the accumulation of organic litter.

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 refuge 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 invasive plants 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 refuge 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. Invasive plants —including Canada thistle, absinth wormwood, and leafy spurge— can be managed in a similar fashion. To date, this management strategy has been employed only occasionally; however, the application shows promise for more frequent use in the future.

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; a substantial wholesale trade, for example, 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 (see table 2). 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—North Dakota 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, North Dakota 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. North Dakota 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 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 (see tables 3 and 4). Since the beginning of the Bureau of Labor Statistics 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. In all, 28,000 workers (9.8 percent) were represented by unions ((the national average is 13.2 percent). 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 microscopic measure of liquid or solid particles in the air that is respirable in the lungs.

Air quality in the area of the refuge 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 refuge complex, and dust associated with wind-blown sand and dirt from the roadways and fields contribute to particulate matter.

Table 2. 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 3. 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 4. 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%.

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. TPI includes net earnings by place of residence; dividends, interest, and rent; and personal current transfer receipts received by the residents of that county.*

4 Management Direction

Prairie Dog
Bob Savannah/USFWS

4 Management Direction

The management direction in this chapter meets the purposes, vision, and goals of the refuge complex. Objectives and strategies to carry out the goals will provide for ecosystem and resource needs and public use.

- A goal is a descriptive, broad statement of desired future conditions that conveys a purpose, but does not define measurable units.
- An objective is a concise statement of what is to be achieved; how much is to be achieved; when and where it is to be achieved; and who is responsible for achieving it.
- Rationale for each objective includes background information, assumptions, and technical details used to formulate the objective. The rationale provides context to enhance comprehension and facilitate future evaluations.
- Strategies are ways to achieve an objective.

Development of refuge complex goals and objectives involved multiple sources of information:

- a review and interpretation of national plans
- a review of existing scientific literature
- an evaluation of habitat conditions
- the personal knowledge of planning team participants

MANAGEMENT SUMMARY

Wetland and upland habitats will be intensively managed, where warranted, throughout the refuge complex. Management objectives for various habitat types are 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) are, therefore, based on a compromised universal benefit concerning particular needs of multiple wildlife groups on an individual tract of land. Wetland and grassland habitats will also continue to be acquired through purchase of

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A Long Lake NWR sunset.

wetland and grassland easements, as well as fee lands.

Additionally, public use and environmental education and interpretation opportunities will be maximized to the extent compatible with other objectives. Expansion of the refuge complex's research and monitoring, staffing, operations, and infrastructure will likely be required to achieve this alternative's goals and objectives. Partnership opportunities will be maximized and will vary widely.

GOALS, OBJECTIVES, STRATEGIES, AND RATIONALE

The goals, objectives, strategies, and rationale listed below describe how management of Service lands will be carried out to meet the overall goals for the refuge 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 refuge 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 refuge 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 refuge 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 5), including that:

- eight species regularly nest on lands in the refuge complex;
- two species use lands in the refuge complex 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 North Dakota 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 refuge complex should benefit a much broader group of "secondary" bird species (appendix L), 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 refuge complex. Because the numerous waterbird species that use lands in the refuge complex 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

Table 5. Target species and their associated conservation plan listings

Species	*North American. Landbird Conser-vation Plan*	*Endangered Species List (Service)*	*North Dakota. Species of Conser-vation Priority*	*U.S. Shorebird Conser-vation Plan*	*Focal Species (Service)*	*Northern Prairie and Parkland Conser-vation Plan*	*Birds of Conser-vation Concern (BCR)*[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	—
Grass-hopper 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 plover	—	Threatened	Level 2	Species of concern (breeding and migrating)	X	—	—

Species	*North American. Landbird Conser-vation Plan*	*Endangered Species List (Service)*	*North Dakota. Species of Conser-vation Priority*	*U.S. Shorebird Conser-vation Plan*	*Focal Species (Service)*	*Northern Prairie and Parkland Conser-vation Plan*	*Birds of Conser-vation Concern (BCR)*[1]
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 sand-piper	—	—	Level 1	Species of concern (breeding and migrating)	X	—	BCR 11, Region 6, national
Western grebe						High concern	
Western meadow-lark	—	—	—	—	—	—	—
Wilson-s phalarope	—	—	Level 1	Species of concern (breeding and migrating)	X	—	BCR 11, Region 6, national

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 to gauge their interest in selling their lands.

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 5-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, which 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.

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 9 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 WPAs 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. Due to substantial summer rain events or other environmental factors, however, years will occur where although an attempt is made

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Habitat and wildlife studies are ongoing.

to dry unit III through evaporative processes, this unit may remain in a shallow water state for the duration of the summer and fall. This unit 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 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 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

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 refuge 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 of the refuge 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 7 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 the refuge complex's ability to control water levels provided it with 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 directly link 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 the refuge complex's water management activities are speculative.

Because the understanding of factors that influence the likelihood of botulism outbreaks is presently fragmentary and insufficient, refuge complex staff intends to continue to apply the current water management strategy, 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 WCS) 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 WPAs.

Objective 3A: Over a 1-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 2-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 1 year of monitoring data.

Objective 3B: Over a 15-year period, study the relationship of 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. In addition, study the relationship of the concentration of various chemical constituents with observed changes in wetland vegetation or aquatic invertebrate community composition. Finally, evaluate multiple years of monitoring data related to various abiotic components of Long Lake and use 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 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. Salinity, for example, can negatively influence invertebrate composition directly by affecting physiology (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, which 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 to which 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 3 feet above the historical 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), available for waterbirds, were at least temporarily reduced. However, an insufficient number of sites were visited to characterize adequately 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 will 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 carried out 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 refuge 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 at 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, which 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, which 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 (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 use different invertebrate species, in order to avoid overlap in habitat use (Recher 1966).

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 a substantial role 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. Invertebrates are, however, sensitive to agrichemicals, which 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 inventory and monitoring efforts, it is important 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 (Newcombe and McDonald 1991, Euliss et al. 1999) or indirectly by affecting habitat structure and foods (Krull 1970, Wollheim and Lovvorn 1996).

The acquisition of initial baseline data and subsequent periodic monitoring will hopefully allow for an improved understanding of the invertebrates that Long Lake supports across space and time.

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 (0.25 m^2) 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 Wetlands in the Refuge Complex):
Provide quality nesting, brood rearing, and migratory stopover habitats for a diversity of wetland-dependent birds.

Background:
Unit II marsh is a 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 3 feet deep and the unit does go completely dry in some years.

USFWS

A waterfowl production area.

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 use this unit as a roost site.

Six other smaller, managed impoundments exist in the refuge 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 carried out in a timely and appropriate manner by refuge complex staff. Ideally, Long Lake's unit II marsh and other impoundments on Long Lake NWR and other Service lands in the refuge 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 frequenting 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 refuge complex's target species for developed wetlands regularly use unit II marsh at various times of the year when hemi-marsh conditions exist. The refuge 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 the 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, staff in the refuge complex will 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 51 inches (130 centimeters) for five different species (Laubhan et al. 2006). However, depths ranging from 12–32 inches (30–81 centimeters) 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 (10–15 centimeters) (Kinzel et al. 2005). However, they will sometimes roost on dry land surrounded by water and conversely in water as deep as 24 inches (61 centimeters) (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 staff in the refuge complex does not have the capability to move water out of unit II marsh, some years will occur when water depths will exceed the refuge complex's target depths (due to wet conditions). 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 will help facilitate ideal water levels in the spring for colonial waterbird nest initiation.

The refuge complex staff acknowledges that unit II marsh has had periodic botulism outbreaks since its 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 visual estimation or GIS area determination using aerial photos taken annually in early July.
- Measure target water depths at target dates (e.g., 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 70–90 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 reflood 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 refuge 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 [8–20 centimeters]), as do those of the piping plover and Baird's sandpiper (0–2 inches [0–5 centimeters]; Helmers 1992). These managed basins should provide suitable foraging habitat for all four 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 (1 meter) deep (Low 1945, Bergman 1973), whereas optimal foraging depths for mallards normally range from dry to <12 inches (30 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). Refuge complex staff anticipates that, depending on the uncontrollable forces of nature (i.e., periods of drought and deluge), it 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 refuge complex staff will attempt to dewater these units will be based upon the perceived moisture conditions (presnowmelt). 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.

Plant species respond differently to exposed soil at different times of the growing season (Laubhan and Roelle 2001) and due to staff's 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 refuge complex. Griffith (1948) 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. 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 enhance the integrity of wetlands throughout the refuge 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, semipermanent, 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., semipermanent 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 the refuge complex's three-county district, differences in wetland density and regime abundance exist in different physiographic regions and ecoregions. Density of depressional palustrine wetlands (prairie potholes) in the 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 semipermanent 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 refuge complex will continue to acquire easements on high-risk wetlands in areas of high 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, invasive plants) on refuges and WPAs.

For the undeveloped wetland habitat type, refuge 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 see table 5), including that:

- nine species regularly nest on lands in the refuge complex;
- one species uses lands in the refuge complex 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 refuge complex should benefit a much broader group of "secondary" bird species (appendix L), 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 refuge 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 invasive plants), 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, North Dakota 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 North Dakota attract breeding duck pairs, drive nesting and re-nesting intensity, and provide brood habitat (Kantrud 1989). While semipermanent 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 1-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 North Dakota for so many years, there is ample opportunity for the Service, and more specifically the refuge 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, but insufficient funding to acquire easements and WPAs on all available lands; therefore, refuge complex staff acquisition decisions can benefit from science-driven predictive habitat models. The habitat and population evaluation team (HAPET) has developed a model which shows the distribution of priority wetlands relative to breeding duck pairs and cropland: 1) 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) semipermanent and permanent wetlands (<1 acre). This acquisition strategy has been adopted by the Service's Dakota Working Group (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 a cumulative minimum of 17,640 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. Use

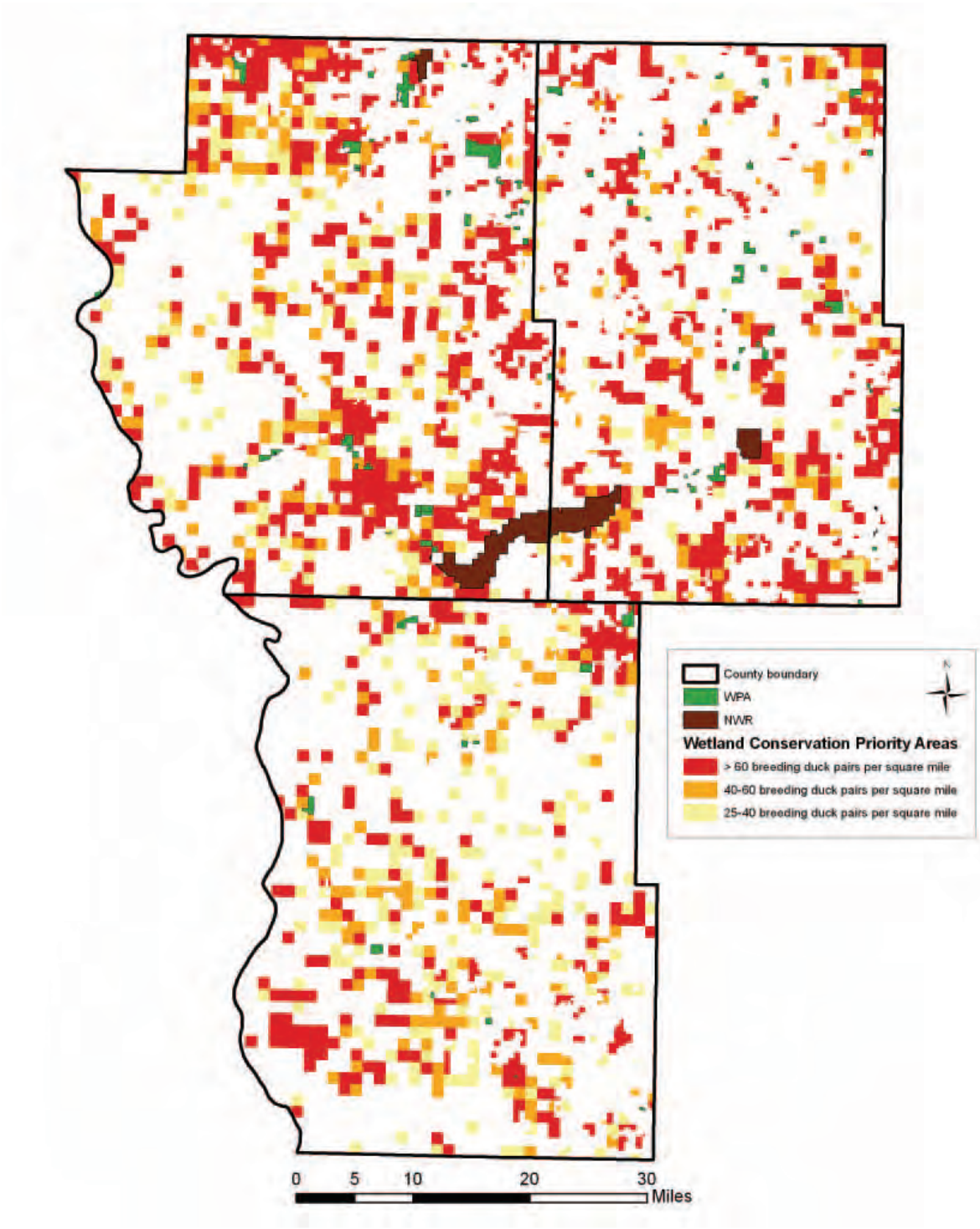

Figure 14. Distribution of 640-acre sections, which contain priority wetlands for conservation, relative to the number of breeding duck pairs per square mile and the existence of cropland

MBCF monies until the state's approved acreage limits for Burleigh, Emmons, and Kidder counties are reached.

- Seek additional funding through the 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, WPAs, or refuges.

Rationale 2:

Historical losses of prairie wetlands in the state were discussed in detail in rationale 1, as was the idea that due to certain recent societal transformations (e.g., 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 most 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 in conjunction 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 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.

Objective 3A: Within 1 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 refuge 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 (in acreage) than 75 percent of all wetland-associated infestations.

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.

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 lands in the refuge complex but have the potential to exist on them.

Rationales 3A, 3B, and 3C:

Wetland basins, which 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 North Dakota 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, refuge 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 three states (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 refuge complex staff develops a better understanding of the frequency and degree to which wetlands in the refuge complex have been invaded by the two aforementioned species. Currently, the refuge complex staff realizes that both species are not uncommon on wetlands throughout the refuge 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 lands in the refuge complex 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 refuge 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 lands in the refuge complex.

In addition to these four wetland and wetland-associated plant species of concern, refuge complex staff must be aware of the occurrence of other problematic wetland and wetland-associated plant species that have not previously been documented

on lands in the refuge complex, but have potential to be—specifically salt cedar, purple loosestrife, curlyleaf pondweed, and Eurasian watermilfoil. Salt cedar and purple loosestrife are both North Dakota State Listed Noxious Weeds (Lym 2004), whereas Eurasian watermilfoil and curlyleaf pondweed are considered invasive plants (North Dakota Department. 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 (757 liters) 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 than other area habitats. Purple loosestrife had been documented in Burleigh and Kidder counties, as of 2003 (North Dakota Department 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. A single plant fragment of either species can create an infestation in a new location (North Dakota. Department of Agriculture 2003, NDGF 2004). As of 2003, Eurasian watermilfoil had not been found in any of the refuge 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 refuge 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 refuge 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.

Strategy 3A:

- Use the refuge complex's GIS and associated refuge lands geographic information system extension (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 (in acreage) 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 refuge complex WPAs) and sites that have the greatest potential of spreading to ecologically important areas.

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 refuge complex.
- Obtain GPS coordinates for areas of infestation.

Strategy 3C:

- Identify the visual 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 likely 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 water bodies on portions of their watercraft.

Objective 4: Within 15 years of the completion of this CCP, determine the degree of sedimentation at 50 Service-owned wetlands in the refuge 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 presettlement 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 refuge complex.

Rationale 4:

A large percentage of wetlands on WPAs and refuges in the refuge 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 refuge 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).

Refuge complex staff suspects that several wetlands on lands in the refuge complex have been subject to accelerated sedimentation rates over time. These include wetlands on WPAs 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, and; 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, the refuge complex intends to work with staff from Northern Prairie Wildlife Research Center (NPWRC; USGS) to identify substantially silted-in wetlands in the refuge 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 refuge 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 North Dakota, South Dakota, Montana, and Minnesota (Service 2005b). As of 2005, 102,646 wetland acres were protected under perpetual Service easements in the refuge complex.

Generally, a Service wetland easement is perpetual in nature. The Service issues the landowner a one-time payment in order to acquire the exclusive right to burn, drain, fill, or level specific wetlands. This prevents landowners from burning, draining, filling, or leveling protected wetlands, without an SUP (e.g., allowing a wetland to be burned 1 in 3 years, allowing a temporary drain on a wetland to alleviate flooding of roads or residences). Any proposed use which may drain, burn, level, or fill a protected wetland should 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, refuge complex staff documents an average of two to five easement violations in the district. The number of potential violations observed during aerial surveillance is generally three to four times that number, and therefore creates a substantial investigatory easement workload for refuge 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 refuge 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 refuge complex can assure a high rate of landowner compliance within the 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 will therefore be 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 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 Sub-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 refuge complex is heavily invaded by a number of exotic invasive grasses (e.g., 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 refuge complex, which 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 refuge complex's native prairie tracts have been invaded to a greater-than-historical extent by certain native low shrub species (e.g., western snowberry, silverberry). Due to past management, or lack thereof, these native low shrub species have greatly increased their coverage, as compared to the presettlement era.

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 junegrass, 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., 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 remaining areas of native prairie have been identified as the refuge complex's highest priority upland sites. Through targeted and science-driven management, refuge complex staff plans to reverse the decline in vegetative heterogeneity such that with modest management, these tracts will resist invasion by exotic cool-season grasses and invasive plants.

