

Comprehensive Conservation Plan

*Lacreek National Wildlife Refuge and
Lacreek Wetland Management District*

February 2006

Prepared by the U.S. Fish and Wildlife Service:

Lacreek National Wildlife Refuge and
Lacreek Wetland Management District
29746 Bird Road
Martin, SD 57551
605/685 6508

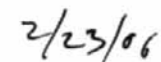
and

U.S. Fish and Wildlife Service, Region 6
Division of Refuge Planning
PO Box 25486 DFC
Lakewood, CO 80225
303/236 4365

Approved by:



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



Date

Comprehensive Conservation Plan Approval

*Lacreek National Wildlife Refuge and
Lacreek Wetland Management District*

Submitted by:

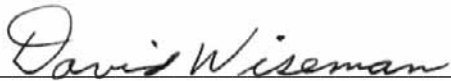


Tom Koerner
Refuge Manager
Lacreek National Wildlife Refuge and
Lacreek Wetland Management District
Martin, SD

FEB 23 2006

Date

Concurred with:

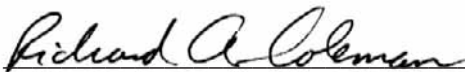


David Wiseman
Refuge Program Supervisor
U.S. Fish and Wildlife Service, Region 6
Lakewood, CO

FEB 23 2006

Date

and



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

FEB 23 2006

Date

Contents

<i>Summary</i>	S-1
1 Introduction	1
Purpose and Need for Plan	1
The U.S. Fish and Wildlife Service and the National Wildlife Refuge System	2
Ecosystem Descriptions and Threats	3
National and Regional Mandates	4
The Planning Process	4
2 Lacreek NWR and Lacreek WMD Background	11
Establishment, Acquisition, and Management History	11
Vision and Goals	13
Special Values	14
Planning Issues	14
3 Refuge Resources and Description	21
Geology and Soils	21
Water Resources	22
Vegetation Communities	23
Wildlife	25
Cultural Resources	27
Special Management Areas	28
Visitor Services	28
Fire and Grazing History	29
Socioeconomics	30
Air Quality	30
4 Management Direction	35
Introduction	35
Management Direction	35
Personnel	54
Funding	54
Step-down Management Plans	54
Monitoring and Evaluation	55
Plan Amendment and Revision	55
<i>Glossary</i>	59

Appendices	67
Appendix A. Compatibility Determinations	69
Appendix B. Key Legislation and Policies	75
Appendix C. Public Involvement.....	81
Appendix D. Planning Team and Contributors	85
Appendix E. Black-tailed Prairie Dog Management Plan, Lacreek National Wildlife Refuge. ...	87
Appendix F. Fire Management Program.....	115
Appendix G. Species List.....	117
Appendix H. Refuge Operating Needs System	129
Appendix I. Maintenance Management System.....	131
Appendix J. Environmental Compliance.....	133
<i>Bibliography</i>	137

List of Figures and Tables

Figures

1. USFWS ecosystem map	5
2. The steps in the CCP process	6
3. Location map	12
4. Prairie dog management	15
5. Habitat map	24
6. Public use map	50
7. Adaptive management	55

Tables

1. Endangered and threatened species found at Lacreek NWR	27
2. Habitat requirements for selected grassland birds	36
3. Current and proposed staff, Lacreek NWR	52
4. Step-down management plans for Lacreek NWR	54

Acronyms and Abbreviations Used in this CCP

BMPs	best management practices
CCP	comprehensive conservation plan
CD	compatibility determination
Corps	U.S. Army Corps of Engineers
EA	environmental assessment
EO	executive order
FMP	fire management plans
FONSI	finding of no significant impact
FTE	full-time equivalent
FQA	floristic quality assessment
FQI	floristic quality index
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
IPM	integrated pest management
LWRRRA	Little White River Recreation Area
NAWMP	North American Waterfowl Management Plan
NEPA	National Environmental Policy Act of 1969
Non-wildlife-dependent recreational uses	Personal watercraft, camping, swimming, horseback riding, volleyball, basketball, tournament fishing, power and speed boating
NWR	national wildlife refuge
Refuge System	National Wildlife Refuge System
SAV	submergent aquatic vegetation
SDGFP	South Dakota Game, Fish and Parks Department
Service	U.S. Fish and Wildlife Service
SWAP	Small Wetlands Acquisition Program
USFWS	U.S. Fish and Wildlife Service
Wildlife-dependent recreational uses	Hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation
WMA	wildlife management area
WMD	wetland management district
WPA	waterfowl production area

Summary

The Refuge and Its Purpose

Lacreek National Wildlife Refuge (NWR) was established in 1935 by President Franklin D. Roosevelt through Executive Order No. 7160. The order establishes Lacreek NWR “...as a refuge and breeding ground for migratory birds and other wildlife.” The refuge lies in the Lake Creek Valley on the northern edge of the Nebraska Sandhills and includes 16,410 acres of native sandhills, sub-irrigated meadows, impounded fresh water marshes, and tall- and mixed-grass prairie uplands.

The refuge serves as an important staging area for many species of waterfowl, sandhill cranes, shorebirds, and Neotropical migrants. Spring flows entering the refuge help to provide critical wintering habitat for the high plains trumpeter swan flock. These open waters during the winter also attract large concentrations of Canada geese and mallards. The refuge’s grasslands support long-billed curlews, marbled godwits, grasshopper sparrows, bobolinks, and other grassland bird species of concern. Bald eagles, a threatened species, are commonly observed on the refuge, and the endangered whooping crane has been documented using refuge wetlands during migration.

Unique habitats are provided in black-tailed prairie dog towns, which support high numbers of burrowing owls and host other species of concern, such as ferruginous hawks. The refuge provides a variety of habitats for resident wildlife and supports local concentrations of white-tailed and mule deer, sharp-tailed grouse, and ring-necked pheasants during the fall and winter.

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

Refuge Vision and Goals

The vision for the refuge is based on the establishing purposes of the refuge, resource conditions and potential, and the issues. The goals help the refuge staff achieve the vision.



Pool 9

© 2005 Laura Crawford Williams

Refuge Vision

Lacreek National Wildlife Refuge's wetland resources create a sanctuary within the semi-arid Great Plains landscape. The refuge provides a great diversity of uses for wildlife and humans alike. Refuge stewards manage hydrology to reflect natural conditions and restore native plant communities of the Lake Creek Valley and the adjacent sandhills for migratory birds and other native wildlife. Visitors learn about grasslands, wetlands, and sandhill ecosystems and enjoy wildlife-dependent recreation. Ongoing cooperation with partners and the public fosters appreciation and builds support for the refuge's biological and cultural assets.

Refuge Goals

Goal 1. Wildlife and Habitat Management:

Conserve, restore, and enhance the native biological diversity of the Lake Creek Valley and Nebraska Sandhills for migratory birds and other wetland and grassland-dependent species.

Goal 2. Research and Science:

Use sound science, monitoring, and applied research to advance the understanding of natural resources and management within the Lake Creek Valley, Nebraska Sandhills, and surrounding grasslands.



Kingfisher

© 2005 Laura Crawford Williams

Goal 3. Public Use:

Provide opportunities for quality wildlife-dependent recreation and promote awareness of Lacreek NWR's resources and the mission of the Refuge System.

Goal 4. Cultural Resources:

Identify, value, and preserve the cultural resources and history of Lacreek NWR to connect refuge staff, visitors, and the community to the area's past.

Goal 5. Refuge Operations:

Secure and demonstrate effective use of funding, staffing, and partnerships for the benefit of all resources in support of the Refuge System mission.

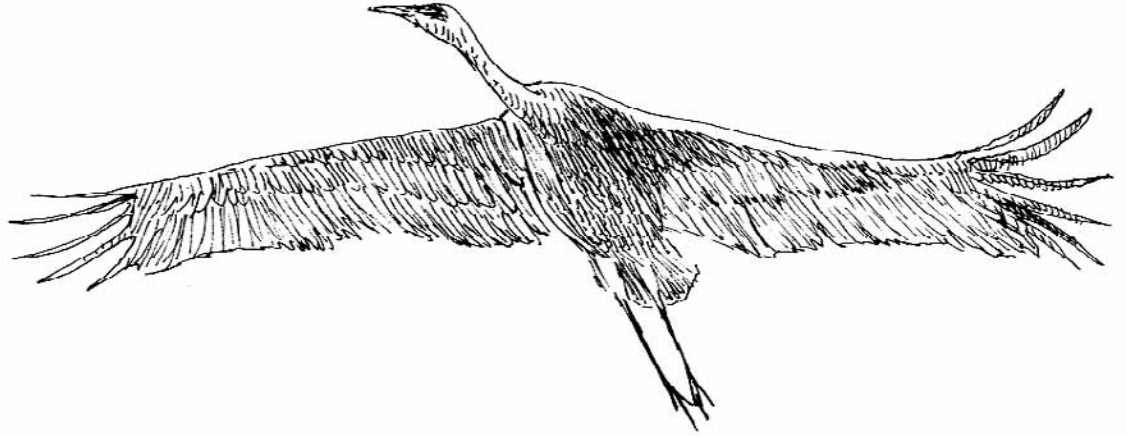
Goal 6. Partnerships:

Engage a wide range of partners, including non-governmental organizations and federal, state, tribal, and local entities, to join with Lacreek NWR Complex to support research and management, promote awareness, and foster appreciation for the Lake Creek Valley, Nebraska Sandhills, and surrounding grasslands.