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 refuge 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 refuge 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 (see table 5), including that:

- all 10 species regularly nest on lands in the refuge complex;
- 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).

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 refuge complex should benefit a much broader group of "secondary" bird species (appendix L), 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 refuge 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 refuge complex have been heavily invaded by a number of cool-season introduced grass species (e.g., smooth brome, Kentucky bluegrass, crested wheatgrass) and invasive plants (e.g., leafy spurge, Canada thistle, absinth wormwood). Vegetative cover type data collected on all Service-owned lands within the refuge complex suggest that approximately 64 percent of all native prairie acres is currently (circa 2003-2006) dominated by nonnative grasses (≥95 percent coverage) or invasive plants (>50 percent coverage; see appendix M for a complete list of cover type categories used between 2003 and 2006 on the refuge 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, Dhol 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 (Grace et al. 2001, Wilson and Partel 2003).

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Native seeding within the prairie.

Additionally, Christian and Wilson (1999) found that the 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, 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 historical ecological disturbance regimes (i.e., fire and herbivory) have been a major contributing factor to the loss of plant diversity. 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 effects on grassland-nesting birds (discussed in detail in rationales 1D and 1E). Vegetative cover type data collected on Service-owned lands within the refuge complex suggest that several native prairie tracts have >43 percent of their upland acres classified as western snowberry (25 percent coverage; appendix M). Monitoring plant species composition changes is essential to determining whether the refuge 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 North Dakota 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.

Transects will be established on all native prairie sites containing ≥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 1 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 refuge complex staff will use in collecting belt transect data is provided in appendix I.

Strategy 1A:

- Establish one permanent 82-foot (25 meter) belt transect for every 10 acres of native prairie.
- Collect baseline plant species composition data along transects.
- Determine upland acreage of sites and employ systematic-random transect placement using the Service's RLGIS and associated data layers.
- 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 upland 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.

Objective 1C: Reduce the total acreage of North Dakota 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.

Rationales 1B and 1C:

The degree to which Service-owned native prairie in the refuge complex is invaded by exotic cool-season grasses and invasive plants (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.

Therefore, the frequency of occurrence of exotic cool-season grasses and the overall acreage of invasive plant species will be reduced on selected tracts of native prairie, over the next 15 years.

Refuge 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 lands in the refuge complex (Gregg Knutsen, Service, unpubl. data) indicate that proposing a more substantial reduction over the same timeframe is likely unrealistic, given several factors, including:

- the refuge 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 an "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 of 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 increased competitive ability of native grass and, therefore, an 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 refuge complex also plans to reduce the overall acreage of invasive plants over a 15-year period. Similar to the proposed reduction rate for exotic cool-season grasses, refuge complex staff proposes what some may view a conservative reduction in the acreage of invasive plants. A possibly conservative—but likely realistic and achievable—reduction value is most appropriate for invasive plants. The refuge complex's management and associated monitoring of invasive plant infestations and other habitat components will 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 refuge 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 refuge 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 invasive plant species, refuge complex staff decided to measure invasive plant changes using a different methodology. Refuge 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, refuge complex staff often controls invasive plants (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, refuge 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 lands in the refuge complex 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.

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 1 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.

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 invasive plant species, in a manner identical to how it was collected on Service-owned lands from 2003 to 2006 (see appendix M).

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 (e.g., western snowberry, silverberry) has occurred over time since European settlement and the subsequent loss or misapplication of historical ecological disturbance regimes (e.g., fire, herbivory). Extirpation of bison (Campbell et al. 1994) and wildfire suppression are factors that have been tied to expansion of woody vegetation in 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 North Dakota.

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 North Dakota 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 refuge complex manage its lands for the benefit of the 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, refuge complex staff must limit 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. A more conservative—and likely realistic—target (30 percent) has been chosen for this initial restoration objective.

The purpose of district 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 refuge complex will allow a greater extent of low shrub coverage in the 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 target species in the refuge complex. 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 1 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.
- Manage shrub component on WPAs and NWRs in an appropriate condition and composition to provide quality nesting cover (i.e., between 0 and 50% on WPAs, between 0 and 30% on NWRs).

Objective 2A: On refuges in the refuge complex, maintain a minimum of 35 percent of all native prairie upland acres in a high visual obstruction reading (VOR) category (>8 inches [20 centimeters] ; Robel et al. 1970), a minimum of 25 percent in a medium VOR category (4–8 inches [10–20 centimeters]), and a minimum of 10 percent in a low VOR category (<4 inches [10 centimeters]).

Objective 2B: On WPAs in the refuge complex, maintain a minimum of 40 percent of all native prairie upland acres in a high VOR category (>8 inches [20 centimeters]; Robel et al. 1970), a minimum of 25 percent in a medium VOR category (4–8 inches [10–20 centimeters]), and a minimum of 5 percent in a low VOR category (<4 inches [10 centimeters]).

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 (1977) 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 refuge complex's target upland species, including the bobolink (Johnson et al. 2004), 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 refuge complex's target upland species. VOR (height-density) preferences for all are listed in table 6.

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 [10 centimeters]); 2) medium cover (4–8 inches [10–20 centimeters]), and; 3) high cover (>8 inches [20 centimeters]). 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.

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 refuge 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). Refuge 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 provide a host of vegetative structures across the Service-owned landscape of the refuge complex.

Table 6. Preferred visual obstruction reading (VOR) range and mean for 10 target upland bird species (Laubhan et al. 2006)

Species	*VOR Range inches (cm)*	*VOR Mean inches (cm)*
Bobolink	12–21 (30–53)	17.8 (45.2)
Chestnut-collared longspur	N/A	7.5 (19.1)
Grasshopper sparrow	11–20 (28–51)	15.1 (38.4)
Mallard	14.5–45 (36.8–114)	28.7 (72.9)
Marbled godwit	0–10 (0–25.4)	5.5 (14)
Northern harrier	10 (25.4)	37.7 (96)
Sedge wren	N/A	23.5 (59.7)
Sharp-tailed grouse	13–30 (33–76.2)	19.4 (49.3)
Upland sandpiper	5–20 (12.7–50.8)	9.2 (23.4)
Western meadowlark	12.5–20 (31.8-50.8)	13.6 (34.5)

Postburn 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 preburn 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, 1 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 postburn, the percentage of short, sparse vegetation (<2 inches [5 centimeters]) increased, but by 2 years postburn 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 (Johnson et al. 2004), sedge wren, grasshopper sparrow, bobolink, western meadowlark, and upland sandpiper (Johnson et al. 2004), 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 (Johnson et al. 2004) of various bird species. In addition to prescribed fire, rotational grazing is commonly recommended as a beneficial defoliation tool for the aforementioned target species and also for 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 2–5 years (Johnson et al. 2004).

Therefore, in general, a defoliation return interval of approximately 3–5 years will be used, with the understanding that this return interval will apply only to priority lands, because of staff and budgetary limitations. This return interval may be decidedly shorter (e.g., 1 year, <1 year) if it is determined that more frequent treatments are needed to most effectively manage against the invasion of cool-season exotic grasses on a particular tract.

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Prescribed fire is used to manage tracts of refuge land.

If management is applied approximately at this interval (3–5 years), lands in the refuge complex should provide the percentages of vegetative structure categories outlined in objectives 2A and 2B. Thirty percent of the upland acreage in the refuge complex will not be targeted for a specific structural category, in order to allow for various uncontrollables (e.g., climatic extremes).

Refuge complex staff established different structural class target percentages for refuges and WPAs. Because WPAs are "waterfowl first" lands, it was decided that it is appropriate to manage for an 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 [10–20 centimeters]) and high (>8 inches [20 centimeters]) categories (Laubhan et al. 2006). Additionally, it should be noted that VORs in the low category (<4 inches [10 centimeters]) 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, refuge 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 refuge 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 3–5 years), but also on low priority units that are managed at much greater intervals (i.e., managed no more than once every 7 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, refuge 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 (5.9 meter) 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, determine the sod history (native versus previously cultivated) of all fee-title lands in the refuge complex. Record sod history data as a layer in the refuge complex's GIS.

Rationale 3:

Determining the sod history of certain Service-owned lands or portions thereof is often relatively straightforward, although it can also be difficult and exhaustive on some tracts. While some lands in the refuge complex 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 refuge complex (Grant, Service, pers. commun.).

A comprehensive and definitive determination of the sod history of all upland acres managed by the refuge 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 refuge 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 multiyear 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 refuge complex was discussed in detail in the background section of the native prairie habitat type. The problems associated with degraded native prairie (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 lands in the refuge complex, 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 refuge complex staff determines that a tract of land has a history of previous cultivation, it can use this management strategy to achieve a desired grass diversity. Conversely, if it is determined that the tract is native sod, staff must use 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 historical 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.
- Use soil experts from the U.S. Natural Resources Conservation Service of the 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 RLGIS 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 semipermanent or permanent wetlands.

Rationale 4A:

The central grasslands were once North America's most extensive ecosystem (Johnson and Igl 2001). Grasslands and wetlands are the two major habitat components 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).

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 presettlement 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. BBS data indicates 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 Reynolds (Service, pers. commun.), for every one 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

presettlement 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 refuge 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 refuge 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 this model deems priority. This acquisition strategy has been adopted by the Service's DWG for grassland easement acquisition, which is ultimately directed at increasing waterfowl productivity. If, over a 15-year period, 80,000 acres of additional grassland habitat can be protected, this will prevent the loss of habitat for a cumulative minimum of 139,080 ducks, based on relationships between grasslands and breeding duck populations (circa 1995-1998; Loesch, Service, unpublished data).

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 semipermanent or permanent wetlands (figure 16). These areas, known as grassland bird conservation areas (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 grassland bird conservation areas 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 cropland) 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 from cultivation all grassland areas under perpetual Service easement over a 15-year period.

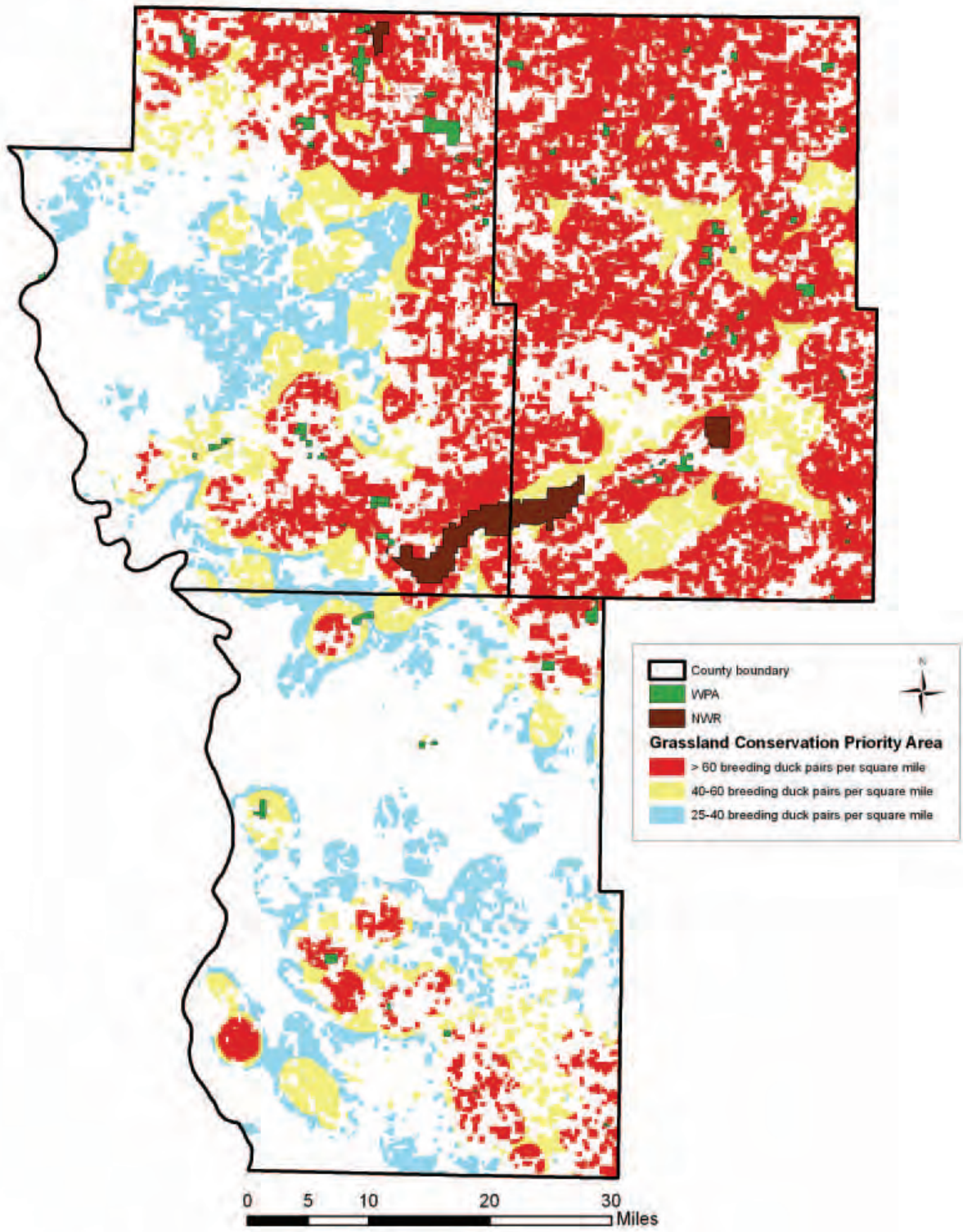

Figure 15. Distribution of 55-acre sections, which contain priority grasslands for conservation, relative to the number of breeding ducks per square mile

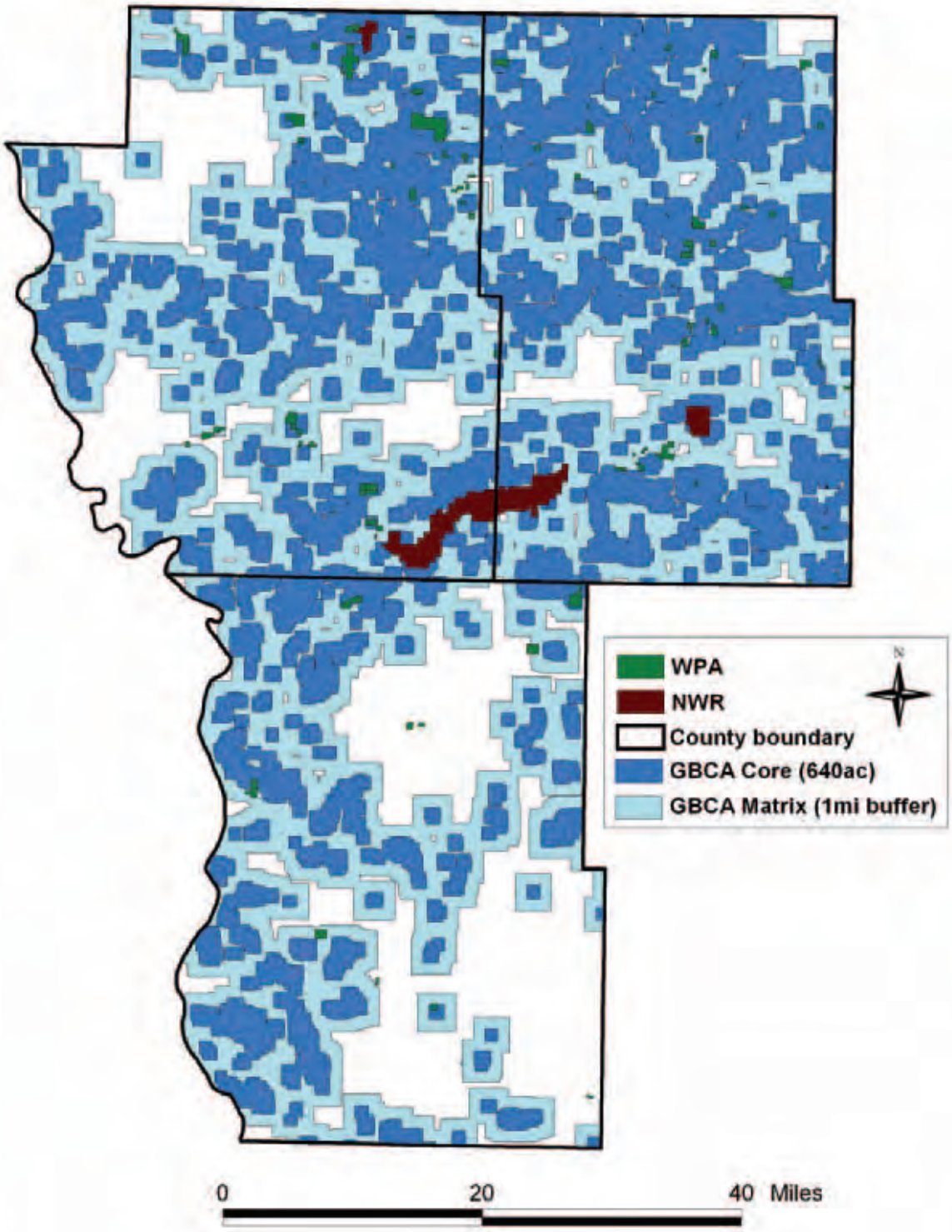

Figure 16. Grassland Bird Conservation Areas (type 1) and their associated 1-mile buffer areas in Long Lake Wetland Management District

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 refuge complex.

Service grassland easements are perpetual in nature. The Service issues the landowner a one-time payment in order to acquire and 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.