Outcome of the Plan

Through an integrated restoration approach, the refuge will strive to restore ecological processes and achieve habitat conditions that require reduced management over time while recognizing the place of the refuge in the overall landscape and community. An emphasis on monitoring the effects of habitat management practices and use of the research results to direct ongoing restoration will be a priority. Current levels of priority public uses and activity will increase. The staff will continue to manage the wetland management district (WMD) through monitoring and enforcement of easements.

1 Introduction



1 Introduction

The U.S. Fish and Wildlife Service (Service) has developed this CCP to provide a foundation for the management and use of the Lacreek National Wildlife Refuge Complex, which includes not only the refuge but also the wetland management district (WMD). The plan is intended to serve as a working guide for management programs and actions over the next 15 years.

The plan was developed in compliance with the National Wildlife Refuge System Improvement Act of 1997 and Part 602 (National Wildlife Refuge System Planning) of the Fish and Wildlife Service Manual. The actions described within this plan also meet the requirements of the National Environmental Policy Act of 1969 (NEPA) (see appendix B). 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 plan will strive to achieve the program vision and the purposes of the refuge. Fish and wildlife and their habitats are the first priority in refuge management, and public use (wildlife-dependent recreation) is allowed and encouraged as long as permission is granted by the manager and it is compatible with, or does not detract from, a refuge's purpose(s).

The plan has been prepared by a planning team composed of representatives from various Service programs, including the refuge staff and the South Dakota Game, Fish and Parks Department (SDGFP).

Purpose and Need for Plan

The purpose of this CCP is to identify the role that Lacreek National Wildlife 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 programs and activities. The plan is needed:

- To provide a clear statement of direction for the future management of the program;
- To provide landowners, neighbors, visitors, and government officials with an understanding of the U.S. Fish and Wildlife Service's management actions on and around these refuges;
- To ensure that the Service's management actions are consistent with the mandates of the National Wildlife Refuge System Improvement Act of 1997;
- To ensure that the management of these refuges is consistent with federal, state, and county plans; and
- To provide a basis for the development of budget requests for the program's operational, maintenance, and capital improvement needs.



Canada Geese Taking Flight

Tom Koerner/USFWS

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

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

The U.S. Fish and Wildlife Service

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

Over 100 years ago, America's fish and wildlife resources were declining at an alarming rate. Concerned citizens, scientists, and hunting and angling groups joined together to restore and sustain our national wildlife heritage. This was the genesis of the U.S. Fish and Wildlife 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 National Wildlife Refuge System, thousands of waterfowl production areas (WPA), and other special management areas. It also operates 66 national fish hatcheries and 78 ecological services field stations.

Service Activities in South Dakota

Service activities in South Dakota contribute to the state's economy, ecosystems, and education programs. Lacreek NWR contributes to the economic benefits of hunting, fishing, wildlife observation, and wildlife photography in South Dakota. A report titled, *Banking on Nature 2004: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*, evaluated the impacts of refuges to local economies. Based on figures from 2004, Lacreek NWR is estimated to have generated \$84,500 in local economic effects from refuge recreation visits. The majority of effects were associated with expenditures by

non-resident visitors. The refuge budget also contributes a stimulus to the local economy with a significant portion of payroll, maintenance, and operation expenditures spent locally.

The refuge employs 7 full-time equivalent (FTE) employees, with a current budget of \$741,700 and has an annual visitation of 16,400. This includes funds for the fire program and the Partners for Fish and Wildlife Program. In addition, 150 volunteer hours are contributed to the refuge operations.

In general, the South Dakota Federal Aid – 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 South Dakota. In 1998, the economic impact of angler expenditures was \$206 million and hunters contributed \$176 million to the overall economy (Source: http://mountain-prairie.fws.gov/reference/briefing_book_nd_2000.pdf).

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 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 including Puerto Rico and the U.S. Virgin Islands.

In 1997, a clear mission was established for the 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 System;
- To fulfill the individual purposes of each refuge;
- To consider the needs of fish and wildlife first;

- To fulfill the requirement of developing a CCP for each unit of the System, and fully involve the public in the preparation of these plans;
- To maintain the biological integrity, diversity, and environmental health of the System;
- To recognize that wildlife-dependent recreational activities including hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation, are legitimate and priority public uses; and
- To retain the authority of refuge managers to determine compatible public uses.

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

- Wildlife comes first.
- Ecosystems, biodiversity, and wilderness are vital concepts in refuge management.
- Refuges must be healthy.
- Growth of refuges must be strategic.
- The 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).



Waterfowl Viewed from the Auto Tour Loop

Tom Koerner/USFWS

People and the National Wildlife Refuge System

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

Ecosystem Descriptions and Threats

Central Flyway

Lacreek NWR is located in the Central Flyway, which is one of four administrative flyways in North America (see figure 1, USFWS ecosystem map). The states and provinces included are: Montana, Wyoming, Colorado, New Mexico, Texas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota, Alberta, and Saskatchewan. The Central Flyway Council is made up of federal, state, and provincial representatives from the United States and Canada who meet regularly to coordinate population surveys, regulate and set hunting seasons, and plan for management of the migratory bird resource. Lacreek NWR designates a staff member to represent region 6 on the swan subcommittee of the Central Flyway Council.

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 and state agencies, private conservation organizations, business and private landowners, national corporations and individuals of 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 non-regulatory;
- To work on public and private lands to protect, restore and enhance critical habitats for waterfowl, shorebirds, waterbirds, and land birds; and
- To build a scientific foundation through improvement of databases, scientific technologies and monitoring that help partners target conservation efforts to where they will do the most good and make the best use of resources.

Northern Great Plains Joint Venture

Lacreek NWR is found in the newest Joint Venture, the Northern Great Plains Joint Venture. It is bounded on the north and east by the Prairie Pothole Joint Venture and on the west by the Intermountain West Joint Venture.

The Northern Great Plains Joint Venture area is arid to semi-arid and mostly unglaciated. Relatively few natural wetlands exist. Land use in the area is primarily livestock production and numerous man-made wetlands have been created for livestock and wildlife. This area of short- and mixed-grass prairie has been dramatically altered in the last 100 years, due primarily to human intervention. Once common native grasslands are seriously threatened and many bird species are declining. Maintaining and protecting existing wetlands and grasslands, as well as creation and enhancement of wetlands, will be a major focus for the Northern Great Plains Joint Venture. Lacreek NWR contributes to and participates in the Northern Great Plains Joint Venture through its active Partners for Fish and Wildlife Program, management of the WMDs easements, and management and restoration of the refuges resources.



Lacreek NWR Headquarters

Tom Koerner/USFWS

Missouri River Main Stem Ecosystem Plan

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

Key legislation and policies can be found in appendix B.

National and Regional Mandates

The administration of the Refuge System is guided by a variety of international treaties, federal laws, and Presidential Executive Orders. Management options under each refuge's establishing authority and the Refuge System Improvement Act of 1997 (the legal and policy guidance for the operation of national wildlife refuges) are contained in the documents and acts listed in appendix B.

The Improvement Act amends the Refuge System Administration Act by providing a unifying mission for the 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 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 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 executive orders that may affect the CCP or the Service's implementation of the CCP is provided in appendix B. Service policies providing guidance on planning and the day-to-day management of a refuge are contained within the Refuge System Manual and the Service Manual.

The Planning Process

This CCP for Lacreek NWR and Lacreek WMD are intended to comply with the Improvement Act and NEPA and their implementing regulations. The Service issued a final refuge planning policy in

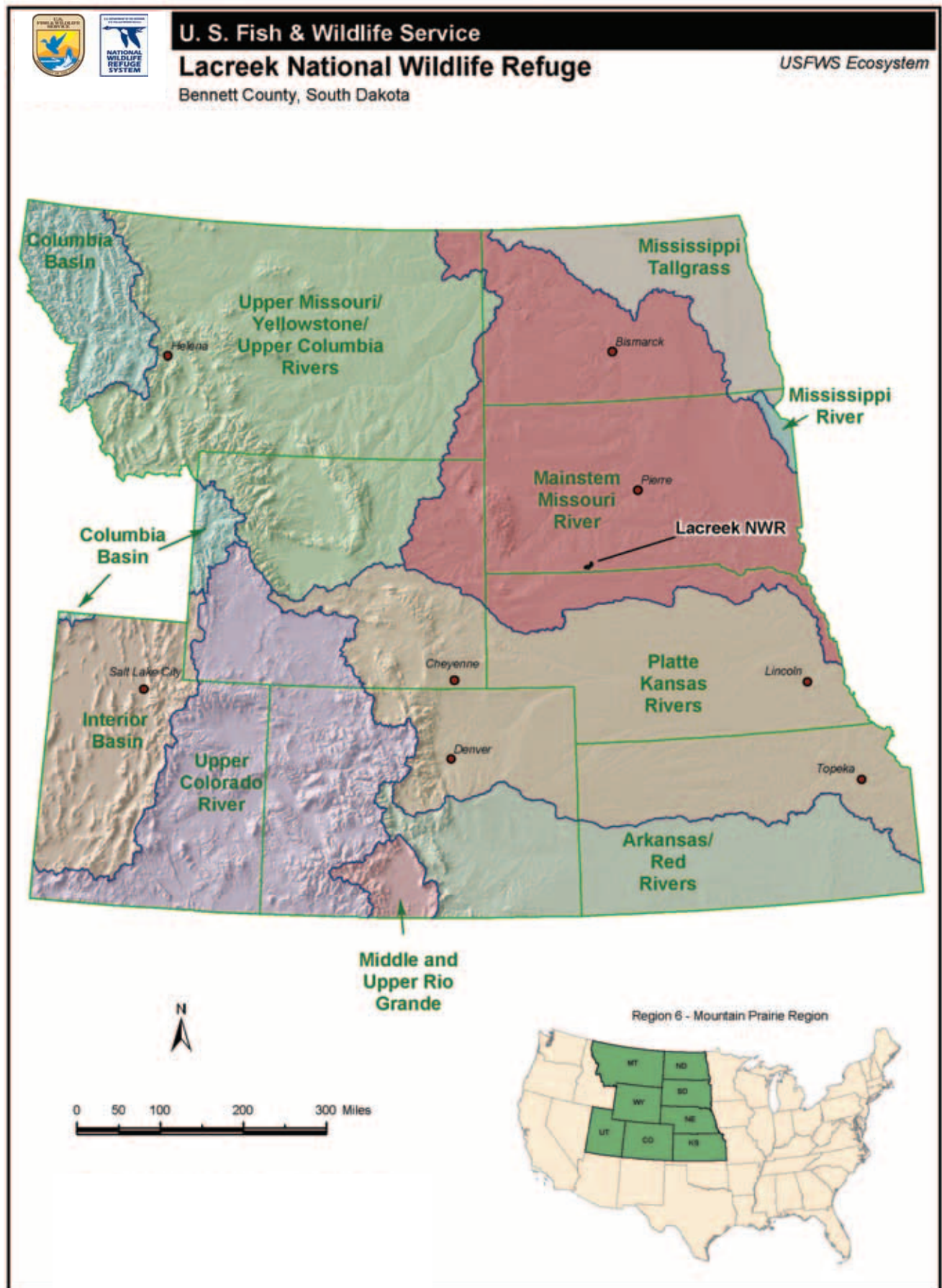


Figure 1. USFWS ecosystem map

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 2):

- Form a planning team and conduct pre-planning;
- Initiate public involvement and scoping;
- Draft vision statement and goals;
- Develop and analyze alternatives, including proposed action;
- Prepare draft CCP and EA;
- Prepare and adopt final CCP and EA and issue a finding of no significant impact (FONSI) or determine if an environmental impact statement is needed;

- Implement plan, monitor and evaluate; and
- Review (every 5 years) and revise (every 15 years) plan.

The Service began the pre-planning process in September 2004 (see appendix C). A planning team comprised of Service personnel from the refuge and the SDGFP (appendix D), was developed shortly after the initial kickoff meeting. Draft issues and qualities lists were developed.

A notice of intent was published in the Federal Register on November 30, 2004. Notification of a public open house was distributed through media press releases.

Over the course of pre-planning and scoping, the planning team collected available information about the resources of the refuge and the surrounding areas. This information is summarized under “Chapter 3, Refuge Resources and Description”.

This CCP provides long-term guidance for management decisions; sets forth goals, objectives, and strategies needed to accomplish refuge purposes; and identifies the Service’s best estimate of future needs. This CCP details program

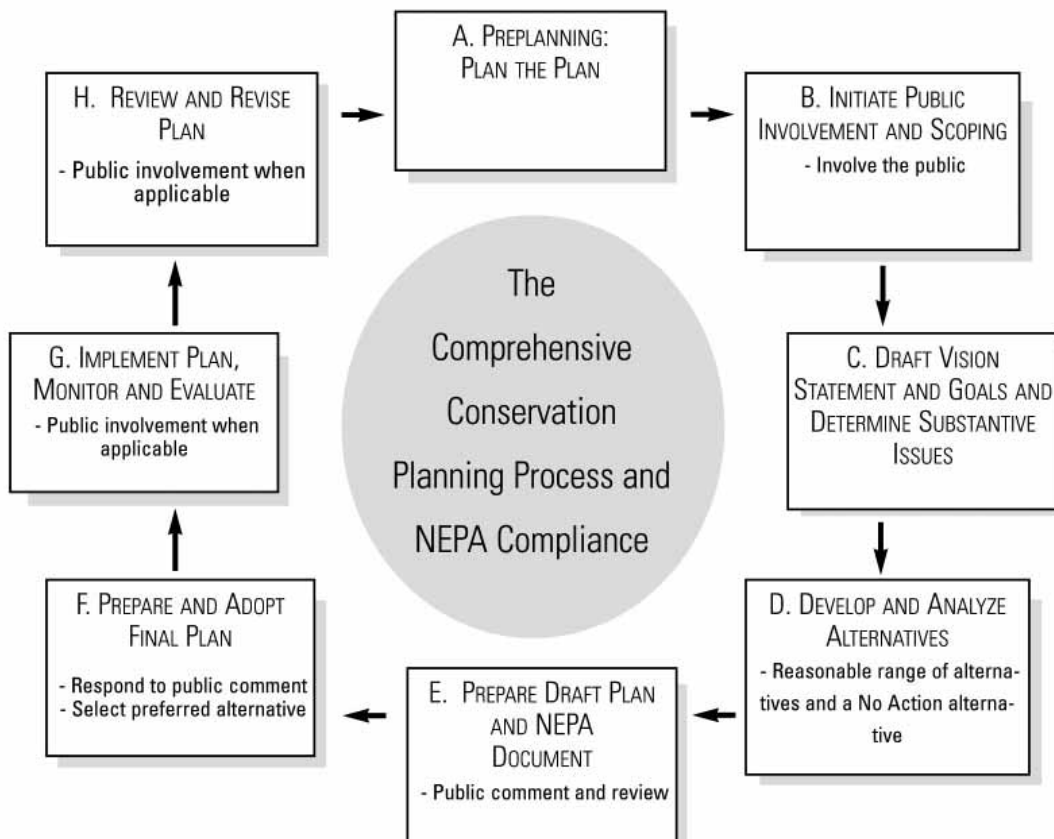


Figure 2. The steps in the CCP process

planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. This CCP does not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

The Service has made compatibility determinations for Lacreek NWR (appendix A).

2 Lacreek National Wildlife Refuge and Lacreek Wetland Management District Background



2 Lacreek National Wildlife Refuge and Lacreek Wetland Management District Background

Establishment, Acquisition, and Management History

Lacreek National Wildlife Refuge was established on August 26, 1935 by President Franklin D Roosevelt through Executive Order No. 7160:

“... as a refuge and breeding ground for migratory birds and other wildlife.”