The purpose of the easements is to protect the landscape for waterfowl production, as well as to secure the needs 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 North Dakota and other states, easement-compliance work is vitally important to the continued success of the program (Service 2005b). Based on current easements in the refuge complex, which are predominantly native prairie, the major regulatory enforcement issue concerns cultivation, since native prairie is rarely used as hayland. In the future, however, as the refuge complex acquires tamegrass (previously farmed) tracts that are used as hayland by landowners, the potential will increase for violation of the pre-July 15th haying restriction. The refuge 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 refuge 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 refuge 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 refuge complex can assure a high rate of landowner compliance within the 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 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 refuge 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 refuge 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 invasive plants. 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 goal will require that extensive reclamation-level management is conducted to restore the native vegetation. Ideally, old cropland in the refuge 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 refuge 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 (see table 5), including that:

- All 10 species regularly nest on lands in the refuge complex;
- two species are endemic to the Great Plains and five others are secondary endemic species (Mengel 1970);
- eight are Noth 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).

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 refuge complex should benefit a much broader group of "secondary" bird species (see appendix L), 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 refuge complex.

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

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

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 sweetclover, 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 properly maintained DNC serves as quality nesting habitat for a variety of upland nesting ducks, staff in the refuge complex 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.). Native vegetation is also preferred over nonnative vegetation by a number of the refuge 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, Dhol 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 North Dakota 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).

The refuge complex will, therefore, 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. Refuge complex staff has used many of these species in past seed mixes.The number of species in refuge 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 refuge complex is part of an historically cool-season grass (C3) dominated ecosystem, which is supplemented with multiple warm-season (C4) grasses. The refuge complex staff strives for a 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 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 and slope).

The site—and more specifically seedbed preparation—are, however, also especially important in the establishment of native seedings (Duebbert et al.1981). A prescription that has been successful within the refuge complex in the past includes multiple years of cropping (i.e., small grains), followed by no less than one season of chemical fallowing using glyphosate-based herbicide. This is 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 4 years of generalist herbicide applications in Saskatchewan, exotic cool-season grasses persisted 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 than 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 postseeding.

Native grass reseeding efforts over the next 15 years will be based on a priority hierarchy established in this CCP for lands in the refuge complex (appendix F). As with many management

actions, but even more importantly for native reseeding activities, budgets need to be considered 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, it is important 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, refuge 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 (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 is harrowing seed into the soil. 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 postseeding management (e.g., prescribed fire). Finally, Koerner (Service, pers. commun.) cautions as to the extended amount of time (i.e., >10 years) necessary for some forb species to express themselves in a seeded field.

Prior to any forb seeding, a limited forb diversity survey should be conducted at a sample of established native seedings to determine an actual need for interseeding forbs.

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 postseeding management, including clipping, prescribed fire, and prescription grazing.

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.)

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.

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.

Rationales 2A and 2B:

Some native seedings on the refuges and WPAs have achieved a floristic composition that is 50 percent native grass within 2 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 may 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. Permanent belt transects should be established 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.

Through properly timed and executed management activities (i.e., fire, grazing), native grass composition should increase to at least 15 percent above the minimum threshold for a native seeding to be considered "established" (50 percent). These seedings should become sites that, with modest management, resist invasion by exotic cool-season grasses and invasive plants. Ideally, native seedings in the refuge 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 refuge complex-imposed minimum success thresholds (e.g., a frequency of occurrence of native grasses 65 percent).

Strategy 2A:

- Establish one permanent 82-foot (25 meter) belt transect for every 10 acres of upland on tracts with >25 total upland acres.
- Collect baseline plant species composition data at 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.

USFWS

Many strategies including grazing will be used to control invasive plant species.

  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 is 50 percent.

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."

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, actively manage 300 acres of North Dakota State Listed Noxious Weeds (e.g., 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, which 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 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 and sedge wrens (Johnson et al. 2004).

The presence of invasive plant species in old cropfields can, however, lead to additional infestations in new locations, as well as future invasive plant problems once native grasses are reseeded. Further, a total lack of effort to control invasive plants 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 invasive plant species is discussed in detail in rationales 3A, 3B, and 3C of the undeveloped wetlands habitat section.

It is important, therefore, to address public complaints about invasive plants on Service-owned lands in the refuge complex and also to target active invasive plant 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. Idle old cropland 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 invasive plant infestations made by refuge 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 refuge complex.

USFWS

Western meadowlark, an "indicator" upland species

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 refuge complex is considered an unnatural component of the historical 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 historical 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 WPAs and refuges.

Meeting the planted and exotic woody vegetation goal will require the removal of planted and exotic woody vegetation from Service lands. Ideally, upland habitats in the refuge 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 refuge 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 (see table 5), including that:

- all 10 species regularly nest on lands in the refuge complex;
- 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).

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 refuge complex should benefit a much broader group of "secondary" bird species (appendix L), 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 refuge 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 will target individual trees and shrubs, fields invaded by exotic saplings, and single- to few-rowed linear plantings. During years 10–15, expand the removal efforts to target many-rowed linear plantings and "block" plantings, based on the results of prior systematic wildlife surveys (see objective 1B).

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).

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 three percent of the land area in South Dakota. In Emmons County, North Dakota, alone, local county conservation districts and the Natural Resources Conservation Service annually plant more than 130,000 trees (Jacobs, Natural Resources Conservation Service, 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 are often 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. Stauffer and Best (1980) found that in Iowa, western meadowlarks preferred pastures and haylands 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). Kahl et al. (1985) characterized typical grasshopper sparrow habitat in Missouri as having no woody vegetation >3.3 feet (1 meter) 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 >246 feet (75 meters) from wooded edges. Also, in Nebraska, none of the ten recorded grasshopper sparrow nests were within 164 feet (50 meters) 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 (45 meters) 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).

This documentation demonstrates that planted tree belts and invaded exotic trees and shrubs likely have a negative impact on grassland passerine use of Service lands in the refuge complex. The refuge complex staff is working with the University of Montana and other refuges and districts in North Dakota 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 [20–220 meters]) on three WPAs and one refuge in the refuge complex. In the winter of 2005–06, refuge 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 passerine 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, artificial nests located <197 feet (60 meters) 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 (45 meters) from woody vegetation (Johnson and Temple 1990a,b). Further, in West Virginia, woodlots surrounding a 103-acre (41 hectare) 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

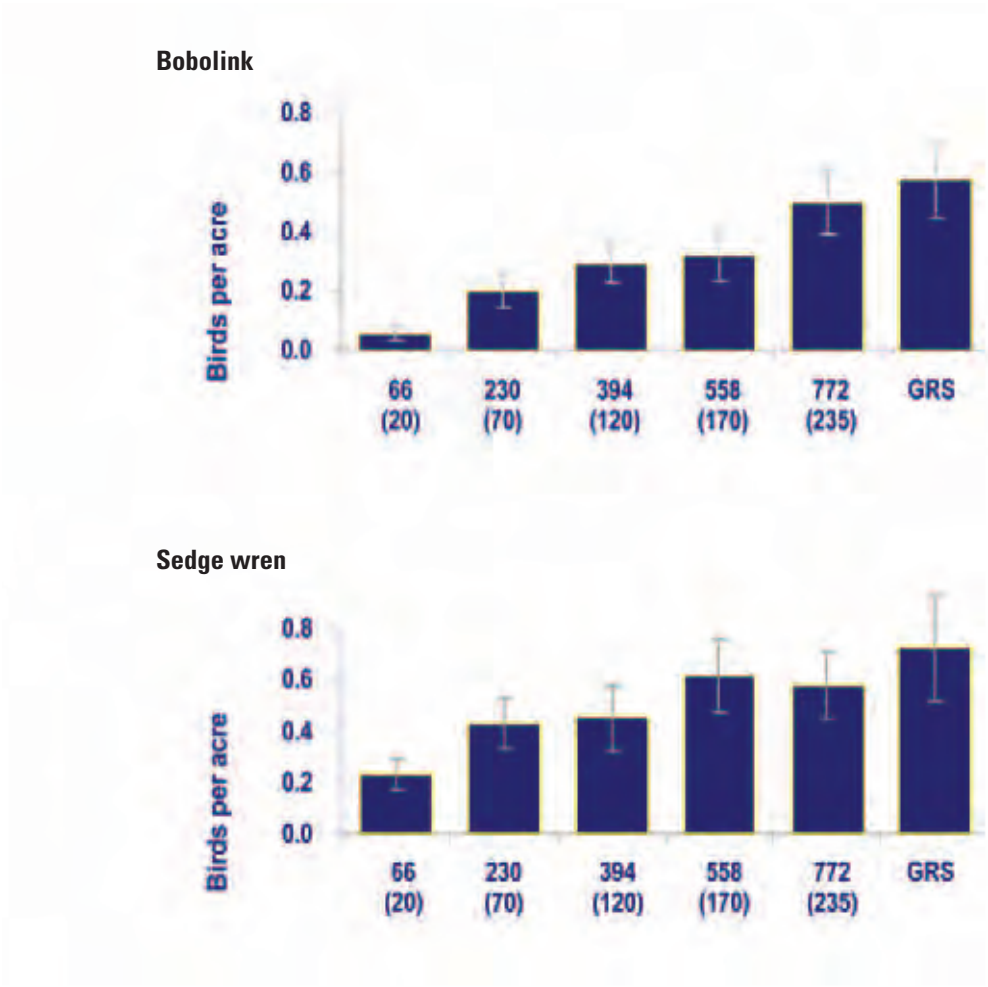

Figure 17. Densities of bobolinks and sedge wrens at increasing distances from treebelts and in open grassland control sites (GRS) in North Dakota and South Dakota during 2005 (n = 48; Frank Quamen, University of Montana, unpublished data).

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 (one 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).

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 [0.60 kilometers]) 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 [0.60 kilometers]) 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, planted and invaded exotic woody vegetation will be removed from WPAs 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, 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 provide 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 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), refuge complex staff proposes to evaluate the overall wildlife importance of these habitats on lands in the refuge complex through a series of systematic wildlife surveys, prior to determining their fate (e.g., removal).

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 downed woody material.

Strategy 1B:

- Use modified area-search methodology (Ralph et al. 1993) or other methodologies (e.g., Emlen 1977) to evaluate seasonal wildlife use.

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 North Dakota 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, refuge complex staff will informally survey these bare areas annually for invasive plant 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 invasive plant infestations, refuge complex staff will attempt to reseed these areas to perennial grass cover within 6 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 invasive plant 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 lands in the refuge complex.

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, to the extent possible with existing staff.

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 [3 meter] 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 refuge complex staff plans to erect these exclosures over piping plover nests that are encountered within the boundaries of the refuge complex; not limited to Service lands, when permission is granted on private property. However, the ability of the refuge complex staff to cage and monitor all documented piping plover nests in a given year will depend upon multiple factors, including staff and budget constraints, as well as the number of piping plover nests found. For example, despite the fact that a relatively small number of piping plover pairs and or nests (e.g., <five) have been documented on survey wetlands in the district in recent years, 107 pairs of piping plovers were recorded on eight wetlands surveyed during the International Piping Plover Census in 2006.

Exclosures placed after one egg has been laid in the nest bowl have resulted in <two percent nest abandonment on an operational basis in the

Figure 18. Unit II marsh dike piping plover management area (0.7 mile).

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 use wetlands and agricultural fields in North Dakota 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 during most years) 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 several 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 the whooping crane's 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 refuge 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 confirming fall observations, where it appears that

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 (mechanical disturbance) vegetation expands to become the predominant cover type on the dike. Refuge 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 refuge complex identified by a HAPET-developed predictive model as having habitat potentially suitable for breeding piping plovers.

Wetlands on which breeding piping plovers 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, 2006) at sites censused in 1991 and a very limited number of new sites (Plissner and Haig 2000). Refuge 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 resurveying sites of known piping plover activity to determine population trends at 5-year intervals, refuge complex staff additionally plans to survey new sites predicted by HAPET's model (figure 19). 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 lands in the refuge complex, in an effort to reduce the risk of an accidental shooting.

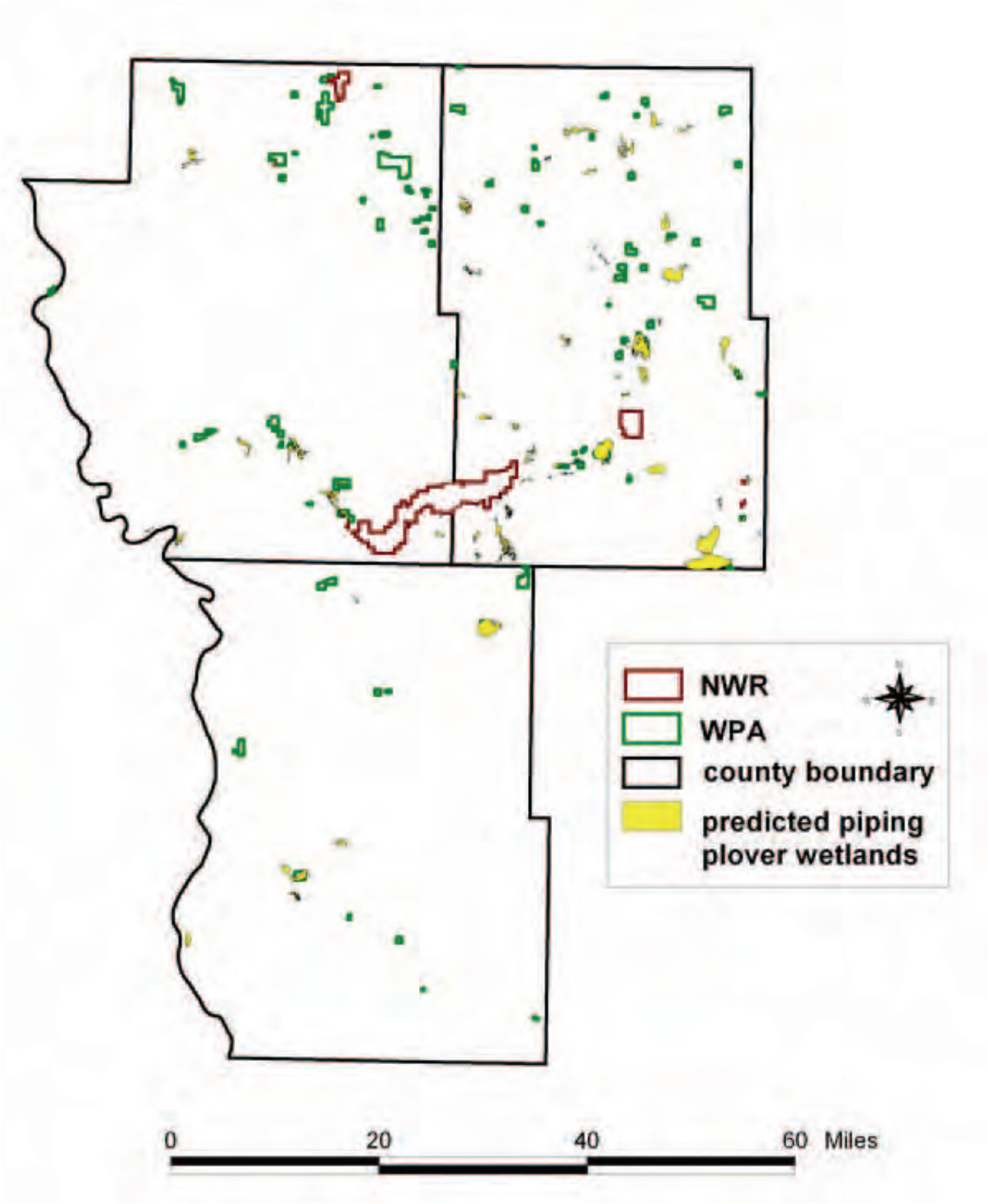

Figure 19. Predicted piping plover breeding wetlands

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 5 years of classification.

Rationale 3:

In 2005, refuge complex staff classified the degree of Dakota skipper habitat potential that existed on Service lands within the refuge 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 J). Upland habitat management of this WPA unit will follow guidelines presented in the Service Conservation Strategy (Murphy 2005). Additionally, any Service lands in the refuge 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 5 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 factors (e.g., new invasion by exotic plant species). During the summer of 2006, a University of North Dakota professor conducted surveys for Dakota skippers on native portions of Braun and Schiermeister WPAs and Florence Lake NWR. No Dakota skippers were collected or documented; however, skippers (Family Hesperiidae) were seen at all three sites, but could not be captured for more specific identification. According to Goodwin (University of North Dakota, pers. commun.), relying on vegetative survey data may be a more appropriate means of determining Dakota skipper presence, compared to actual butterfly surveys, based on the rarity of the species and the short flight period.

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, refuge complex staff plans this removal effort to be a part of a multifacetted 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 refuge 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, Martin 1995, 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 lands in the refuge complex 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, nest success was determined to be three 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 (Cowardin et al. 1985, Greenwood 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, professional trapper(s) will be hired to reduce mammalian predator populations on large township-sized blocks (approximately 36 square miles) over a period of 3 years.

The refuge 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 refuge complex, through issuance of a special use permit (SUP) 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 district, in accordance with NDGF trapping regulations.

A decision matrix developed by HAPET (figure 20) will allow the assessment of 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 refuge 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).

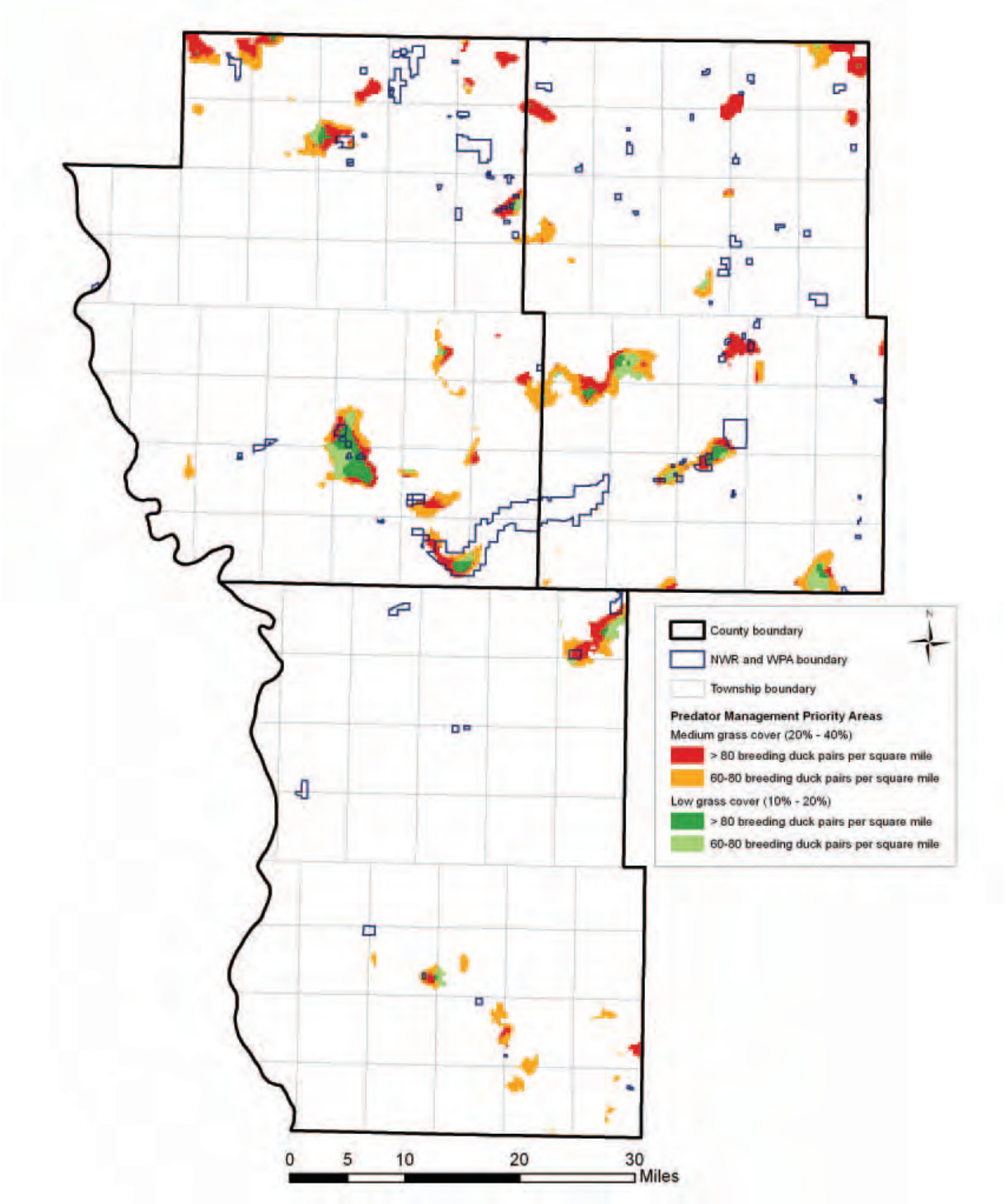

Figure 20. Priority areas for large-block predator management, relative to the percent grass cover on the landscape and the number of breeding duck pairs per square mile.

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 or greater 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 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 five 80-acre sites chosen through systematic-random selection, using chain drag methodology (Klett et al. 1986). Alternatively, refuge 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 refuge 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 refuge 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 nine 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), the refuge complex staff proposes to initiate predator removal efforts on selected Service-owned islands within the refuge 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 the refuge 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 2 years.
- Use current aerial photography to identify all manageable (i.e., predator removal) islands on refuges and WPAs in the refuge complex.

Objective 4: Oversee the placement of hen houses on priority WPAs and refuge wetlands through a partnership with Delta Waterfowl, Inc. Delta will erect new hen houses at a rate that will increase the total number that existed on lands in the refuge complex in 2005 (n=23) by 10 percent a year, over a 15-year period. Delta will annually determine duck use, nest, success, and maintenance needs. It will 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) suggest 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 RLGIS model developed by HAPET, refuge complex staff plans to select semipermanent 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.
- Refuge 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: Complete a refuge complex avian disease contingency plan within 1 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).

Rationale 1A:

Because of emerging disease threats, refuge 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 refuge complex dealt primarily with two principal diseases in its 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 West Nile virus (USGS 2006c). However, the highly pathogenic H5N1 strain of avian influenza (HPAI) presents refuge complex staff and other wildlife resource personnel with a wide range of unknowns, including possibly serious human health threats.

HPAI (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 2006b).

The Service is taking a proactive approach to HPAI, both with respect to monitoring and to employee safety. In the near future, the refuge complex will conduct all avian disease surveillance, reporting, response, and handling activities under the auspices of a refuge complex avian disease contingency plan.

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).

Rationale 1B:

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. Refuge 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 (2003 and 2004) and by assisting with tissue sample processing in 2003. Refuge 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.

Strategies 1A and 1B:

- Follow the monitoring and response protocols outlined in various disease contingency plans.

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).

Objective 2: Within 1 year of the completion of this CCP, eliminate all winter feeding operations on lands in the refuge complex.

Rationale 2:

For a number of years, refuge 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 winter mortality of ring-necked pheasants 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 North Dakota and other Midwestern states are generally considered to be very expensive and ultimately provide few tangible results (NDGF 1992). The refuge 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 multiyear 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 one or two 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 refuge 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 refuge 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 refuge complex's resource availability. As an alternative, refuge 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 3-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 districts (i.e., Long Lake, Northeast Montana, Kulm) in the PPR of North Dakota 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 refuge complex will not attempt to initiate this study immediately (i.e., from the completion of the CCP until 2 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. Therefore, the refuge 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 districts (i.e., Kulm, northeast Montana).

Research, Inventory, and Monitoring Goal:

Use data from inventory, monitoring, and applied research to advance the understanding of the natural resources and their management on lands within the refuge complex.

Objective 1: Within 10 years of the completion of this CCP, develop and complete a new inventory and monitoring plan for the refuge complex.

Objective 2: Within 7 years of the completion of this CCP, develop and complete a new habitat management plan for the refuge complex.

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 refuge complex's CCP.

Objective 4: Within 1 year of the completion of this CCP, establish a secondary priority needs list of research, inventory, and monitoring information needs for the refuge complex.

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 objectives for the refuge complex, it is imperative that step-down plans, such as inventory and monitoring and habitat management plans are produced. The purpose of step-down plans is to provide greater detail and clearer direction to Service managers and other employees who will carry out 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, 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 refuge complex has been entrusted with managing and protecting, are many and varied. The information needs that refuge 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 earlier in this chapter.

Developed Wetlands
See objectives 1A, 1B, and 2.

Undeveloped Wetlands
See objectives 1A, 1B, 1C, and 2.

Native Prairie
See objectives 1A, 1B, 1C, 1D, 1E, 2A, 2B, and 3.

Old Cropland
See objectives 1 and 2.

Priority Population Issues
See objectives 1A, 1B, and 2.

Predator Management
See objectives 1 and 2.

Wildlife Disease
See objective 1.

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, refuge complex staff will identify biological activities, in addition to those addressed in the CCP's biological objectives, which are deemed as important and accomplishable. This group of biological activities will be considered as a secondary priority.

Strategies 1 and 2:

- Complete detailed and accurate plans within the allowed timeframes.

Strategy 3:

- Direct the principal thrust of the refuge complex's biological efforts towards the information needs outlined in its CCP's biological objectives.

Strategy 4:

- Evaluate the refuge complex's biological information needs not addressed in the CCP's biological objectives to determine which deserve consideration as secondary priority needs.

Socio-economic Sub-Goal

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 of refuge complex management and to provide quality public use opportunities.

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 refuge 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 (NGO) to obtain the necessary data to ascertain travel trends concerning the refuge complex. Work with USGS's BRD economists and area universities, as well as with Region 6's Education and Visitor Services division to develop user-friendly, easily distributed questionnaires to obtain information from local, national, and international refuge complex visitors.

Objective 3: Develop an economic impact analysis within 5 years of CCP approval, to determine and describe how the refuge complex's management activities affect the local and state economies.

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The refuge plans to partner with local environmental education groups in the future.

Rationales 1, 2, and 3:

Because of its size and rural location, the refuge complex has limited information concerning what the public wants and expects from the refuge complex. The Service will analyze this data to make decisions about future public use program developments and facilities.

Finally, this data will supplement existing data on economic benefits generated for the local and state economies where the refuge complex lies.

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 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 (BRD) 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 refuge complex.

Public Use 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 fishing—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. Within 15 years of CCP approval, 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).

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 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 lands in the refuge complex 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 (refuge 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 refuge 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 fisheries in the refuge complex, it may be possible to develop additional compatible fishing programs and provide information about these fishing opportunities (i.e., fishery location maps for the public). This will enable the refuge 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 and when necessary. Survey information will determine whether areas support fish, and further evaluation will determine whether areas can be opened for fishing in a compatible manner (e.g., 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 refuge complex may be able to administer and provide some of the proposed opportunities without the need for additional resources.

Strategy 1:

- Coordinate with the Service's Bismarck Missouri River Fish and Wildlife Management 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 will 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 conflicts with 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 refuge 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, refuge 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 will enable the 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

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A youth fishing event will be conducted annually.

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 (e.g., 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 refuge complex may be able to administer and provide some of the proposed opportunities without the need for additional resources.

Strategy 2:

- Coordinate with the Service's Bismarck Fisheries Assistance Office and NDGF fisheries division staff to sample permanent wetlands with fisheries potential. (Target those wetlands associated with WPAs with depths ≥ 10 feet and surface acreage of > 200 acres).
- No fisheries will be developed through the introduction of fish.
- Where current fisheries exist, fish populations could be augmented with stocking.
- 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 refuge 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 more limited potential for reducing predation on ground-nesting birds, as compared to predator removal between March 15 and July 15 (Dixon and Hollevoet 2005), 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, the Animal and Plant Health Inspection Service, and Wildlife Services personnel. These problems could likely be somewhat mitigated by providing a

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Additional hunting opportunities will be explored.

compatible recreational predator hunting program on refuges administered by the refuge 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 refuge 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 refuge 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.
- Evaluate the potential for expanding late-season upland gamebird hunting programs on Slade NWR and Florence Lake NWR.
- Provide a predator 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 specific areas if deemed appropriate.
- Identify needs for enhanced hunting programs (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 refuge 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. in targeting the furbearing mammals that damage refuge infrastructure (e.g., muskrats) and prey on neighboring livestock (e.g., coyotes).

Trappers, who continue to remove mammals that predate ground-nesting birds late in the winter or 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 to obtain information regarding targeted mammal groups and reduce surplus mammals that present specific management issues, while providing a biologically sound recreational and economic activity.

Strategy 1:

Continue to administer the trapping program on the refuges 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 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 refuge 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 one of the six priority public uses outlined in the Improvement Act.

Facilities at Slade NWR will be upgraded to meet accessibility standards. Adjustments in facilities at Lake Isabel Recreation Area will be made to augment wildlife-dependent activities and reduce or eliminate nonpriority public uses. Upgrades will include accessible trails and tables. Signage at the refuge will be reduced by installing a centralized kiosk, which will 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 5 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 Juniors Acquiring Knowledge, Ethics, and Sportsmanship [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 will 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 a trail.
- Upgrade facilities at Slade NWR to meet compatibility and accessibility standards. Upgrades will include accessible trails and tables.
- Install a centralized kiosk at Slade NWR, which will 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 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 the on-site wildlife-oriented environmental education programs offered by the refuge 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 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 capitol), which has a metropolitan 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) existing historical stone buildings could be developed into an environmental education center, and; 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 and activities targeting a menu of specific lesson themes for school groups.
- Promote self-guided tours, led by educators, targeting on-site environmental education for school-age children.
- Develop an educator's guide to self-guided refuge tours, which provides a menu of options and lessons for site-specific environmental education tours. The educator's guide will be tailored to the needs of various class levels with varied levels of complexity, depending on the age level/class 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 the 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. The tower/deck will include interpretive panels containing information about the area wildlife.

USFWS

The refuge complex provides excellent opportunities for wildlife observation.

Objective 3: Within 10 years of the approval of the CCP, expand the quality and quantity of the off-site wildlife-dependent environmental education program offered by the refuge 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 biologist in the refuge complex 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 (e.g., shorebird, wetland, prairie, endangered species) for off-site classroom reservations for area schools.

Objective 4: Increase visibility of the refuge 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 complex's 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 Sub-Goal:
Identify, value, and preserve the cultural resources and history of the refuge complex and connect refuge 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 projects in the refuge complex to identify concerns.

Objective 2: Successfully integrate the Section 106 process into all applicable refuge complex projects by notifying the Service's cultural resource staff early in the planning process and, whenever possible, complete the review without delay to the project.

Strategy 2:

- Incorporate the Section 106 review into the project design as early as possible and complete process as applicable.
- Complete a Programmatic Agreement with the state Historic Preservation Office 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 the Service's 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 of the headquarters built by the Works Progress Administration (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 refuge complex. If feasible, carry out 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 Sub-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 complex will continue to participate in partnerships that promote sound wildlife management or contribute to the missions of the Service, the Refuge System, or the refuge 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 refuge 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 plant control, recreation area maintenance, conservation education, etc.
- Explore opportunities for new, nontraditional partnerships that further the accomplishment of the goals and objectives of the refuge 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.z
- 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 resource needs at the refuge complex.

Rationale 3:

Partners are essential in fully implementing the CCP for the refuge complex. They 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 refuge 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 the refuge complex's wildlife, habitat, and public use programs will not continue without the additional funding and support from partners. Without partners, many of the habitat protection, restoration, and enhancement projects will go unfunded. Over time, the diversity of wildlife species will begin to decline as habitat became degraded.

The refuge complex spans the entire three-county landscape with wetland and grassland easement programs and other activities that occur on lands administered by the refuge 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 refuge complex's programs. Partnerships are vital to accomplishing the Service mission. By establishing and maintaining partnerships it will foster communication between local communities, stakeholders, and others interested in the welfare of the refuge complex.

Refuge 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 refuge 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 carry out the strategies described in the CCP.

Under the CCP, refuge complex staff will revise or develop several step-down plans for the refuge 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 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 monitoring plan for the refuge complex. In this CCP, habitat monitoring receives the primary emphasis. Many of the wildlife species in the refuge 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. If a change in bobolink use occurs on a manipulated field, it may or may not be directly tied to 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.

When stringent protocols or complex data analysis is needed, monitoring should be designed and developed in cooperation with universities and/or government research divisions (e.g., NPWRC, University of North Dakota). Applied research can help to answer habitat, wildlife, and public use

management questions. Refuge complex staff will work with researchers to ensure that the research is applicable and compatible with refuge 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 refuge complex.

Glossary of Terms

Canada Goose
Bob Savannah/USFWS

Glossary of Terms

accessible—Pertaining to physical access to areas and activities for people of different abilities, especially those with physical impairments.

adaptive management—Rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities; a process that uses feedback from research, monitoring, and evaluation of management actions to support or modify objectives and strategies at all planning levels; a process in which policy decisions are carried out within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

alternatives—Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission and resolving issues.

amphibian—Class of cold-blooded vertebrates including frogs, toads or salamanders.

baseline—Set of critical observations, data, or information used for comparison or a control.

biological control, *also* **biocontrol**—Reduction in numbers or elimination of unwanted species by the introduction of natural predators, parasites, or diseases.

biological diversity, *also* **biodiversity**—Variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1.12B). The Refuge System's focus is on indigenous species, biotic communities, and ecological processes.

biological integrity—Composition, structure, and function at the genetic, organism, and community levels consistent with natural conditions and the biological processes that shape genomes, organisms, and communities.

biomass—Total amount of living material, plants and animals, above and below the ground in a particular habitat or area.

biotic—Pertaining to life or living organisms; caused, produced by, or comprising living organisms.

borrow area—An area used to provide substrate for construction projects or other purposes.

breeding habitat—Habitat used by migratory birds or other animals during the breeding season.

canopy—Layer of foliage, generally the uppermost layer, in a vegetative stand; midlevel or understory vegetation in multilayered stands. Canopy closure *(also* canopy cover*)* is an estimate of the amount of overhead vegetative cover.

CCC—See Civilian Conservation Corps.

CCP—See comprehensive conservation plan.

Cervis—Pertaining to the deer family. Distinguished from Bovidae by the male's having solid, deciduous antlers (e.g., deer, caribou, moose, elk).

CFR—See Code of Federal Regulations.

Civilian Conservation Corps—Peacetime civilian "army" established by President Franklin D. Roosevelt to perform conservation activities from 1933–42. Activities included erosion control; firefighting; tree planting; habitat protection; stream improvement; and building of fire towers, roads, recreation facilities, and drainage systems.

climax—Community that has reached a steady state under a particular set of environmental conditions; a relatively stable plant community; the final stage in ecological succession.

cm—Centimeter; equivalent to 0.39 inch.

code of federal regulations (CFR)—Codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government. Each volume of the CFR is updated once each calendar year.

colony—Nests or breeding place of a group of birds such as herons or gulls occupying a limited area.

community—Area or locality in which a group of people resides and shares the same government.

compatible use—Wildlife-dependent recreational use or any other use of a refuge that, in the sound

professional judgment of the director of the Service, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge (Draft Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identified stipulations or limits necessary to ensure compatibility.

comprehensive conservation plan (CCP)—A document that describes the desired future conditions of the refuge and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the Refuge System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

concern—See *issue*.

conservation—Management of natural resources to prevent loss or waste. Management actions may include preservation, restoration, and enhancement.

conspecific—An individual belonging to the same species as another.

cool-season grass—Grass that begins growth earlier in the season and often become dormant in the summer; will germinate at lower temperatures (65–85°F). Examples are western wheatgrass, needle-and-thread, and green needlegrass.

cooperative agreement—Legal instrument used when the principal purpose of the transaction is the transfer of money, property, services or anything of value to a recipient in order to accomplish a public purpose authorized by federal statute and substantial involvement between the Service and the recipient is anticipated.

coordination area—Wildlife management area made available to a state, by "(A) cooperative agreement between the United States Fish and Wildlife Service and the state fish and game agency pursuant to Section 4 of the Fish and Wildlife Coordination Act (16 U.S.C. 664); of (B) by long-term leases or agreements pursuant to the Bankhead–Jones Farm Tenant Act (50 Stat. 525; 7 U.S.C. 1010 et seq.)." States manage coordination areas, but they are part of the Refuge System. CCPs are not required for coordination areas.

coteau—A hilly upland including the divide between two valleys; a divide; the side of a valley.

coulee—A ravine or gully.

cover, *also* **cover type, canopy cover**—Present vegetation of an area.

cultural resources—Remains of sites, structures, or objects used by people in the past.

cultural resource inventory—Professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined area. Inventories may involve various levels including background literature search (class I), sample inventory of project site distribution and density over a larger area (class II), or comprehensive field examination to identify all exposed physical manifestation of cultural resources (class III).

cultural resource overview—Comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field office background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

curtilage—An enclosed area immediately surrounding a house or development

database—Collection of data arranged for ease and speed of analysis and retrieval, usually computerized.

deciduous—Pertaining to any plant organ or group of organs that is shed annually; perennial plants that are leafless sometime during the year.

defoliation—Removing of vegetative parts; to strip vegetation of leaves; removal can be caused by weather, mechanical, animals, and fire.

demography—Quantitative analysis of population structure and trends.

dense nesting cover (DNC)—Composition of grasses and forbs that allows for a dense stand of vegetation that protects nesting birds from the view of predators, usually consisting of one to two species of wheatgrass, alfalfa, and sweetclover.

depredation—Taking of wildlife—including destruction of nests or dens, and eggs or young—by a predatory animal; damage inflicted on agricultural crops or ornamental plants by wildlife.

dike—A mound or dam used to impound surface water.

disturbance—Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., timber harvest).