The refuge lies in the Lake Creek Valley on the northern edge of the Nebraska Sandhills and includes 16,410 acres of native sandhills, sub-irrigated meadows, impounded fresh water marshes, tall- and mixed-grass prairie uplands, reseeded grasslands, and trees and shelterbelts (see figure 3, location map). The refuge serves as an important staging area for migrating Canada geese, other waterfowl, sandhill cranes, shorebirds, and Neotropical migrants. Providing critical migrational and wintering habitat for the high plains trumpeter swan flock is a primary goal. Unique habitats are provided in black-tailed prairie dog towns that support high numbers of burrowing owls and host ferruginous hawks, a species of concern. The refuge provides a variety of habitats for resident wildlife and supports concentrations of white-tailed and mule deer, sharp-tailed grouse,

and ring-necked pheasants during the fall and winter.

The majority of the refuge was acquired shortly after refuge establishment. Several inholdings within the approved refuge boundary were never acquired. The refuge will be interested in acquiring these inholdings, should a future opportunity arise to purchase from a willing landowner. At the time of establishment it was the only managed NWR west of the Missouri River in South Dakota. Today Lacreek is one of two refuges west of the Missouri River in South Dakota.

The WMD was started as part of the Small Wetlands Acquisition Program (SWAP) in the 1950s to save wetlands from various threats, particularly draining. The passage of Public Law 85-585 in August of 1958 amended the Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) of 1934, allowing for the acquisition of waterfowl production areas (WPAs) and easements for waterfowl management rights (easements).

The WMD contains eight perpetual easements totaling 3,443 acres. The easement restrictions vary; however, they generally prohibit wetland drainage, grassland conversion, development, and they require a special use permit for vegetative manipulation. The lands remain in private ownership. No fee title lands are currently owned



Pool 5

© 2005 Laura Crawford Williams

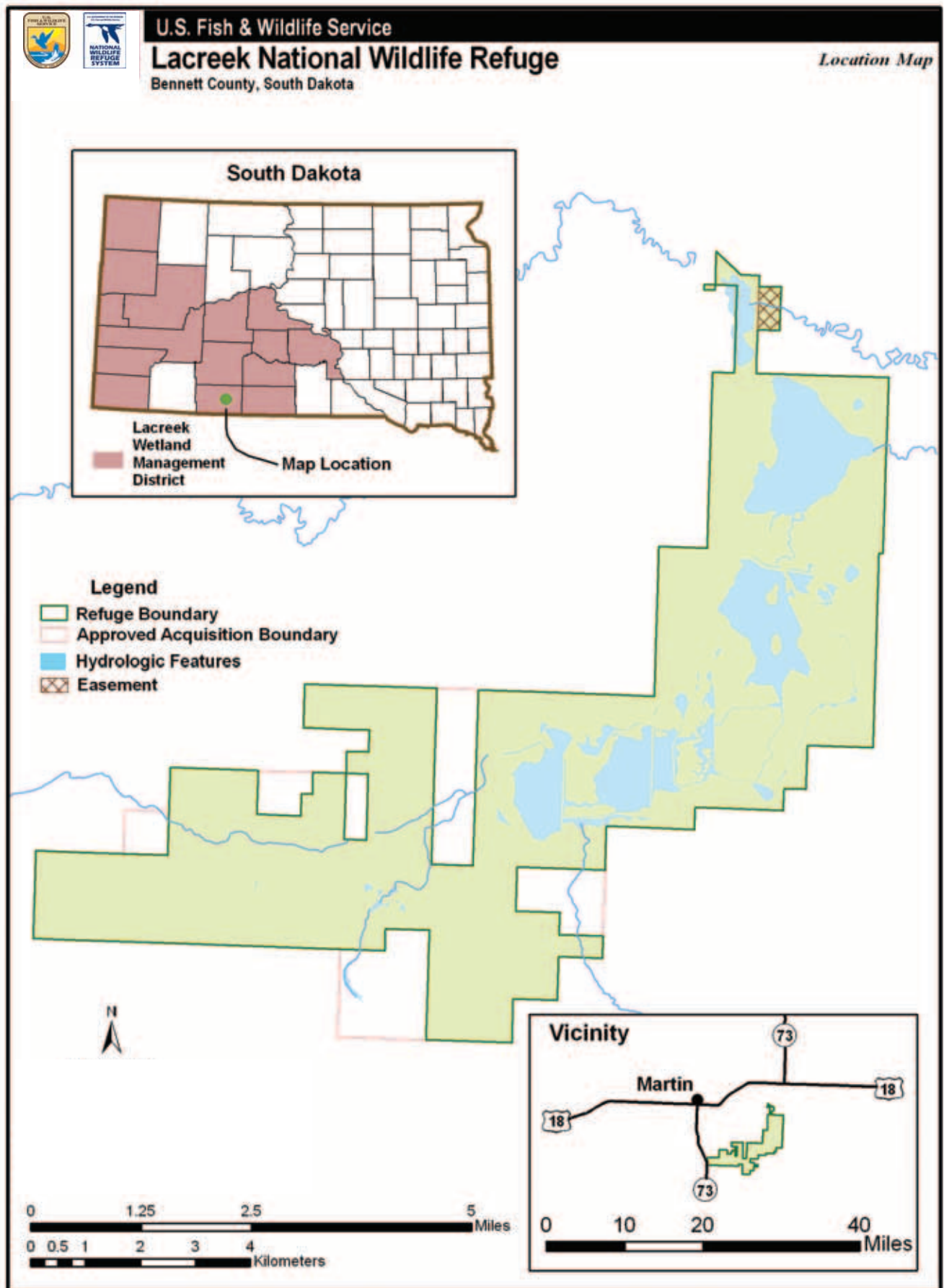


Figure 3. Location map

by the Service in the WMD. There is no active easement or fee title acquisition program in the WMD.

Refuge and Wetland Management District Purposes

The purposes for the refuges and wetland management district are as follows:

Executive Order, August 26, 1935 “...as a refuge and breeding ground for migratory birds and other wildlife...”

Migratory Bird Conservation Act “...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”

The 223 acre Little White River Recreation Area was donated to and accepted by the Service on May 20, 1980 under the authority of the Refuge Recreation Act

Refuge Recreation Act (16 USC 460K-K4) “...for public recreation on...developments adjacent to conservation areas in existence.”

Lacreek Wetland Management District

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.”

Vision and Goals

Vision

Lacreek National Wildlife Refuge’s wetland resources create a sanctuary within the semi-arid Great Plains landscape. The refuge provides a great diversity of uses for wildlife and humans alike. Refuge stewards manage hydrology to reflect natural conditions and restore native plant communities of the Lake Creek Valley and the adjacent sandhills for migratory birds and other native wildlife. Visitors learn about grasslands, wetlands, and sandhill ecosystems and enjoy wildlife-dependent recreation. Ongoing cooperation



Trumpeter Swans

Tom Koerner/USFWS

with partners and the public fosters appreciation and builds support for the refuge’s biological and cultural assets.

Goals

Goal 1. Wildlife and Habitat Management:

Conserve, restore, and enhance the native biological diversity of the Lake Creek Valley and Nebraska Sandhills for migratory birds and other wetland- and grassland-dependent species.

Goal 2. Research and Science:

Use sound science, monitoring, and applied research to advance the understanding of natural resources and management within the Lake Creek Valley, Nebraska Sandhills and surrounding grasslands.

Goal 3. Public Use:

Provide opportunities for quality wildlife-dependent recreation and promote awareness of the refuge’s resources and the mission of the System.

Goal 4. Cultural Resources:

Identify, value, and preserve the cultural resources and history of Lacreek NWR to connect refuge staff, visitors, and the community to the area’s past.

Goal 5. Refuge Operations:

Secure and demonstrate effective use of funding, staffing, and partnerships for the benefit of all resources in support of the System mission.

Goal 6. Partnerships:

Engage a wide range of partners, including non-governmental organizations and federal, state, tribal, and local entities, to join with Lacreek NWR Complex to support research and management, promote awareness, and foster appreciation for the Lake Creek Valley, Nebraska Sandhills, and surrounding grasslands.

Special Values

The planning team and public identified special values and qualities that make most of these refuges valuable for wildlife and the American people. The Lacreek NWR has the following attributes:

- The refuge lies at an intersection of different grassland types. Sandhills prairie, tall-grass prairie, and mixed-grass prairie can all be found here.
- Water in an otherwise arid landscape is a wildlife magnet. The presence of reliable springs with high quality water was the reason for establishment of the refuge and continues today.
- Many species of both eastern and western birds, small mammals, and other wildlife overlap ranges here. For example, both eastern and western meadowlarks can be found on the refuge.
- Lacreek NWR played a key role in the restoration of the High Plains Flock of trumpeter swans and continues to be one of the primary fall staging and wintering sites for this flock.
- Visitors can still find wide-open spaces that remain relatively undisturbed. Visitors may often feel as if they had the place to themselves.

Wildlife is abundant and highly visible because of habitat types and relatively low disturbance levels.

Planning Issues

This section describes issues regarding the refuge that were identified during public scoping.

Habitat Management

Lacreek NWR's primary purpose is to provide optimal habitat conditions for the needs of a suite of migratory and resident wildlife found on the refuge. To achieve goals and objectives set for the refuge's habitat, aggressive management must be completed. Nearly all uplands north of Lake Creek were previously farmed and the native vegetation lost. Many of the refuge's wetlands are located behind or below earthen dams that can be used to either create deep and stable water levels or to mimic natural wet and dry cycles. There is a gap between public perception of disturbance and

the understanding of how managed disturbance mimics natural disturbance and creates healthier ecosystems.

Black-tailed Prairie Dog Management

In July 1998, the National Wildlife Federation petitioned the Service to list the black-tailed prairie dog as threatened under the Endangered Species Act. In the fall of 1999, a moratorium of all black-tailed prairie dog control on Service lands was issued by the Regional Director. In February 2000, the Service concluded that this species warranted listing, but was precluded from being listed due to other higher priority species concerns and resource constraints. In August 2004, an updated evaluation of the best available scientific information led the Service to determine that the black-tailed prairie dog should be removed as a candidate for listing.

In March 2005, the South Dakota legislature passed Senate Bill 216. This measure sets forth conditions under which prairie dogs will be considered pests by the state. It also outlines a formalized complaint process by which private landowners may file complaints against adjacent landowners. If the adjacent private landowner does not comply with controlling a one mile buffer or mutually agreed to buffer, then the County Weed Board may be authorized to enter onto private lands to control prairie dogs and bill the landowner for that work. The state Department of Agriculture will attempt to negotiate control measures on federal and tribal lands where formal complaints are received from adjacent private landowners.

During this same 1999-2005 period, a severe drought hit western South Dakota. A cessation of all control activities on federal lands combined with the drought caused a rapid increase in



Prairie Dog

Tom Koerner/USFWS

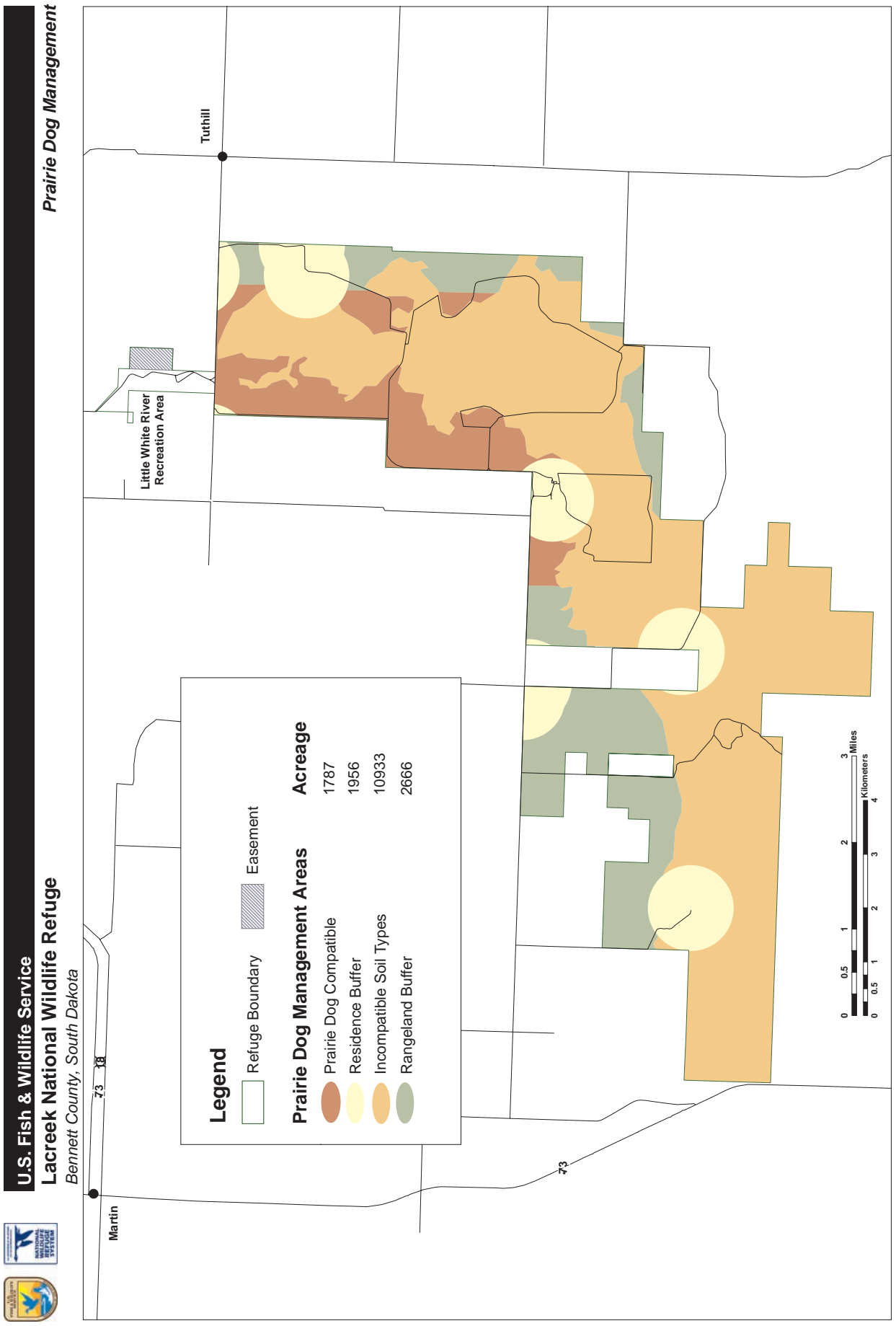


Figure 4. Prairie dog management

total acres occupied by black-tailed prairie dogs in southwestern South Dakota. The number of occupied acres on Lacreek NWR showed a similar trend, and increased an estimated 343 percent from 1997 to 2004. The number of individual prairie dog towns increased from three in 1997 to 10 in 2004.

Prairie restoration includes control of noxious weeds such as Canada thistle, and replacement of non-native planted species that tend to form single-species stands of vegetation (such as crested wheatgrass and smooth brome). Restoration is best accomplished by farming for 3 to 5 years, and then reseeding with a diverse seed mix including native grass collected locally, sedge, and forb seeds. Under current regulations prairie dogs cannot be disturbed by plowing. Therefore, this effective prairie restoration technique can no longer be used on the refuge.

Prairie dogs located on the refuge have expanded onto adjacent private lands where they are not wanted. Control on private lands has proven futile in these situations, as prairie dogs quickly re-occupy controlled sites. A step down black-tailed prairie dog management plan is in appendix E.

Noxious Weed Control

Noxious weeds, especially Canada thistle, have the ability to degrade wildlife habitat and to spread into adjacent private lands. This has been a significant issue on the refuge for many years. A large portion of the refuge's resources are directed at control of Canada thistle 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—such as salt cedar or purple loosestrife—establishing on the refuge is a constant threat. Generally, an immediate control response to new invasive species is most effective in the long term.

Water Rights and the Use of Water for Wetland Management

Contested water rights on the Brown Ranch portion of the refuge have been a significant issue for the refuge during the last 20 years. During a coordinated resources management effort, the Service agreed to withdraw its application for diversion of water from Lake Creek to flood irrigate portions of the refuge north of Lake Creek. The CRM process was not successful in resolving water issues with refuge neighbors. Following a protracted hearing before the South Dakota Water Management Board, a water right was granted for

installation and maintenance of Diversion 4A for the primary purpose to act as a physical barrier for carp. Adjacent landowners and Bennett County officials involved in this dispute are concerned that the Service may attempt to reapply for this water right to divert water from Lake Creek.

Public Use

Hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation are all uses currently allowed on the refuge. Limited public lands available for public recreation in the area make this an issue of interest. There is demand for increased and improved recreational fishing opportunities on the refuge.

Little White River Recreation Area

The Little White River Recreation Area (LWRR) was accepted as a donation in fee title under the Refuge Recreation Act. The recreational fishery and opportunities for swimming and boating are currently impaired by high sediment loads. Many local residents are interested in determining if improvements are possible.

A second issue concerning the LWRR is the proposed Phase III Project. The proposed project includes excavation of a secondary emergency spillway, replacement of the primary emergency spillway, replacement of the outlet works, and raising the elevation of the dam by one foot. The operating level of the pool would not be increased due to the 1 foot of additional freeboard. Once completed, a probable maximum flood event would pass without overtopping the dam.