DNC—See dense nesting cover.

drawdown—Manipulating water levels in an impoundment to allow for the natural drying-out cycle of a wetland.

EA—See environmental assessment.

easement—Agreement by which a landowner gives up or sells one of the rights on his/her property.

ecological diversity—Variety of life and its processes including the variety of living organisms, the genetic differences among them, and the

communities and ecosystems in which they occur (Service Manual 052 FW 1.12B).

ecological fit—Applies to how well an organism is suited to fulfill its role in the environment it is in.

ecological succession—Orderly progression of an area through time from one vegetative community to another in the absence of disturbance. For example, an area may proceed from grass-forb through aspen forest to mixed-conifer forest.

ecosystem—Dynamic and interrelating complex of plant and animal communities and their associated nonliving environment; a biological community, together with its environment, functioning as a unit. For administrative purposes, the Service has designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries and their sizes and ecological complexity vary.

ecotone—A transitional zone between two communities containing the characteristic species of each.

EIS—See environmental impact statement.

emergent—Plant rooted in shallow water and having most of the vegetative growth above water such as cattail and hardstem bulrush.

endangered species, federal—Plant or animal species listed under the Endangered Species Act of 1973, as amended, that is in danger of extinction throughout all or a significant portion of its range.

endangered species, state—Plant or animal species in danger of becoming extinct or extirpated in a particular state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

endemic species—Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

environmental assessment (EA)—Concise public document, prepared in compliance with NEPA, that briefly discusses the purpose and need for an action and alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or a FONSI (40 CFR 1508.9).

environmental education—Education aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution.

environmental health—Natural composition, structure, and functioning of the physical, chemical, and other abiotic elements, and the abiotic processes that shape the physical environment.

environmental impact statement (EIS)—Detailed written statement required by section 102(2)(C) of NEPA, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-tern uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

executive order (EO)—An order signed by the President of the United States or top executive of a country.

extinction—Complete disappearance of a species from the earth; no longer existing (Koford et al. 1994).

extirpation—Extinction of a population; complete eradication of a species within a specified area.

fauna—All the vertebrate and invertebrate animals of an area.

federal land—Public land owned by the federal government, including lands such as national forests, national parks, and national wildlife refuges.

federally listed species—Species listed under the federal Endangered Species Act of 1973, as amended, either as endangered, threatened, or species at risk (formerly candidate species).

fee title—Acquisition of most or all of the rights to a tract of land.

finding of no significant impact (FONSI)—Document prepared in compliance with NEPA, supported by an EA, that briefly presents why a federal action will have no significant effects on the human environment and for which an environmental impact statement will not be prepared (40 CFR 1508.13).

fire regime—Description of the frequency, severity, and extent of fire that typically occurs in an area or vegetative type.

flora—All the plant species of an area.

flowage easement—Agreement by which a landowner gives up or sells the right to impound, flood, and/or inundate his/her property with water The term applies only to developed wetlands, which impound water in excess of the capacity of, or longer in duration than, that which would occur naturally.

FONSI—See *finding of no significant impact.*

forb—A broad-leaved, herbaceous plant; a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue but dies down at the end of the growing season.

forest—Group of trees with their crown overlapping (generally forming 60–100 percent cover).

fragmentation—The alteration of a large block of habitat that creates isolated patches of the original habitat that are interspersed with a variety of other habitat types (Koford et al. 1994); the process of reducing the size and connectivity of habitat patches, making movement of individuals or genetic information between parcels difficult or impossible.

friends group—Any formal organization whose mission is to support the goals and purposes of its associated refuge and the Refuge System overall; "friends organizations" and cooperative and interpretive associations.

FWS—See U.S. Fish and Wildlife Service.

Garrison Diversion Project—A multi-faceted government project aimed at providing water from the Missouri River to various parts of North Dakota.

geographic information system (GIS)—Computer system capable of storing and manipulating spatial data; a set of computer hardware and software for analyzing and displaying spatially referenced features (i.e., points, lines and polygons) with nongeographic attributes such as species and age (Koford et al. 1994).

GIS—See geographic information system.

global positioning system (GPS)—System that, by using satellite telemetry, can pinpoint exact locations of places on the ground.

goal—Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

GPS—See global positioning system.

grassland block—Contiguous area of grassland without fragmentation.

habitat—Suite of existing environmental conditions required by an organism for survival and reproduction; the place where an organism typically lives and grows.

habitat conservation—Protection of animal or plant habitat to ensure that the use of that habitat by the animal or plant is not altered or reduced.

habitat disturbance—Significant alteration of habitat structure or composition; may be natural (e.g., wildland fire) or human-caused events (e.g., timber harvest and disking).

habitat type, *also* **vegetation type, cover type**—Land classification system based on the concept of distinct plant associations.

herbivore—Animal feeding on plants.

impoundment—A body of water created by collection and confinement within a series of levees or dikes, creating separate management units although not always independent of one another.

indicator species—Species of plant or animal that is assumed to be sensitive to habitat changes and represents the needs of a larger group of species.

integrated pest management (IPM)—Methods of managing undesirable species such as invasive plants; education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods.

intermittently flooded—Substrate usually exposed, but surface water is present for variable periods without seasonal periodicity.

introduced species—Species present in an area due to intentional or unintentional escape, release, dissemination, or placement into an ecosystem as a result of human activity.

introduction—Intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.

invasive plant—Species that is nonnative to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health. Any living stage (including seeds and reproductive parts) of a parasitic or other plant of a kind that is of foreign origin (new to or not widely prevalent in the U.S.) and can directly or indirectly injure crops, other useful plants, livestock, poultry, other interests of agriculture, including irrigation, navigation, fish and wildlife resources, or public health. According to the Federal Noxious Weed Act (PL 93-639), an invasive plant is one that causes disease or has adverse effects on humans or the human environment and, therefore, is detrimental to the agriculture and commerce of the U.S. and to public health.

inviolate sanctuary—Place of refuge or protection where animals and birds may not be hunted.

IPM—See integrated pest management.

issue—Any unsettled matter that requires a management decision; e.g., a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (Draft Service Manual 602 FW 1.5).

limited-interest refuge landowner—Owner of property that is covered by a refuge and/or flowage easement that is located within the approved acquisition boundary of a limited-interest national wildlife refuge.

lacustrine—Relating to, formed in, living in, or growing in lakes.

lek—An area where certain species of birds (e.g., grouse) assemble for sexual display and courtship.

loam—Soil consisting of sand and clay loosely coherent, with admixture of organic matter or humus.

local agencies—Municipal governments, regional planning commissions, or conservation groups.

long-term protection—Mechanisms such as fee-title acquisition, conservation easements, or binding agreements with landowners that ensure land use and land management practices will remain compatible with maintenance of the species population at the site.

macrophyte—Plant, especially a marine plant, that is large enough to be visible to the naked eye.

maintenance management system (MMS)—National database that contains the unfunded maintenance needs of each refuge; projects include those required to maintain existing equipment and buildings, correct safety deficiencies for the implementation of approved plans, and meet goals, objectives, and legal mandates.

management alternatives—See *alternatives*.

management plan—Plan that guides future land management practices on a tract of land. See *cooperative agreement*.

mechanical control—Reduction in numbers or elimination of unwanted species through the use of mechanical equipment such as mowers and clippers.

mesic—Characterized by, relating to, or requiring a moderate amount of moisture; having a moderate rainfall.

microhabitat—Habitat features at a fine scale; often identifies a unique set of local habitat features.

mid-seral stage forest—Forest of middle ages, usually characterized by a closed canopy and diameters of greater than or equal to 8 inches diameter at breast height.

migration—Regular extensive, seasonal movements of birds between their breeding regions and their wintering regions (Koford et al. 1994); to pass usually periodically from one region or climate to another for feeding or breeding.

migratory bird—Bird species that follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

migratory game bird—Bird species, regulated under the Migratory Bird Treaty Act and state laws, that is legally hunted including ducks, geese, woodcock, and rails.

mission—Succinct statement of purpose and/or reason for being.

mitigation—Measure designed to counteract an environmental impact or to make an impact less severe.

mixed-grass prairie—Transition zone between the tall-grass prairie and the short-grass prairie dominated by grasses of medium height that are approximately 2–4 feet tall. Soils are not as rich as the tall-grass prairie and moisture levels are less.

mm—Millimeter; equivalent to 0.04 inch.

MMS—See maintenance management system.

moist soil management—A modern day practice of managing surface water levels in order to promote the production of wetland plants and invertebrates that are preferrred foods for a variety of waterbirds.

monitoring—Process of collecting information to track changes of selected parameters over time.

moraine—Mass of earth and rock debris carried by an advancing glacier and left at its front and side edges as it retreats.

national wildlife refuge (NWR)—Designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include coordination areas; a complete listing of all units of the Refuge System is in the current "Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service."

National Wildlife Refuge System (Refuge System)—Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife including species threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas.

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

native species—Species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

NAWMP—See North American Waterfowl Management Plan.

Neotropical migratory bird (NTMB), *also* **Neotropical migrant** —Bird species that breeds north of the United States/Mexico border and winters primarily south of this border.

nest success—Percentage of the total number of nests initiated in an area that successfully hatch at least one egg.

NOA—See notice of availability.

NOI—See notice of intent.

nongovernmental organization—Any group that is not composed of federal, state, tribal, county, city, town, local, or other governmental entities.

nonlethal fire—Rangeland fires in which vegetation structure and composition, 3 years following the fire, are similar to preburn conditions.

North American Waterfowl Management Plan (NAWMP)—North American Waterfowl Management Plan, signed in 1986, recognizes that the recovery and perpetuation of waterfowl populations depends on restoring wetlands and associated ecosystems throughout the United States and Canada. It established cooperative international efforts and joint ventures composed of individuals; corporations; conservation organizations; and local, state, provincial, and federal agencies drawn together by common conservation objectives. Long Lake NWR Complex falls into the "Prairie–Pothole Joint Venture."

notice of availability (NOA)—Notice that documentation is available to the public on a federal action such as a comprehensive conservation plan. Published in the Federal Register.

notice of intent (NOI)—Notice that an environmental impact statement will be prepared and considered (40 CFR 1508.22); published in the Federal Register.

NTMB—See Neotropical migratory bird.

NWR—See national wildlife refuge.

NWRS—See National Wildlife Refuge System.

objective—Concise statement of what is to be achieved, when and where it is to be achieved, and who is responsible for the work. Objectives are derived from goals and provide the basis for determining management strategies. Objectives should be attainable, time-specific, and measurable.

overwater species—Nesting species such as diving ducks and many colonial-nesting birds that build nests within dense stands of water-dependent

plants, primarily cattail, or that build floating nests of vegetation that rest on the water.

palustrine—Of, or relating to vegetated wetlands traditionally called by such names as marsh, swamp, fen, bog, and prairie; as well as the small, shallow, permanent or intermittent water bodies often called ponds.

Partners for Wildlife Program—Voluntary habitat restoration program undertaken by the U.S. Fish and Wildlife Service in cooperation with other governmental agencies, public and private organizations, and private landowners to improve and protect fish and wildlife habitat on private lands while leaving the land in private ownership.

Partners in Flight (PIF)—Western Hemisphere program designed to conserve Neotropical migratory birds and officially endorsed by numerous federal and state agencies and nongovernmental organizations; also known as the Neotropical Migratory Bird Conservation Program (Koford et al. 1994).

partnership—Contract or agreement entered into by two or more individuals, groups of individuals, organizations or agencies in which each agrees to furnish a part of the capital or some inBkind service, such as labor, for a mutually beneficial enterprise.

passerine—Bird that typically has feet adapted for perching; belonging to the order Passeriformes.

patch—Area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

percolation—Passing or filtering through.

perennial—Lasting or active through the year or through many years; a plant species that has a life span of more than 2 years.

permanently flooded—Surface water is present throughout the year in all years.

PIF—See Partners in Flight.

planning team—Team that prepares the comprehensive conservation plan. Planning teams are interdisciplinary in membership and function. A team generally consists of a planning team leader; refuge manager and staff biologist; staff specialists or other representatives of Service programs, ecosystems or regional offices; and state partnering wildlife agencies as appropriate.

planning team leader—Typically a professional planner or natural resource specialist knowledgeable of the requirements of National Environmental Policy Act and who has planning experience. The planning team leader manages the refuge planning process and ensures compliance with applicable regulatory and policy requirements.

planning unit—Single refuge, an ecologically or administratively related refuge complex, or distinct unit of a refuge. The planning unit also may include lands currently outside refuge boundaries.

plant association—Classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.

plant community—Assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soil, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community, i.e., ponderosa pine or bunchgrass.

prairie pothole—A glacially derived depressional wetland found in the northern Great Plains.

predation—Mode of life in which food is primarily obtained by the killing or consuming of animals.

prescribed fire—Skillful application of fire to natural fuels under conditions such as weather, fuel moisture, and soil moisture that allow confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

priority public use—See wildlife-dependent recreational use.

private land—Land that is owned by a private individual, a group of individuals, or a nongovernmental organization.

private landowner—Any individual, group of individuals, or nongovernmental organization that owns land.

private organization—Any nongovernmental organization.

proposed action—Alternative proposed to best achieve the purpose, vision, and goals of a refuge (contributes to the Refuge System mission, addresses the significant issues, and is consistent with principles of sound fish and wildlife management). The draft comprehensive conservation plan.

public—Individuals, organizations, and groups; officials of federal, state, and local government agencies; American Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

public involvement—Process that offers affected and interested individuals and organizations an opportunity to become informed about, and to express their opinions on, Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

public involvement plan—Broad long-term guidance for involving the public in the comprehensive planning process.

public land—Land that is owned by the local, state, or federal government.

purpose of the refuge—Purpose specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing authorization or expanding a refuge, refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

raptor—Carnivorous bird such as a hawk, a falcon, an eagle, or a vulture that feeds wholly or chiefly on meat taken by hunting or on carrion (dead carcasses).

recruitment rate—Regarding waterfowl, it is the number of young females in the fall population, divided by the number of adult females in the spring population.

refuge lands—Lands in which the Service holds full interest in fee title, or partial interest such as limited-interest refuges.

refuge operations needs system (RONS)—National database that contains the unfunded operational needs of each refuge. Projects included are those required to carry out approved plans and meet goals, objectives, and legal mandates.

refuge purpose—See purpose of the refuge.

Refuge System—See National Wildlife Refuge System.

refuge use—Any activity on a refuge, except administrative or law enforcement activity, carried out by or under the direction of an authorized Service employee.

resident species—Species inhabiting a given locality throughout the year; nonmigratory species.

rest—Free from biological, mechanical, or chemical manipulation, in reference to refuge lands.

restoration—Artificial manipulation of a habitat to restore it to something close to its natural state. Involves taking a degraded grassland and reestablishing habitat for native plants and animals. Restoration usually involves the planting of native grasses and forbs, and may include shrub removal and prescribed burning.

rhizome— A horizontal, underground stem that can send out both shoots and roots, rhizomes sometimes have thickened areas that store starch.

riparian area *or* **riparian zone**—Area or habitat that is transitional from terrestrial to aquatic ecosystems including streams, lakes, wet areas, and adjacent plant communities and their associated soils that have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, "riparian" describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes all plant life growing on the land adjoining a stream and directly influenced by the stream.

RONS—See refuge operations needs system.

rough fish—Fish that is neither a sport fish nor an important food fish.

runoff —Water from rain, melted snow, or agricultural or landscape irrigation that flows over the land surface into a water body.

scoping—Process of obtaining information from the public for input into the planning process.

seasonally flooded—Surface water is present for extended periods in the growing season, but is absent by the end of the season in most years.

sediment—Material deposited by water, wind, and glaciers.

semipermanently flooded—Surface water is present throughout the growing season in most years.

seral stage—Any plant community whose plant composition is changing in a predictable way; characterized by a group of species or plant community that will eventually be replaced by

a different group of species or plant community, for example, an aspen community changing to a coniferous forest community.