Species of Concern

Pelicans. Lacreek NWR hosts the largest nesting colony of American white pelicans in South Dakota. Lacreek's nesting colony has fluctuated from year to year, but has had continued use since the 1940s. Management of water levels in refuge pools, particularly Pool 9, could impact this nesting colony by allowing predators such as coyotes easier access to the islands. When Pool 9 is drawn down, a land bridge forms, allowing coyotes and other predators to walk to the islands. Emergent vegetation may also begin to grow around the islands with successive drawdowns, making the site less attractive to pelicans. During the 2005 nesting season, all adult pelicans abandoned the island and all young died. On several occasions, refuge visitors observed a coyote on the island that had swam from the shore. It is not known if a single coyote or numerous coyotes learned this behavior of swimming to the island. The abandonment and

subsequent loss of all young pelicans has occurred at several other nesting colonies in recent years, and coyote predation was also speculated as a cause in these cases.

Swans. Lacreek NWR played a key role in the restoration of the High Plains Flock of trumpeter swans to the Central Flyway. Today, a significant portion of this flock returns to Lacreek each fall. The swans winter on spring-fed streams in the sandhills to the south. The refuge will continue to play a key role as a fall staging and wintering area.

Federally Listed Threatened and Endangered Species. The Biological Integrity, Diversity, and Environmental Health Policy (published January 16, 2001, effective April 16, 2001) (<http://policy.fws.gov/library/01fr3809.pdf>) guides System personnel in implementing the clause of the Improvement Act that directs the Secretary of the Interior to ensure that the Service maintain the “biological integrity, diversity, and environmental health” of the 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 System mission.”

The Lacreek NWR staff reviewed all threatened and endangered species with historical ranges on or near the refuge to determine if additional actions could be taken to restore or enhance habitat for endangered species. Only the blowout penstemon (*Penstemon haydenii*) was determined to be appropriate for restoration actions.

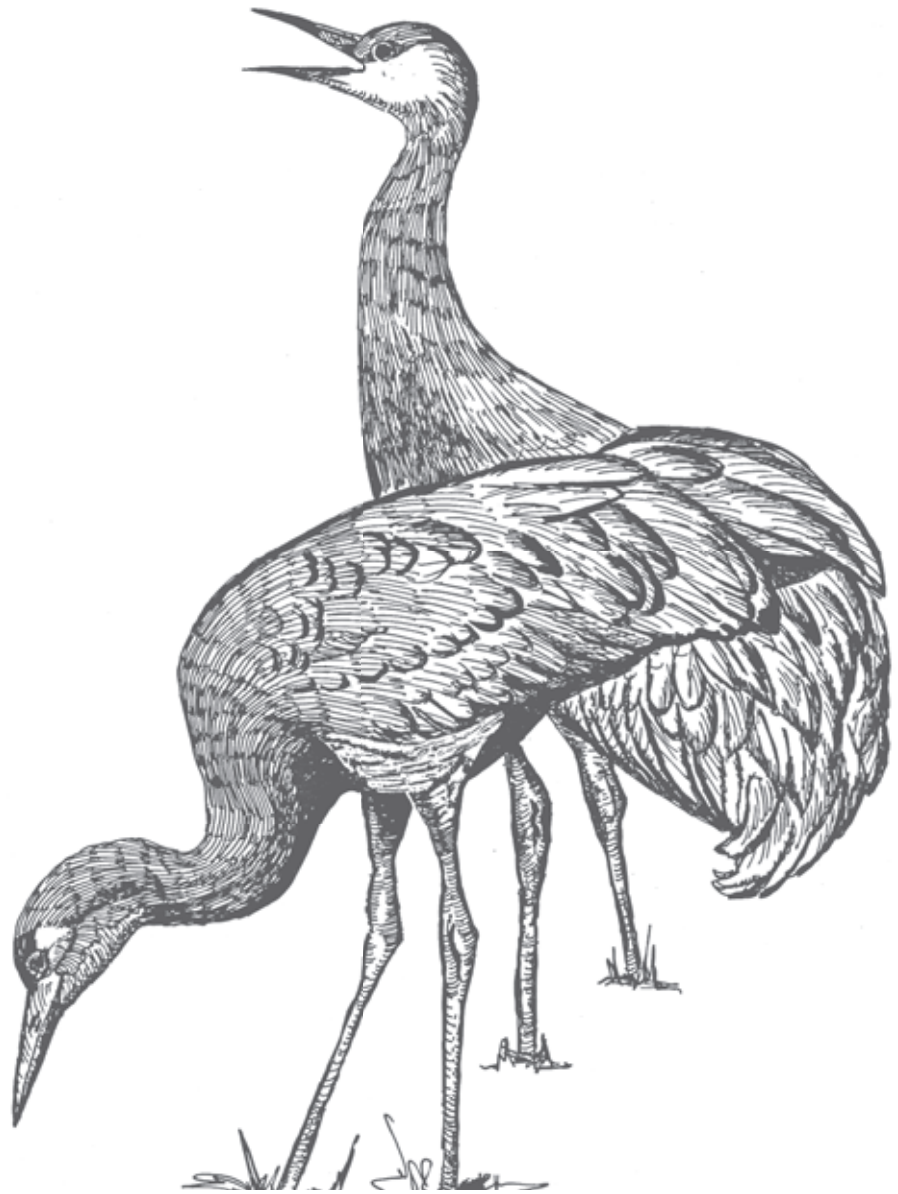
Predators. The predator community on Lacreek NWR is diverse, ranging from coyotes and short-tailed weasels to bald eagles and kestrels. This array of predators helps maintain the “biological integrity, diversity, and environmental health” of the refuge. Several species, including striped skunks and raccoons, are found at higher than historical levels due to modifications of habitat. These species can impact migratory bird populations and reduce the likelihood of reaching goals and objectives outlined for the refuge, primarily by depredating the nests of an array of grassland-nesting bird species.



American White Pelican

© 2005 Laura Crawford Williams

3 Refuge Resources and Description



3 Refuge Resources and Description

Lacreek NWR is located about 12 miles southeast of Martin in Bennett County in southwestern South Dakota. The refuge lies in the shallow Lake Creek Valley on the northern edge of the Nebraska Sandhills and includes native sandhills, sub-irrigated meadows, impounded fresh water marshes, and tall- and mixed-prairie uplands. The refuge occurs in a region characterized by the transition between eastern and western plant and animal species. Wildlife on the refuge includes aquatic and marsh dwelling species, as well as species typical of the prairie. This chapter describes the refuge's environmental resources that may be affected by the implementation of the CCP.

The refuge is in a semi-arid area characterized by cold winters and hot summers. Temperature fluctuates both seasonally and daily. Summer temperatures climb above 100°F, while winter temperatures may drop to -30°F with wind chills as low as -60°F. Annual rainfall is 17 inches, of which 80 percent occurs from April to September. Average snowfall is 32 inches.

Geology and Soils

The geologic materials underlying the refuge consist of clays and silts of the Chadron Formation and siltstones and sandstones of the Brule Formation, deposited during the Lower Tertiary

and overlain with materials of the Arikaree and Ogallala Formations deposited during the Upper Tertiary (Whitehead 1996). The materials of the Arikaree and Ogallala Formations were deposited primarily by streams, but the presence of volcanic ash indicates that some material was deposited as the result of wind (Perisho 1912).

The sandhills were of late Pleistocene age and were formed by wind-deposited sands. The surface on which the sand dunes were formed rises nearly 2,000 feet over the 250-mile east-west extension of the sandhills.

Three major soil associations are present on the refuge. The Valentine Association is an extension of the Nebraska Sandhills, and consists of hills with ridges ranging from 29 to 75 feet high. This association is made up of excessively drained, deep sandy soils. These soils are very permeable; a large percentage of runoff percolates into the groundwater. These soils also are very erosive, causing large "blowouts" to form when vegetation and its soil binding root systems are removed.

The Keith-Rosebud Association is an area of nearly level to gently sloping tablelands and consists of well drained, deep silty soils. These soils are suitable for farming, and the majority of these soils were farmed prior to establishment of the refuge.

The Mosher-Minature Loup Association is found on bottoms, terraces, upland valley bottoms, and basins that have a fluctuating water table. These



Soil Erosion

Tom Koerner/USFWS



Tom Koerner/USFWS

Wetland

associations consist of nearly level, somewhat poorly drained, deep loamy soils and saline soils with a clay pan. The shallow water table supports vegetation more typical of tall-grass prairie. In areas of saline soils with a claypan, saltgrass and foxtail barley are the predominant vegetation.

Water Resources

Surface Water

Several spring-fed creeks emerge from the Nebraska Sandhills and provide a constant supply of clear water for the refuge. Lake Creek is the major spring-fed stream after which the refuge is named (see figure 5, habitat map). Average stream flows on Lake Creek range from a low of 9.2 cfs in 1981 to a high of 41.2 cfs in 1997. The long-term average is about 20 cfs. A series of dikes with control structures impound these waters and create 5,400 acres of wetlands in 13 water management units.

Groundwater

The majority of deep groundwater in Bennett County occurs in geologic materials of Oligocene, Miocene, and Holocene/Pleistocene age; however, some aquifers also exist at greater depths in Cretaceous and Paleozoic materials (Whitehead 1996). Some domestic wells exist in the deeper aquifers, but there has been little development of deep groundwater for irrigation in the vicinity of the refuge.

Groundwater is also present in the alluvial aquifer associated with Lake Creek, and in the sandhills to the south of the refuge. The sandhills act like a huge sponge, soaking up the limited amount of precipitation that falls and slowly releasing it back to surface water features. The sandhills are largely

responsible for maintaining Lake Creek as a perennial stream. The alluvial aquifer is expressed by the springs, small wetlands, and wet meadows near Lake Creek and Cedar Creek. This aquifer is critical to the maintenance of subirrigation on the refuge and surrounding properties. This subirrigated area has historically been the most productive area for grass hay.

Wetlands

Wetlands on Lacreek NWR occur primarily within the floodplain of Lake Creek. Given that the majority of groundwater at Lacreek NWR in this area discharges by movement to lakes and streams, leakage to shallower aquifers, and to springs (Whitehead 1996), surface hydrology of wetlands on the NWR is influenced by a combination of surface water and groundwater inputs. Several small, spring-fed creeks and major creeks (i.e., Lake Creek, Cedar Creek, Elm Creek) contributing water to the NWR exhibit perennial flows even though evaporation far exceeds precipitation annually. Data from the USGS gauging station on Lake Creek above the refuge indicate daily flows exceeded 20 cfs and 10 cfs about 50 percent and 95 percent of days, respectively, during the periods 1963-1979 and 1997-2003. Further, groundwater discharge from aquifers has been documented as contributing more than 50 percent of flows in the Little White River and Minnechaduzza Creek, which are in relatively close proximity to the refuge (Carter 1998). This suggests that the influence of groundwater on the surface hydrology of wetlands on the NWR may be substantial, particularly during the late spring and summer when evapotranspiration rates are greatest.

Water Rights

The following section is a summary of water rights associated with the refuge:

- U.S. Water Right 2-2, priority date October 16, 1934, for all unappropriated waters of Lacreek (Lake Creek) and tributaries in Bennett County to be used on the refuge by means of dams 7, 8, 9, and 10. A maximum amount of 23,710 acre-feet (11,008 acre-feet of storage and 12,702 acre-feet of seasonal use) of water use is permitted.
- U.S. Water Right 3-2, priority date December 13, 1935, authorizes storage of water in the LWRRA reservoir and the diversion of water from the Little White River to Pools 9 and 10. U.S. 3-2 was supplemented with the purchase of water license 253-2, priority date May 27, 1940, for all of the unappropriated waters of

the Little White River from its confluence with Lake Creek to the Town of White River. A maximum of 1,827 acre-feet of storage with 843 acre-feet of seasonal use is authorized for use in supplementing Pools 9 and 10.

- Water Right 2147-2 to appropriate and impound up to 167.5 acre-feet in the DU sub-impoundment in Pool 9 with a priority date of November 1, 1990.
- Water Right 2192-2, priority 1991, authorizes 1444.7 acre-feet with 4.44 cfs from six springs originating along the edge of the sandhills to create 235 acres of marshes, sloughs and wet meadows for waterfowl propagation and enhancement of wildlife habitat.
- Water Right 1921-2, priority May 20, 1933 for 4.45 cfs from Cedar Creek to be stored in a dam on Cedar Creek with a capacity of 30 acre-feet, and to irrigate 362 acres.
- South Dakota Reissued Water Permit 2300-2 authorizes reconstruction and maintenance of a control structure to impound 0.75 acre-feet of water to prevent carp from traveling upstream of the structure, in order to protect the state-listed threatened pearl dace. This permit has a priority date of February 1, 1994.

Vegetation Communities

Wetlands and Associated Vegetative Communities

Wetlands on the refuge (see figure 5) are managed to provide both resting cover and food resources for migratory birds. Flows from springs through the winter months keep portions of some units open and provide resting and feeding sites for trumpeter swans, Canada geese, mallards, and a small number of other migratory bird species. Throughout the rest of the year, wetlands serve as production and maintenance habitat for waterfowl, other migratory birds, and resident wildlife.

Substantial emergent and submergent vegetation occurs in wetlands at the refuge. Sago pondweed, coontail, and duckweed occur in the deeper, more permanently flooded zones, while cattail, bulrush, wild rice, burreed, and arrowhead grow in more shallowly flooded areas that may go dry due to a drawdown. The perimeter of these units may be dominated by smartweed, barnyard grass, Canada bluejoint, prairie cordgrass, sedges, rushes, wild mint, and dock that can tolerate shorter periods of surface flooding and saturated soils.

The management of wetlands on the refuge attempts to simulate historical wet/dry cycles by raising and lowering water levels to meet specific management objectives. Desirable emergent and submergent vegetation establishment and growth is encouraged, invertebrate substrate is increased, water clarity can be improved, accumulated nutrients in bottom sediments are broken down and cycled, and some measure of carp control is achieved. Extensive mudflats are created when wetlands are in the initial drawdown phase and create optimal feeding opportunities for migrating shorebirds, wading birds, and other Neotropical species.

Wet Meadows and Associated Vegetative Communities

Wet, subirrigated meadows make up about 13 percent of the acres on the refuge and occur notably between the Nebraska Sandhills to the south and the drier, uplands to the north (see figure 5, habitat map). These meadows are nearly flat, have saturated soils near the surface for most of the growing season, and frequently pond water for short periods after rainfall events. Much of the western portion of the refuge falls into the wet-meadow category. These wet meadows contain a full complement of native grasses and forbs. Species found in this community include Nuttall's sunflower, blue vervain, goldenrod, wild licorice, swamp milkweed, wild mint, spotted joe-pye weed, and black-eyed susan.

Uplands and Associated Vegetative Communities

There are 10,350 acres of grasslands at Lacreek that consist of sandhills, meadows, and uplands (see