Service—See U.S. Fish and Wildlife Service.

shelterbelt—Single to multiple rows of trees and shrubs planted around cropland or buildings to block or slow down the wind.

shorebird—Any of a suborder (Charadrii) of birds such as a plover or a snipe that frequent the seashore or mud flat areas.

sound professional judgment—Finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Refuge Administration Act and other applicable laws.

spatial—Relating to, occupying, or having the character of space.

special-status species—Plants or animals that have been identified through federal law, state law, or agency policy as requiring special protection of monitoring. Examples include federally listed endangered, threatened, proposed, or candidate species; state-listed endangered, threatened, candidate, or monitor species; the Service's species of management concern; and species identified by the Partners in Flight program as being of extreme or moderately high conservation concern.

special use permit—Permit for special authorization from the refuge manager required for any refuge service, facility, privilege, or product of the soil provided at refuge expense and not usually available to the public through authorizations in Title 50 CFR or other public regulations (Refuge Manual 5 RM 17.6).

species of concern—Those plant and animal species, while not falling under the definition of special-status species, that are of management interest by virtue of being federal trust species such as migratory birds, important game species, or significant keystone species; species that have documented or apparent populations declines, small or restricted populations, or dependence on restricted or vulnerable habitats. Species that: (1) are documented or have apparent population declines; (2) are small or restricted populations; or (3) depend on restricted or vulnerable habitats.

species of management interest—Plant and animal species, while not failing under the definition of special-status species, that are of management interest by virtue of being federal trust species such as migratory birds, important game species including white-tailed deer, furbearers such as American marten, important prey species including red-backed vole, or significant keystone species such as beaver.

species richness—Absolute number of species in an assemblage or community; the number of species in a given area (Koford et al. 1994).

stand—Any homogenous area of vegetation with more or less uniform soils, landform, and vegetation. Typically used to refer to forested areas.

stand density—Number of trees growing in a given area, usually expressed in terms of trees per acre.

stand diversity—Distribution of tree sizes, layers, and ages in a forest. Some stands are all one size (single-story), some are two-story, and some are a mix of trees of different ages and sized (multistory).

stand initiation—When land is occupied by trees following a stand-replacing disturbance. Also referred to as early successional, early seral, and regeneration.

state land—Public land, such as a state park or state wildlife management area, owned by a state.

step-down management plan—Plan that provides the details necessary to implement management strategies identified in the comprehensive conservation plan (Draft Service Manual 602 FW 1.5).

strategy—Specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

submergent—Vascular or nonvascular hydrophyte, either rooted or nonrooted, that lies entirely beneath the water surface, except for flowering parts in some species.

tamegrass—Commercially cultured grasses genetically selected for desired characteristics.

tame species—See dense nesting cover.

taxonomy—The theories and techniques of naming, describing, and classifying organisms; the study of the relationships of taxa, including positional changes that do not involve changes in the names of taxa.

temporarily flooded—Surface water is present for brief periods during the growing season.

threatened species, federal—Species listed under the Endangered Species Act of 1973, as amended, that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

threatened species, state—Plant or animal species likely to become endangered in a particular state within the near future if factors contributing to population decline or habitat degradation or loss continue.

transpiration—Loss of water vapor from land plants into the atmosphere, causing movement of water through the plant from the soil to the atmosphere via roots, shoot and leaves.

travel corridor—Landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required for long-term survival or reproduction of its migrants.

trophic system—Made up of organisms that occupy various trophic levels (i.e., the position an organism occupies in a food chain).

trust resource—Resource that, through law or administrative act, is held in trust for the people by the government. A federal trust resource is one for which trust responsibility is given in part to the federal government through federal legislation or administrative act. Generally, federal trust resources are those considered to be of national or international importance no matter where they occur, such as endangered species and species such as migratory birds and fish that regularly move across state lines. In addition to species, trust resources include cultural resources protected through federal historic preservation laws, nationally important and threatened habitats, notably wetlands, navigable waters, and public lands such as state parks and rational wildlife refuges.

trust species—See trust resource.

understory—Any vegetation whose canopy (foliage) is below, or closer to the ground than canopies of other plants.

understory reinitiation—When a second generation of trees is established under an older, typically seral, overstory. Also referred to as mid-successional, mid-seral, and young forest.

upland—Dry ground; other than wetlands.

U.S. Fish and Wildlife Service (Service, USFWS, FWS)—Principal federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. The Service manages the 93-million-acre National Wildlife Refuge System comprised of more than 530 national wildlife refuges and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological service field stations, the agency enforces federal wildlife laws, manages migratory bird populations, restores national significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the federal aid program that distributes millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

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

USFWS—See U.S. Fish and Wildlife Service.

U.S. Geological Survey (USGS)—Federal agency whose mission is to provide reliable scientific information to describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

USGS—See U.S. Geological Survey.

vision statement—Concise statement of what the planning unit should be, or what the Service hopes to do, based primarily on the Refuge System mission, specific refuge purposes, and other mandates. In addition, the vision statement is tied to the maintenance and restoration of biological integrity, diversity, and environmental health of each refuge and the Refuge System.

visual obstruction—Pertaining to the density of a plant community; the height of vegetation that blocks the view of predators and conspecifics to a nest.

visual obstruction reading (VOR)—Measurement of the density of a plant community; the height of vegetation that blocks the view of predators to a nest.

VOR—See visual obstruction reading.

waders, *also* **wading birds**—Birds having long legs that enable them to wade in shallow water. Includes egrets, great blue herons, black-crowned night-herons, and bitterns.

warm-season grass—Grass that begins growth later in the season (early June); require warmer soil temperatures to germinate and actively grow when temperatures are warmer (85–95°F). Examples are Indiangrass, switchgrass, and big bluestem.

water control structure—An artificial structure that allows for the manipulation of surface water levels.

waterfowl—Category of birds that includes ducks, geese, and swans.

waterfowl production area (WPA)—Prairie wetland with associated upland that is managed to provide nesting areas for waterfowl, which is owned in fee title by the Service. These lands are purchased from willing sellers with funds from Duck Stamp sales. They are open to public hunting, fishing, and trapping according to state and federal regulations.

watershed—Geographic area within which water drains into a particular river, stream or body of water. A watershed includes both the land and the body of water into which the land drains.

wetland—Land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.

wetland easement—Perpetual agreement entered into by a landowner and the Service. The easement covers only the wetlands specified in the agreement. In return for a single lump-sum payment, the landowner agrees not to drain, burn, level, or fill wetlands covered by the easement.

wetland management district (WMD)—Land that the Refuge System acquires with Federal Duck Stamp funds for restoration and management primarily as prairie wetland habitat critical to waterfowl and other wetland birds.

wilderness—"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain."(Wilderness Act of 1964 Section 2c [P.L. 88-577)]). This legal definition places wilderness on the "untrammeled" or "primeval" end of the environmental modification spectrum. Wilderness is roadless lands, legally classified as component areas of the National Wilderness Preservation System, and managed to protect its qualities of naturalness, solitude, and opportunity for primitive types of recreation (Hendee 1990).

wildfire—Free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

wildland fire—Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3).

wildlife corridor—Landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic, including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required for long-term survival or reproduction of its migrants.

wildlife-dependent recreational use—Use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. These are the six priority public uses of the System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife.

wildlife management—Practice of manipulating wildlife populations either directly through regulating the numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors.

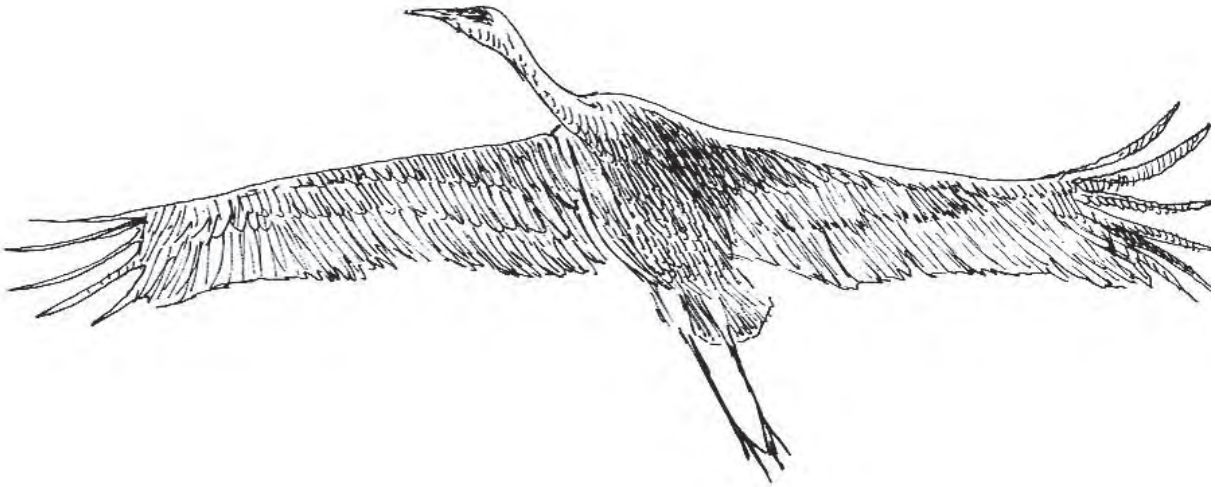
WMD—See wetland management district.

woodland—Open stands of trees with crowns not usually touching, generally forming 25–60 percent cover.

WPA—*See* waterfowl production area.

xeric—Of, characterized by, or adapted to an extremely dry habitat.

Appendices



Sandhill Crane
Bob Savannah/USFWS

Appendix A
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 Purpose
"…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." U.S. code of federal regulations (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 WPAs, while considering the needs of other migratory birds, threatened and endangered species and other wildlife." (The purpose statement was developed for all Region 6 districts 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 refuge 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 refuge 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 used to control invasive plants, 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 refuge complex. Farming will subsequently be reduced as native grass seeding activities throughout the refuge 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 use 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 refuge 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 refuge 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 refuge 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 [10–20 centimeters]), and low (< 4 inches

[10 centimeters]) 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 refuge complex and this use is not anticipated to change.

Without management, wetland and upland habitat conditions will deteriorate due to long periods of rest. Cool-season invasive species will 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 will 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 will deteriorate without the use of a full range of management tools. Migratory bird habitat and ecological diversity will decrease as habitat suitability declines. Habitat will degrade and meet the requirements of fewer migratory bird species on an annual basis as quality and condition deteriorate. Exotic and invasive plant species will increase and habitat diversity will decrease if management practices did not continue throughout the refuge complex.

Mandatory 15-year reevaluation date: September 2021

2. Description of Proposed Use:

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 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 refuge 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 will 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 will occur in areas frequented by visitors. There will be some minor damage to vegetation, littering, and increased maintenance will be necessary. Location and time limitations placed on environmental education and interpretation activities will ensure that this activity will have only minor impacts on wildlife and will not detract from the primary purposes of the various units of the refuge complex.

No cultural resources will 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 refuge complex will not materially interfere with, or detract from, the purposes for which this refuge complex was established.

Environmental education and interpretation are priority public uses listed in the Improvement Act. By facilitating environmental education, refuge visitors will gain knowledge and an appreciation of fish, wildlife, and their habitats, which will lead to increased public awareness and stewardship of natural resources. Increased appreciation for natural resources will 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: September 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 RONS and 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 refuge complex will 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 will gain knowledge and an appreciation of fish and wildlife which will lead to increased public stewardship of wildlife and their habitats. Increased public stewardship will support and complement the Service's actions in achieving the purposes of the refuge complex and the mission of the refuge system.

Mandatory 15-year reevaluation date: September 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 refuge 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 used. 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 refuge 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 refuge 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 will 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: September 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 refuge 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 refuge 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 refuge 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 will allow for population reductions at a time in the season when there will be little or no disturbance to most migratory birds. While any population reduction during the winter will be temporary, the opportunity provided by coyote and fox hunting will 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 78 WPAs and one WDA managed by the refuge 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 refuge complex will not materially interfere with or detract from the purposes for which this refuge complex was established or the goals and objectives of the Refuge System.

Mandatory 15-year Reevaluation Date: September 2021

6. Description of Use: Recreational Trapping and Predator Management

Provide for recreational trapping on lands in the refuge complex along with spring predator trapping to improve upland nesting bird success in the refuge complex
Recreational trapping on refuges administered by the refuge complex is authorized through issuance of SUPs to trappers who are interested in removing surplus and problem animals as agents of management. The 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 refuge 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 refuge complex at existing levels. When the trapping programs are expanded as is called for in this CCP, the refuge 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 N. 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 will 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. Refuge 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 refuge complex infrastructure (i.e., roads, dikes, WCS) 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 refuge 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: September 2021

7. Description of Use: Research

Continue to provide opportunities for research.
The refuge complex receives periodic requests to conduct scientific research. Some requests are specific to Service lands administered by the refuge complex, and others are part of a larger landscape-level project that requires authorization from multiple refuge field stations. In addition, the refuge 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, refuge 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 refuge 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 refuge 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 will be given to research proposals that support the refuge complex's purposes, goals, and objectives. This will include, for example, studies that contribute to the enhancement, protection, use, preservation and management of native refuge complex wildlife

activities can have on the Service's ability to achieve refuge complex purposes, sufficient restrictions will 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: September 2021

Submitted

8/4/06

Paul Van Ningen — Date
Project Leader
Long Lake National Wildlife Refuge Complex, ND

Approved

8/9/06

Richard A. Coleman, Ph.D. — Date
Assistant Regional Director
National Wildlife Refuge System
U.S. Fish and Wildlife Service, Region 6, CO

Reviewed

8/4/06

Lloyd Jones — Date
Regional Compatibility Coordinator
U.S. Fish and Wildlife Service, Region 6, ND

8/4/06

Rod Krey — Date
Refuge Supervisor (ND, SD)
U.S. Fish and Wildlife Service, Region 6, CO

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 "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. 460*l*-4 through 460*l*-11)

Refuge Purpose(s):

"...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:

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 NWRS.

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 grassland easement contract may be authorized up to one threshold level (8.0 acres) of total impact, whether it occurs at one time or in different request authorizations. Therefore, only up to 8.0 acres of encumbered grassland per easement contract (regardless of it's size), may be authorized for curtilage expansion or other authorized 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 which 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 FWS 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 four-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: _____.

Note: See page 164 of this document for the approval signatures for this approved programmatic compatibility determination.

COMPATIBILITY DETERMINATION
for
Authorized Early Haying
of Grassland Easements
for
Management Purposes

Use: Authorized Early Haying of Grassland Easements and FmHA Conservation 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:

Medicine Lake WMD, MT
Bowdoin WMD, MT
Benton Lake WMD, MT
Northwest Montana 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. 460*l*-4 through 460*l*-11)

Refuge Purpose(s):

"...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. Canada thistle, a perennial, primary noxious weed, is required by state law to be controlled by each landowner. Haying can be an effective tool in controlling the seed dispersal of Canada thistle, but it must be done before the thistle flowers mature and develop wind-dispersed seeds. 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.

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 15th 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.

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 time 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.

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 fall herbicide treatment of the regrown noxious weeds at the permittee's expense.

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.

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 time 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: _____

Note: See page 164 of this document for the approval signatures for this approved programmatic compatibility determination.

Signatures:

Submitted:

Michael Bryant, Project Leader
Lake Andes WMD
Date: 3/10/2005

Tom Tornow, Project Leader
Madison WMD
Date: 3-10-05

Harris Holstad, Project Leader
Huron WMD
Date: 3-10-05

Larry Martin, Project Leader
Waubay WMD
Date: 3-10-05

Gene Williams, Project Leader
Sand Lake WMD
Date: 3-10-05

Tom Koerner, Project Leader
Lacreek NWR
Date: 3-10-05

Jack Lalor, Acting Project Leader
Tewaukon WMD
Date: 4/26/05

Dave Azure, Acting Project Leader
Kulm WMD
Date: 3-10-05

Kim D. Hanson, Project Leader
Arrowwood WMD
Chase Lake WMD
Valley City WMD
Date: 3/10/05

Gary Williams, Acting Project Leader
Audubon WMD
Date: 3/10/05

Paul Van Ningen, Project Leader — 3/10/2005 Date
Long Lake WMD

Tedd Gutzke, Project Leader — 3/10/2005 Date
J Clark Salyer WMD

Roger Hollevoet, Project Leader — 3/10/05 Date
Devils Lake WMD

Fred G. Giese, Project Leader — 04/26/05 Date
Lostwood WMD
Crosby WMD

Michael Rabenberg, Acting Project Leader — 04/26/05 Date
Medicine Lake WMD

Carmen Luna, Project Leader — 4/26/05 Date
Bowdoin WMD

David Gilland, Project Leader — 4/26/05 Date
Benton Lake WMD

Steve Kallan, Project Leader — 4/26/05 Date
NW Montana WMD

Review:

Lloyd Jones — 4.27.05 Date
Regional Compatibility Coordinator

Rodney Krey / Ref. Sup — 4/28/05

Approval:

Ronald D. Shupe, Region 6 — May 05, 2005 Date
Acting Chief of Refuges

COMPATIBILITY DETERMINATION
for
PUBLIC AND PRIVATE
BURIED UTILITY LINES
OCCURRING ON
FWS
EASEMENT PROPERTIES
or Fee-Owned WPA's

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.

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:

Medicine Lake WMD, MT
Bowdoin WMD, MT
Benton Lake WMD, MT
Northwest Montana 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. 460*l*-4 through 460*l*-11)

Refuge Purpose(s):

"...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:

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, or conservation 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 insure 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 "trenching" bucket (approximately 8 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 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 NWRS.

_____ 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 impacts to wetlands protected by FWS easements. 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 FWS grassland easements 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.

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 resource protected by the Service's fee or easement by this activity. The use will not detract fron or materially interfere with the mission or purpose of the NWRS. 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 whic 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:_____

populations and their habitats, and will include cultural resources. Research applicants will submit a proposal that outlines: 1) objectives of the study; 2) justification for the study; 3) detailed methodology and schedule; 4) potential impacts on refuge complex wildlife and/or habitat, including disturbance (short- and long-term), injury, or mortality; 5) personnel required; 6) costs to the refuge complex, if any, and; 7) end products (i.e. reports, publications). Research proposals will be reviewed by refuge 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.
- Refuge complex staff may deny proposal when it is impossible for the refuge 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 refuge 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 refuge 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 refuge 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 refuge complex wildlife populations and their habitats. In view of the potential impacts research

Signatures:

Submitted:

Michael Bryant, Project Leader
Lake Andes WMD
Date: 3/10/2005

Tom Tornow, Project Leader
Madison WMD
Date: 3-10-05

Harris Hoistad, Project Leader
Huron WMD
Date: 3-10-05

Larry Martin, Project Leader
Waubay WMD
Date: 3-10-05

Gene Williams, Project Leader
Sand Lake WMD
Date: 3-10-05

Tom Koerner, Project Leader
Lacreek NWR
Date: 3-10-05

Jack Lalor, Acting Project Leader
Tewaukon WMD
Date: 4/26/05

Dave Azure, Acting Project Leader
Kulm WMD
Date: 3-10-05

Kim D. Hanson, Project Leader
Arrowwood WMD
Chase Lake WMD
Valley City WMD
Date: 3/10/05

Gary Williams, Acting Project Leader
Audubon WMD
Date: 3/10/05

Paul Van Ningen, Project Leader — Date: 3/10/2005
Long Lake WMD

Tedd Gutzke, Project Leader — Date: 3/10/2005
J Clark Salyer WMD

Roger Hollevoet, Project Leader — Date: 3/10/05
Devils Lake WMD

Fred G. Giese, Project Leader — Date: 04/26/05
Lostwood WMD
Crosby WMD

Michael Rabenberg, Acting Project Leader — Date: 04/26/05
Medicine Lake WMD

Carmen Luna, Project Leader — Date: 4/26/05
Bowdoin WMD

David Gilland, Project Leader — Date: 4/26/05
Benton Lake WMD

Steve Kallan, Project Leader — Date: 4/26/05
NW Montana WMD

Review:

Lloyd Jones — Date: 4-27-05
Regional Compatibility Coordinator

Rodney F. Finney — 4/28/05
Refuge Supervisor

Approval:

Ronald D. Shupe, Region 6 — Date: May 15, 2005
Acting Chief of Refuges

Compatibility Determination

Use: Buried waterlines on grassland easements to provide livestock watering

Refuge Name:
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 Authority(ies):

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 Purpose(s):

> "...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)
>
> "...for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
>
> "...for conservation purposes ... "7 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 NWRS. 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 is 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.

Compatibility Determination

Signature: Refuge Manager:

Kim Hanson, Arrowwood Wetland Management District (Signature) 8/17/04 (Date)

Mike McEnroe, Audubon Wetland Management District (Signature) 8/17/04 (Date)

Mick Erickson, Chase Lake Wetland Management District (Signature) 8/17/04 (Date)

Tim Kessler, Crosby Wetland Management District (Signature) 8/17/04 (Date)

Roger Hollevoet, Devils Lake Wetland Management District (Signature) 8/17/04 (Date)

Harris Hoistad, Huron Wetland Management District (Signature) 8-17-04 (Date)

Lee Albright, J. Clark Salyer Wetland Management District (Signature) 8-17-04 (Date)

Bob Vanden Berge, Kulm Wetland Management District (Signature) 8/17/04 (Date)

Mike Bryant, Lake Andes Wetland Management District (Signature) 8/17/04 (Date)

Paul VanNingen, Long Lake Wetland Management District (Signature) 8/17/04 (Date)

Todd Frerichs, Lostwood Wetland Management District (Signature) 8-17-04 (Date)

Thomas Tornow, Madison Wetland Management District (Signature) 8-17-04 (Date)

Gene Williams, Sand Lake Wetland Management District (Signature) 8-17-04 (Date)

Jack Lalor, Tewaukon Wetland Management District (Signature) 8/18/04 (Date)

Kory Richardson, Valley City Wetland Management District (Signature) 8-18-04 (Date)

Larry Martin, Waubay Wetland Management District (Signature) 17 Aug. 2004 (Date)

Review: Regional Compatibility Coordinator Lloyd Jones 8/18/04 (Date)

Review: Zone Supervisor Rod Krey 8/18/04 (Date)

Concurrence: Regional Chief Rick Coleman 8/19/04 (Date)

Mandatory 10- or 15- year Re-Evaluation Date: 2019

ENVIRONMENTAL EVALUATION CHECKLIST
Refuges and Wildlife
Region 6

Project Description:__Buried waterlines for livestock watering on grassland easements in North and South Dakota

Submitted by:__Wetland Managers on 16 Districts_____

EFFECTS

	Short Term	Long Term	Magnitude
Wetlands	Y	N	- Minor
Uplands	Y	N	+ Minor
T & E Candidate Species	N	N	0
Other Wildlife	N	N	0
Cultural Resources	N	N	0
Water Quality	N	N	0
Water Quantity (conserve= + deplete = -)	N	N	0
Air Quality	N	N	0
Socio-Economic	N	N	0
Compatible?	Y	Y	
Cumulative Impacts	Y	N	- Minor

Y=Yes; N=No; +=Beneficial; -=Detrimental; 0=None

Decision

__X__ Project is categorically excluded from NEPA documentation

____ Start environmental assessment (EA)

BY _16 Wetland Managers, signatures on CD
Project Leader Date

Concur Rodney T. King 8/18/09
Refuge Supervisor Date

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 NWR, 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 NWR Complex, Moffit, ND
Gregg Knutsen	refuge biologist	Long Lake NWR Complex, Moffit, ND
Lynda Knutsen	outdoor recreation planner	Long Lake NWR Complex, Moffit, ND
Randy Kreil	wildlife division chief	NDGF, 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 NWR 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
Shane Delgrosso	fire management officer
Jeff Dion	fire management officer/ Arrowwood NWR complex
John Esperance	chief of land protection planning branch
Sheri Fetherman	chief of education and visitor services
Pete Finley	ROS/pilot
Galen Green	fire ecologist
Toni Griffin	refuge planner
Todd King	maintenance worker
Laura King	refuge planner
Wayne King	regional biologist

Rod Krey	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 Refuge System and other policies and key legislation that guide the management of the 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. (Improvement Act.)

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, American Indian 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 Refuge System (1996)—Defines the mission, purpose, and priority public uses of the 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 nonfederal, 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 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 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 nonfederal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

Appendix E

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 refuge complex's CCP. A planning team comprised of Service personnel from the refuge complex and the regional office, as well as of NDGF personnel (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. Five public open-house meetings were held from 7:00 to 9:00 p.m. during consecutive nights from March 29–April 2, 2004 at Steele (Community Center), Tappen (City Hall), Hazelton (Public School cafeteria), Wing (Senior Center), and Bismarck (NDGF headquarters), respectively. Notification of dates and times of the public open houses was distributed through 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 (e.g., letter, telephone, 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 refuge complex and the surrounding areas. This information is summarized under chapter 3: Refuge Resources and Description.

Many of the public comments from the open houses and issue workbooks were general comments for all units of the refuge complex being managed as part of the Refuge System.

Draft issues and qualities lists, as well as the vision and goals for the refuge complex were developed during a workshop held in the Service's Bismarck office in late September 2004.

The planning team developed four alternatives. An assessment of each alternative's impacts (conducted between March and August 2005) guided the team in choosing the one that would best fulfill the purposes, vision and goals for the refuge complex. Once they identified the preferred alternative (proposed action), the planning team developed the objectives, strategies and rationales for each of the goals of the refuge complex. These are listed in chapter 4: Management Direction.

The team released the draft CCP/EA for a 30-day public comment period on July 10, 2006. During this public comment period, they held a public meeting at the refuge complex headquarters (July 12, 2006, from 12:00 p.m. until 8:00 p.m.) A announcement of this meeting and the release of the draft CCP/EA for public comment was published in the *Federal Register* on July 10, 2006 (Vol. 71, No. 131, pages 38892-38893), as well as in local media. No members of the public attended the public meeting.

The public comment period closed on August 10, 2006. One printed letter and an email message were the only comments received from the public. The following summarizes those two comments and the planning team's responses.

*Comment—A*lternative C of the draft CCP/EA is the best alternative because is good for furbearer management and for wildlife in general.

Response—The management scheme described under alternative C of the draft CCP/EA would indeed be good for furbearer management and wildlife in general. However, the refuge complex staff determined that the preferred alternative (alternative D) is the best alternative to fulfill the legislated purposes of *all* the units of the refuge complex as well as all the goals set out by the refuge complex staff.

Comment 2—The Service has strayed far from its own policy, which dictates that *fish and wildlife come first"* in the Refuge System. Refuges allow activities that are detrimental to wildlife, including hunting, fishing, trapping, motor boating, and jet skiing—often in the absence of thorough and accurate biological data on the species inhabiting and migrating through the refuge.

While the Improvement Act establishes hunting as a priority use, it also requires refuges to conduct rigorous scientific research on the status of refuge wildlife populations and use this information to guide refuge planning.

Wildlife trapping is *not* included as a "priority use" in the Improvement Act and therefore does not carry the same weight as the six priority public uses. The staff at the refuge complex should help to restore this public land system to its original purpose of providing a refuge and breeding place for migratory birds, other wild birds, game animals, and fur-bearing animals.

Response—The Service agrees, in words and actions, with the commenter that "fish and wildlife come first" on all units of the Refuge System. But the Improvement Act goes even further by recognizing that wildlife-dependent recreation activities—including hunting, fishing, wildlife observation and photography, and environmental education and interpretation—are legitimate public uses. Therefore, refuge staffs throughout the Refuge System devote significant amounts of time ensuring that public uses do not conflict with wildlife and habitat preservation goals.

Although the refuge complex staff spends a considerable about of time monitoring refuge species, it has limited funding and/or staffing to assess fully the health and population levels of every species (including furbearers and predators) that occupies the lands of the complex.

As noted by the commenter, trapping is not a priority public use. It is, however, an important tool in reducing the populations of predators that disrupt the nest success rate of waterfowl and other birds. There are many other problems associated with furbearers, including the damage they cause to infrastructure on the complex (e.g., beaver works at water control structures, holes in dikes and roads excavated by minks and muskrats) and their predation upon adjacent landowner's livestock (i.e., coyotes). These problems are fully documented in chapter 4 (predator management sub-goal) of the CCP.

Habitat fragmentation and population protection exacerbates problems specifically when it comes to predator and furbearer populations. The CCP attempts to address these issues through increased habitat protection and management, as well as through management of predators and furbearing mammals. The CCP addresses a number of strategies, some of which are nonlethal and aversion methods. It also addresses the need for lethal control of certain predators and furbearers in the most cost efficient, least disruptive, and most controlled manner. The problems encountered by management associated with predators and furbearers are reasons for actively managing their populations.

Population control methods for predatory and furbearing mammals are limited due to their varied characteristics (nocturnal, primarily water abode, seclusion, etc.). Nonlethal and aversion methods provide only a limited amount of relief from high population levels. Trapping is often the only effective method of reducing populations of predators and other furbearers, as many species are secretive and either not susceptible to traditional hunting methods, or traditional hunting is not an effective method of keeping their populations at acceptable levels (population levels that do not promote the management problems discussed above).

Trapping is not a recreational program that is open and/or available to the general public on the refuges of the complex. The project leader issues only a limited number of trapping permits to qualified trappers who will aid in the complex's goals. Trappers target specific individual animals and/or populations which present management issues. The project leader further restricts trapping to specific periods when the activity can be efficient and not interfere with other recreational or management activities. Trapping for recreational purposes is permitted on Long Lake WMD in accordance with its establishing legislation and state laws regulating this method of wildlife management.

The bald eagle represents the only potential conflict with a threatened and endangered species; however, there is limited overlap between the seasons of eagle migration and predator/ furbearer management activities. Eagles are also visual predators—they are attracted by sight to prey. By limiting sets to nonexposed visual baits (primarily during their migration periods through the refuge complex) there is essentially no risk to capture nontarget threatened and endangered species (e.g., bald eagles).

Mailing List

A mailing list was developed for this CCP. It includes the following:

Dr. George Linz, USDA/National Wildlife Research Center, Great Plains Field Station

Federal Agencies

U.S. Fish & Wildlife Service
National Wetlands Research Center Great Plains Field Station

U.S. Department of Agriculture
USDA Animal and Plant Health Inspection Service Wildlife Services

Natural Resources Conservation Service
Steel Service Center
Bismarck Service Center
Linton Service Center

State Officials
Randy Kreil, chief, Wildlife Division, NDGF

State Agencies
North Dakota Game and Fish Department

Local Agencies
Burleigh County Commissioners
Emmons County Commissioners
Kidder County Commissioners

Organizations, Businesses and Civic Groups
Delta Waterfowl Foundation
Ducks Unlimited Great Plains Regional Office
Bismarck Mandan Bird Club
Audubon Society North Dakota Office
WHSRN
Dakota Zoo
American Bird Conservancy
National Wild Turkey Federation
Steele Birding Drives
Driscoll Wildlife Club
Hazelton Lions Club
Nodak Sportsman Club
Bismarck Mandan Reel & Recreation
Emmons County Wildlife Club
Robinson Wildlife Club
Tuttle Wildlife Club
Wilton Sportsmans Club
Wing Wildlife Club
Lewis & Clark Sportsmen Club

Universities and Colleges
Bismarck State College
Kidder County North Dakota State University Extension
North Dakota State University Extension, Southwest District Director
Emmons County North Dakota State University Extension

Individuals
77 Private individuals

Appendix F

Long Lake National Wildlife Refuge 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.) ≥320 acres in total size, with ≥ 100 upland acres

H3.) ≥80 acres 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 acres.

M2.) Between 160 and 319 acres in total size, with ≥50 upland acres.

M3.) Between 25 and 79 acres of native prairie

M4.) Tract lies entirely within a Type I Grassland Bird Conservation Area (core) and has ≥ 40 upland acres.

Criteria for LOW Priority Tracts

L1.) All remaining tracts.

HIGH PRIORITY[1]

National wildlife refuge or waterfowl production area	County	Qualifying Criteria
Rath/Wonnenburg	Burleigh	H1, H2, H3, H4
Long Lake	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

National wildlife refuge or waterfowl production area	County	Qualifying Criteria
Florence Lake	Burleigh	H2, H3
Goldsmith	Kidder	H2, H3
Monroe	Burleigh	H2, H3
Rachel/Hoff	Burleigh	H1, H4
Ryberg/Wonnenburg	Burleigh	H1, H3
Slade	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

National wildlife refuge or waterfowl production area	County	Qualifying Criteria
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]

National wildlife refuge or waterfowl production area	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

National wildlife refuge or waterfowl production areas	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

Project #	Station[1]	Project Title	Cost Estimate First Year Need (1000s)	Recurring Annual Need (1000s)
96026	LNL WMD	Enhance visitor services/outreach in the district 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 district survey.	$75	$30
98008	LNL WMD	Conduct annual survey of colonial-nesting bird colonies in the district 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 refuge 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 district 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

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 thula*) – **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, B**
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*)

Plants[1]

Absinth wormwood (*Artemisia absinthium)* - **I**
Alfalfa (*Medicago sativa)* - **I**
American Plum (*Prunus Americana*)
Aspen (*Populus* spp.)
Barley
Beans
Beggarticks (*Bidens* spp.)
Big Bluestem (*Andropogon gerardii*)
Blacksamson Echinacea (*Echinacea angustifolia*)
Blanket Flower (*Gaillardia aristata)*
Blue Gram (*Bouteloua gracilis*)
Breadroot Scurfpea (*Psoralea esculenta*)
Buffaloberry (*Shepherdia argentea)*
Bulrush (*Schoenoplectus* spp.)
Burreed (*Sparganium* spp.)
Canada Thistle (*Cirsium arvense)* - **I**
Caragana (*Caragana arborescens)* - **I**
Cattail (*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
Cosmopolitan Bulrush (*Schoenoplectus maritimus)*
Cottonwood (*Populus deltoids)*
Crested Wheatgrass (*Agropyron cristatum)* - **I**
Curlyleaf Pondweed (*Potamogeton crispus)* - **I**
Dotted Blazing Star (*Liatris punctata*)
Duckweed (*Lemna* spp.)
Durum Wheat
Eurasian Watermilfoil (*Myriophyllum spicatum)* - **I**
Fendler Threeawn (*Aristida purpurea*)
Field Pennycress (*Thlaspi arvense)* - **I**

Flatspine Stickseed (*Lappula occidentalis)*
Flax
Foxtail Barley (*Hordeum jubatun)*
Goldenrod (*Solidago* spp.)
Green Ash (*Fraxinus pennsylvanica)*
Green Foxtail (*Setaria viridis)* - **I**
Green Needlegrass (*Stipa viridula)*
Groundplum Milkvetch (*Astragalus crassicarpus)*
Hoary Puccoon (*Lithospermum canescens)*
Inland Saltgrass (*Distichlis spicata)*
Intermediate Wheatgrass (*Agropyron intermedium)* - **I**
Juneberry (*Amelanchier alnifolia*)
Kentucky Bluegrass (*Poa pratensis)* - **I**
Lead Plant (*Amorpha canescens)*
Leafy Spurge (*Euphorbia esula)* - **I**
Lichens (*Lycopodium* spp.)
Little Bluestem (*Schizachyrium scoparium)*
Lotus Milkvetch (*Astragalus lotiflorus)*
Narrowleaf Goosefoot (*Chenopodium leptophyllum*)
Needle-and-Thread (*Stipa comata)*
Needleleaf Sedge (*Carex eleocharis)*
Nuttall's Alkaligrass (*Puccinellia nuttalliana)*
Oats
Pasture Sage (*Artemisia ludoviciana)*
Pinto Beans
Porcupine Grass (*Stipa spartea)*
Potato
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 arkansana*)
Purple Coneflower (*Echinacea angustifolia)*
Purple Loosestrife (*Lythrum salicaria)* - **I**
Reed Canary Grass (*Phalaris arundinacea*)
Rushes (*Juncus* spp.)
Russian Olive (*Elaeagnus angustifolia)* - **I**
Sago Pondweed (*Potamogeton pectinatus)*
Salt Cedar (*Tamarix ramosissima)* - **I**
Sandberg's Bluegrass (*Poa juncifolia)*
Scarlet Beeblossom (*Gaura coccinea)*
Seaside Arrowgrass (*Triglochin maritime)*
Sedges (*Carex* spp.)
Siberian Elm (*Ulmus pumila)* - **I**
Sideoats Grama (*Bouteloua curtipendula)*
Silverberry (*Elaeagnus commutate*)
Silverleaf Scurfpea (*Psoralea argophylla)*
Slender Wheatgrass (*Agropyron caninum)*
Sloughgrass (*Beckmannia syzigachne)*
Smartweed (*Polygonum* spp.)
Smooth Brome (*Bromus inermis*) - **I**
Softstem Bulrush (*Schoenoplectus validus)*
Spiny Phlox (*Phlox hoodii*)
Spring Wheat
Stiffstem Flax (*Linum rigidum)*
Sugar Beets
Sunflower
Sun Sedge (*Carex heliophila)*
Sweet Clover (*Melilotus* spp.) - **I**
Switchgrass (*Panicum virgatum)*
Tall Wheatgrass (*Agropyron elongatum)* - **I**
Tarragon (*Artemisia dracunculus)*
Threadleaf Sedge (*Carex filifolia)*
Three-square Bulrush (*Schoenoplectus americanus)*
Tule Bulrush *(Schoenoplectus acutus*)
Western Snowberry (*Symphoricarpos occidentalis)*
Western Wheatgrass (*Agropyron smithii*)
White Milkwort (*Polygala alba)*
White Prairieclover (*Dalea candida*)
White Sagebrush (*Artemisia ludoviciana)*
Woolly Plantain (*Plantago patagonica)*

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[1]Scientific names are not listed for domestic agricultural species.

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

Environmental Action Statement

U.S. Fish and Wildlife Service, Region 6
Lakewood, Colorado

Within the spirit and intent of the Council on Environmental Quality's regulations for carrying out the National Environmental Policy Act and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record.

I have determined that the action of implementing the *Comprehensive Conservation Plan for Long Lake National Wildlife Refuge Complex* is found not to have significant environmental effects, as determined by the attached "Finding of No Significant Impact" and the environmental assessment as found with the draft comprehensive conservation plan.

J. Mitch King
Regional Director
U.S. Fish and Wildlife Service, Region 6
Lakewood, CO

9/15/2006
Date

Richard A. Coleman, Ph.D.
Assistant Regional Director
National Wildlife Refuge System
U.S. Fish and Wildlife Service, Region 6
Lakewood, CO

9/11/06
Date

Rod Krey
Refuge Program Supervisor (ND, SD)
U.S. Fish and Wildlife Service, Region 6
Lakewood, CO

8/23/06
Date

Paul Van Ningen
Project Leader
Long Lake National Wildlife Refuge Complex
Moffit, ND

8/23/06
Date

Finding of No Significant Impact

U.S. Fish and Wildlife Service, Region 6
Lakewood, Colorado

Fulfill the comprehensive conservation plan for Long Lake National Wildlife Refuge Complex

Four management alternatives for the Long Lake National Wildlife Refuge Complex were assessed as to their effectiveness in achieving the refuge complex's purposes and their impact on the human environment. Alternative A, the "no-action" alternative, would continue current management. Alternative B, "natural processes management," would focus on a return to more natural wetland and upland habitats and habitat functions through removal of water control structures and intensive reseeding to native plant communities. Alternative C, "single wildlife group-level intensive management," would promote intensive upland and wetland management. Management objectives for particular tracts would be based on fulfilling the life needs of either one wildlife taxonomic group or of closely related wildlife taxonomic groups.

Alternative D, "target species group-level modified management" (the proposed action), would allow for intensive upland and wetland management where warranted in the complex. Management objectives for particular tracts would be based on fulfilling the life needs of a group of target (indicator) species, which would consist of members of various closely related wildlife taxonomic groups. Based on this assessment and comments received, I have selected alternative D as the preferred alternative for implementation.

The preferred alternative was selected because it best meets the purposes for which the Long Lake National Wildlife Refuge Complex was established and is preferable to the "no-action" alternative in light of physical, biological, economic, and social factors. The preferred alternative will continue to provide public access for wildlife-dependent recreation, environmental education, and interpretation.

I find that the preferred alternative is not a major federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an environmental impact statement on the proposed action is not required.

The following is a summary of anticipated environmental effects from carrying out the preferred alternative:

- The preferred alternative will not adversely impact endangered or threatened species or their habitat.
- The preferred alternative will not adversely impact archaeological or historical resources.
- The preferred alternative will not adversely impact wetlands nor does the plan call for structures that could be damaged by, or that would significantly influence, the movement of floodwater.
- The preferred alternative will not have a disproportionately high or adverse human health or environmental effect on minority or low-income populations.
- The state has been notified and given the opportunity to review the CCP and associated EA.

Sharon R Rose 9/15/2006

J. Mitch King
Regional Director
U.S. Fish and Wildlife Service
Region 6
Lakewood, CO

Date

Appendix I

Long Lake National Wildlife Refuge Complex
Upland Plant Associations

- Based on ≥50 percent canopy cover dominance, unless otherwise specified
- Modified from Grant et al. 2004

Shrub and Tree Types

low shrub (generally <1.5 meters tall)

11 snowberry dense (other low shrub species total 0–25 percent); *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 ≥1.5 meters 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 percent 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 percent* (or >50 percent if mixed with other nonnatives)
52 Kentucky bluegrass and NATIVE grass-forbs, *KY bluegrass 50–95 percent*
53 NATIVE grass-forbs and Kentucky bluegrass, *KY bluegrass 5–50 percent*
61 smooth brome (or quackgrass) >*95 percent* (or >50 percent if mixed with other nonnatives)
62 smooth brome (or quackgrass) and NATIVE grass-forbs, *brome 50–95 percent*
63 NATIVE grass-forbs and smooth brome (or quackgrass), *brome 5–50 percent*
71 crested wheatgrass >*95 percent* (or >50 percent if mixed with other nonnatives)
72 crested wheatgrass and NATIVE grass-forbs, *crested wheatgrass 50–95 percent*
73 NATIVE grass-forbs and crested wheatgrass, *crested wheatgrass 5–50 percent*
98 tall exotic legume: sweetclover of alfalfa

Invasive Plant Types

81 leafy spruge
85 Canada thistle
87 wormwood
88 other invasive plants (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 percent, add a "9" as a modifier (e.g., 41 = 41**9**)
in the event of an apparent 50:50 mix of Kentucky bluegrass and smooth brome – consider as code **61

Appendix J

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); invasive plants (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 percent 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);

2. average <20 percent occurrence by smooth brome-dominated and invasive plant-dominated types (types 61, 62, and 80s, collectively);

3) average <30 percent 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 "habitat classification" mapping data collected on the ground for use with RLGIS (version 3.0, 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 percent occurrence comprised by two grass-forb subclasses: ">95 percent native grasses/forbs," and "native/nonnative mix with natives dominant (>50 percent)."

2. average <20 percent occurrence by smooth brome-dominated and invasive plant-dominated types: "smooth brome monotype [>95 percent]" plus any invasive plant subclass.

3. average <30 percent occurrence by two low shrub-dominated types: "snowberry [>25 percent]" and "silverberry [>25 percent]."

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).

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3. average <30 percent occurrence by two low shrub-dominated types: "snowberry [>25 percent]" and "silverberry [>25 percent]."

Appendix K

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 the refuge complex. North Dakota "Species of Conservation Concern" are separated into three different categories (levels 1, 2, and 3), giving priority to species which 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
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
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

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[1]The historical range of these species included parts of the refuge complex and they have been documented on Service lands within the refuge complex, but it is not likely that they presently occur on Service lands within the refuge complex.

Appendix L

Secondary (Target) Species

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)

Night Jars

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's 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 sparrow (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 refuge complex if this CCP's biological objectives are met (DW = developed wetlands; UW = undeveloped wetlands; NP = native prairie; OC = old cropland; WV = planted and exotic woody vegetation).

[2]Species names in **bold** indicate those that presently nest on lands in the refuge complex.

Appendix M

Long Lake National Wildlife Refuge Complex Habitat Cover Type (Subclass) List

Habitat cover types used when classifying vegetative cover on all fee-title lands in the complex 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/nonnative mix, natives >50%	V HD V A 5 N
Grass	Planted	Native/nonnative mix, natives >50%	V HD V A 5 C
Grass	Natural	Nonnative/native mix, nonnatives >50%	V HD V A 5 N
Grass	Planted	Nonnative/native mix, nonnatives >50%	V HD V A 5 C
Grass	Natural	Nonnative 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 invasive plants 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 nonnative 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

System[1]	Subsystem[2]	Subclass[3]	NVCS[4]
Woodland	Natural	*Dead tree(s) between 25% and 60%*	—
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	—
Wetland	—	Semipermanent wetland	—
Wetland	—	Seasonal wetland	—
Wetland	—	Temporary wetland	—
Wetland	—	Other wetland area	—
Barren	—	Bare soil	—

System[1]	Subsystem[2]	Subclass[3]	NVCS[4]
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.

Tier 1 Projects					
Project #	Station[1]	Project Title	Cost Estimate First Year Need (1000s)	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 districts providing essential heavy equipment	$159	—	$10

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

[1]*LNL = Long Lake; SLD = Slade*

Tier 2 Projects				
Project #	Station[1]	Project Title	Cost Estimate First Year Need (1000s)	Recurring Annual Need (1000s)
00014	LNL NWR	Develop refuge low level water management capability by constructing outlet WCS	$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 the state	$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 wcss 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 refuge 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[1]	Project Title	Cost Estimate First Year Need (1000s)	Recurring Annual Need (1000s)
96036	LNL WMD	Mitigate low waterfowl recruitment in high pair zones by providing secure district nesting islands.	$200	$20
98002	LNL WMD	Provide logistical support for district habitat development by purchasing a semi-tractor/trailer.	$162	$10
98010	LNL WMD	Provide district (remote) logistical maintenance support capability by acquiring a maintenance vehicle.	$54	$5
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 basic daily operations equipment.	$381	$20

[1]*LNL = Long Lake; SLD = Slade*

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 refuge complex fire program mission support identified in approved fire management 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	Rehabilitate 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
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

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
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
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	Construction Costs (Route 103-105, 2.1 mi, Parking lots 903-910)	$1100	02120118

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
LNL WMD	Preliminary Engineering Costs (Route 103-105, 2.1 mi, Parking lots 903-910)	$104	02120156
LNL WMD	Construction Costs (Route 100-102, 2.3Mi, Parking lots 900-902, 904)	$1100	02120163
LNL NWR	Preliminary Engineering Costs - 5 roads, 5 parking areas (Routes 10, 11, 100-103, 900-903, 910; 10.2 mi)	0	02120191
LNL NWR	Construction Costs - 5 roads, 5 parking areas (Routes 10, 11, 100-103, 900-903, 910; 10.2 mi)	$365	02120236
LNL WMD	Preliminary Engineering Costs (Route 100-102, 2.3mi, Parking lots 900-902, 904)	$104	02120243
LNL WMD	Repair East Lost Lake Dam #2.	$35	02120282
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 kiosks.	$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/rehabilitate 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
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

Station	Project Title	Cost Estimate (1000s)	SAMMS Work Order #
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 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 recreation opportunities 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/headquaters facility.	$35	97105937
LNL NWR	Replace sewer lines.	$30	97105938
LNL NWR	Replace headquarters 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 vistor contact station.	$90	98123853
LNL NWR	Replace large refuge recognition signs.	$38	98105942
LNL NWR	Develop moist-soil units to increase migratory bird support capability by constructing new levees.	$357	98123564
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 management and public use.	$123	98123569
LNL NWR	Enhance public use facilities and promote visitation in conjunction with Lewis & Clark bicentennial.	$64	99123622

**LNL = Long Lake; SLD = Slade; FCL = Florence Lake*

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Persons: Paul Van Ningen
Gregg Knutsen

Telephone Number: (701) 387-4397

Date: July 12, 2006

1. Region: 6

2. Service Activity (Program): Refuges & Wildlife, Long Lake NWR Complex

3. Pertinent Species and Habitat:

1. Federally Listed Species and/or their critical habitat within or downstream from action area:

   bald eagle, *Haliaeetus leucocephalus* (federally listed as threatened; delisting proposed)

   whooping crane, *Grus americana* (federally listed: endangered)

   piping plover, *Charadrius melodus*, (federally listed: threatened)

   least tern, *Sterna antillarum*, (federally listed: endangered)

   Critical Habitat: In 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 areas consist of Long Lake NWR, three Kidder County WPAs, and seven Burleigh County WPAs.

2. Proposed species and/or proposed critical habitat within the action area:

There are no known proposed species or critical habitat in Long Lake NWR Complex

C. Candidate species within or downstream from the action area :
Dakota skipper, *Hesperia dacotae*, candidate species within area of the complex

A. Include species/habitat occurrence on a map: see attachment

IV Geographic area or station name and action:

Station: Long Lake National Wildlife Refuge Complex
Action: Issuance & Implementation of Comprehensive Conservation Plan for Long Lake NWR Complex

V Location (map attached):

A. Ecoregion Number and Name: Long Lake NWR Complex is located within the Service's Region 6, Mountain-Prairie Region, and specifically in the Main Stem Missouri Ecosystem

F. Counties and State: Burleigh, Emmons, and Kidder counties, North Dakota

G. The Long Lake NWR Complex includes all sections within Burleigh, Emmons and Kidder Counties in North Dakota

A. Distance and direction to nearest town: The Long Lake NWR Complex headquarters is located in the southeastern area of Burleigh County, North Dakota, approximately 3 miles east of the town of Moffit, and approximately 40 miles southeast of the city of Bismarck.

B. Habitats and Occurrence of Federally listed and Candidate species:

Bald eagle: The bald eagle is a relatively common migrant during the spring and fall migrations. Observations of this species on the complex's refuges and WPAs can usually be tied to large concentrations of migrant waterfowl.

Whooping crane: Long Lake NWR is a key stopover site for this species that migrate 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. Since 2000 there have been at least eight confirmed fall observations of whooping cranes using Long Lake NWR. Additionally, during recent years, this species has been documented on WPAs in the complex.

Piping plover: The piping plover breeds on the shoreline of the large, alkaline lakes that are common throughout the northeastern one-third of the complex.

Least tern: 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 North Dakota centers on the Missouri River.

Dakota skipper: This prairie-obligate 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. Schiermeister WPA is the only tract of land in the complex with habitat characteristics that currently meet the requirements for this species.

VI Description of proposed action

The proposed action is: development and implementation of a Comprehensive Conservation Plan to guide the management of the Long Lake NWR Complex for the next 15 years. Implementation of this Plan comprises implementation of all actions and activities to achieve the stated goals contained in the Plan that will ultimately lead to the fulfillment of the purposes for which Congress established all the units comprising the Long Lake NWR Complex and assist in the fulfillment of the goals of the National Wildlife Refuge System.

VII Determination of effects:

A. Explanation of effects of the action on species and critical habitats in items III. A, B & C

Bald eagle: Implementing the CCP is not thought to have detrimental effects on this raptor. In fact, the continued preservation and management of complex lands for the benefit of wildlife species should enhance foraging sites for eagle use.

Whooping crane: Implementing the CCP is not thought to have detrimental effects on this migrant crane. In fact, the continued preservation and management of complex lands for the benefit of wildlife species should enhance loafing and resting sites for crane use.

Least tern: This species is a rare visitor to the complex. However, should this species wander through the complex, it is expected that implementation of the CCP would not have detrimental effects on habitats frequented by this species. Continued preservation and management of complex lands for the benefit of wildlife species should enhance sites for use by this tern species.

Piping plover: Implementing the CCP is not thought to have detrimental effects on this plover species. In fact, the continued preservation and management of complex lands, especially predator management and restrictions on certain public uses, for the benefit of this and other wildlife species should enhance nesting success as well as provide adequate loafing and resting sites for plover use.

There is already federally designated critical habitat on the action area (Long Lake NWR Complex) and the CCP does not find a need to propose designating further habitats as critical habitat within the complex at this time.

Dakota skipper: Implementing the CCP is not thought to have detrimental effects on this species. In fact, the continued preservation and management of these lands for the benefit of wildlife species (e.g., restoration of native vegetation) should enhance uplands for this insect.

C. Explanation of actions to be implemented to reduce adverse effects: None are necessary. All actions delineated in this CCP are thought to follow and be in accordance with provisions of protection and restoration plans for several species, as delineated by the Service and other Federal and state agencies. The complex staff is well acquainted with provisions that would be invoked and be put into effect to protect federally listed species and species of special concern from any public use or management action by refuge staff or visitors to the refuge.

VIII Effect determination and response requested: [* = optional]

A. Listed species/designated critical habitat:

Determination	Response Requested
no effect/no adverse modification (species: NONE)	_____*Concurrence
may affect, but is not likely to adversely affect species/adversely modify critical habitat (species: NONE)	_____ Concurrence
likely to jeopardize the continued existence of species and adversely modify or destroy their critical habitat (species: NONE)	_____ Formal Consultation

A. Proposed species/proposed critical habitat: none at this time

Determination	Response Requested
no effect on proposed species/no adverse modification of proposed critical habitat (Species: NONE)	_____*Concurrence
Is likely to jeopardize proposed species/ adversely modify proposed critical habitat (species: NONE)	_____ Conference

A. Candidate Species:

Determination	Response Requested
no effect is likely to jeopardize candidate species (species: NONE)	_____ *Concurrence

Paul C. Van Ningen _____ 7/13/06 _____

Paul Van Ningen
Project Leader
Long Lake National Wildlife Refuge Complex
Moffit, ND

Date

IX. Reviewing ESO Evaluation:

A. Concurrence ✓ Nonconcurrence _____

B. Formal Consultation required: ____

C. Conference required: ____

D. Informal conference required: ____

E. Remarks: ____

Bill Richwell _____ JULY 28, 2006 _____

Jeffery Towner
North Dakota Field Supervisor
U.S. Fish & Wildlife Service

Date

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