Nuttall's Sunflower

© 2005 Laura Crawford Williams

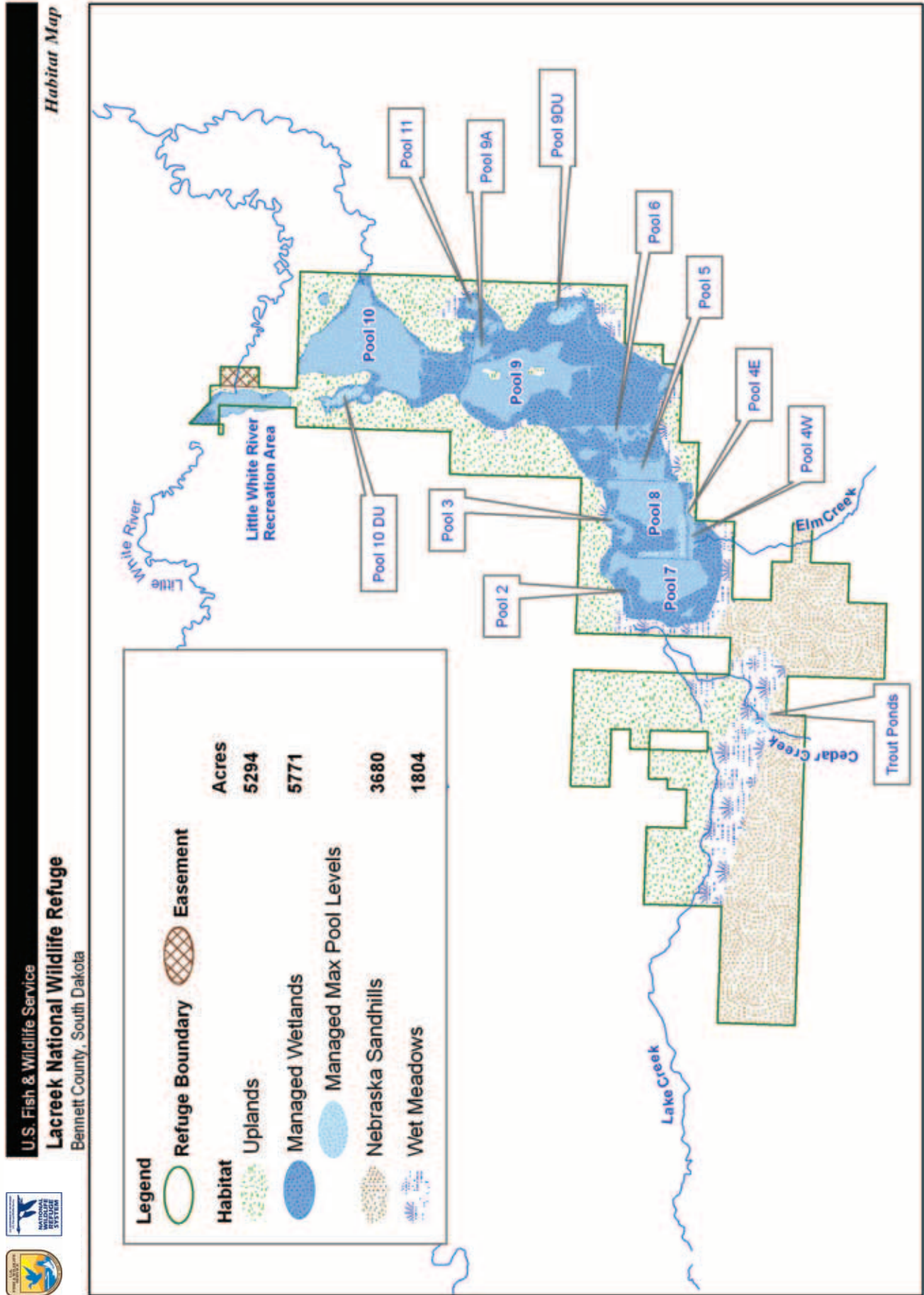


Figure 5. Habitat map

figure 5, habitat map). Approximately 4,900 acres of native grasses are within the refuge, of which 3,726 acres are in the Nebraska Sandhills. Big bluestem, little bluestem, sand bluestem, prairie sandreed, switchgrass, Indian grass, Canada wildrye, June grass, sand dropseed, needle-and-thread grass, western wheatgrass, and salt grass have all been noted on refuge grassland transects.

The sandhills portion of the refuge contains a diverse component of grass and forb species generally not found anywhere else on the refuge. Although not found on the refuge, today it is believed that blowout penstemon may have extended at one time to the edge of the sandhills, including the area of Lacreek NWR. Several small “blowouts” or areas of active sand movement can be found and may be suitable habitat.

During the 1930s, large fields formerly planted to crops were plowed to form ridges, and planted with non-native grasses including smooth brome, crested wheatgrass, and Kentucky bluegrass species to minimize soil erosion. Today, the refuge contains approximately 5,450 acres of uplands dominated by these non-native species. Extensive areas of crested wheatgrass and smooth brome remain on the refuge.

In the early 1970s, habitat management techniques were developed to provide dense nesting cover for waterfowl. Several areas on the refuge were planted to grass species such as smooth brome 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 noxious weeds. The refuge plans to restore these grasslands, along with the crested wheat grass fields, 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 noxious weeds, and prepare a seed bed for planting native seed. Since 1997, the refuge has restored or is in the process of restoring approximately 670 acres to native grasses. Approximately 350 acres were planted to native grasses in 2000 and 2001 alone. Starting in 2004, refuge staff began to harvest seed from the refuge and other local sites. Over 120 species of native grass, forb, sedge, and rush species have been harvested to be used for restoration. Future plantings will utilize over 100 species of locally collected seed.

Upland vegetation is maintained to provide nesting habitat for migratory and resident bird species. Upland habitats also provide necessary habitat requirements for resident wildlife throughout the year. A variety of management techniques have been implemented to maintain and enhance upland habitat conditions on the refuge including the use

of prescribed fire, grazing, haying, native prairie restoration, and invasive species management.

Shrub and Tree Plantings (Shelterbelts)

The refuge has less than 70 acres of shrubs and trees. Some refuge dikes are lined with American plum, chokecherry, peachleaf willow, sandbar willow, and eastern cottonwood. In order to maintain dikes, and provide secure fire lines for prescribed burning, most of the peachleaf willows will be removed from the dikes. American plum, chokecherry, and sandbar willow provide habitat for species such as Bell’s vireos and willow flycatchers. Large mature cottonwoods will be maintained to provide perch sites for bald eagles and other raptors. The refuge has several mature shelterbelts composed of green ash, American elm, honey locust, hackberry, ponderosa pine, eastern redcedar, and Russian olive. Many of the shelterbelts are near refuge housing, headquarters, and other buildings and provide protection from the wind.

Wildlife

Mammals

A total of 39 species of mammals have been recorded on the refuge. Representative species include coyote, cottontail rabbit, deer mice, shrew, meadow vole, weasel, ground squirrel, prairie dog, badger, mink, beaver, muskrat, skunk, raccoon, white-tailed deer, mule deer, and pronghorn.

Black-tailed Prairie Dogs

It is unknown to what extent prairie dogs historically occurred on the refuge. Prairie dog control programs were enacted prior to refuge establishment and during the early years of the refuge. It is likely, however, that prairie dogs were present north of the sandhills and Lake Creek. Most of these soils were farmed prior to refuge establishment and were seeded to crested wheatgrass and smooth brome. These shallow-rooted introduced grasses are more prone to drought stress than native mixed-grass prairie. The resulting short vegetation allows for rapid expansion of black-tailed prairie dogs during droughts.

Eleven prairie dog towns totaling 502 acres are currently located within the refuge and are found primarily in the uplands north of Lake Creek (see the Draft Black-tailed Prairie Dog Management Plan in appendix E).

Reptiles and Amphibians

Formal and informal surveys and observations on the refuge have noted tiger salamanders, Woodhouse's toad, western chorus frog, leopard frog, bullfrog, and plains spadefoot toad. Turtles include common snapping turtle, western painted turtle, and box turtle. Four species of lizard have been observed: northern earless lizard, northern prairie lizard, many-lined skink, and the prairie racerunner. Snakes include the eastern yellow-bellied racer, western hognose snake, bull snake, plains garter snake, red-sided garter snake, and prairie rattlesnake.

Birds

Over 281 species of birds have been recorded at Lacreek NWR since 1959. The majority of passerines and other birds common to the plains states are found on the refuge at some time during the year. Twenty-four species of waterfowl are commonly observed. During spring and fall migrations, waterfowl numbers have peaked at 29,000 ducks and 37,000 geese in recent years. Refuge files indicate that as many as 80,000 ducks have staged on the refuge during migration. Approximately 150 to 200 trumpeter swans typically winter at Lacreek. The largest nesting colony of American white pelicans in South Dakota is found on the refuge. Nine species of cormorant, herons, egrets, bittern, and ibis use the refuge for migration and/or nesting. Secretive species such as American bitterns are commonly observed. Golden eagles, bald eagles, red-tailed hawks, Swainson's hawks, northern harrier, American kestrel, great horned owls, burrowing owls, and short-eared owls are some of the more common species of raptors seen on the refuge. Twenty-one species of shorebirds use the refuge from spring through fall, some staying to nest. Regionally rare species such as long-billed curlews and marbled godwits are commonly observed. A number of songbirds migrate through or nest on the refuge. Declining species, such as grasshopper sparrows, bobolinks, eastern meadowlarks, and dickcissels, are commonly observed in refuge grasslands.

Trumpeter Swans

Trumpeter swans were introduced on the refuge from Red Rock Lakes NWR between 1960 to 1962. These original birds established the High Plains Flock, which now nest primarily on sandhill lakes to the south of the refuge. An estimated 400 birds make up this flock, with as many as 268 returning to Lacreek NWR during the fall and winter. The trumpeter swans also rely heavily on spring-fed creeks in the sandhills for winter habitat. A portion of this flock migrates north to Greenwater Lake



© 2005 Laura Crawford Williams

Snapping Turtle



© 2005 Laura Crawford Williams

Red-headed Woodpecker

Provincial Park in Saskatchewan, Canada to nest and returns to Lacreek NWR to winter.

Lacreek NWR has not had a successful nesting attempt for over 5 years. Habitat has decreased, but with wetland management efforts, habitat is increased and there may be nesting in the future.

American White Pelicans

American white pelicans began nesting on two islands in Pool 9 shortly after construction. This nesting colony has become one of the largest in South Dakota. A nesting site relatively free from predators, little human disturbance, and abundant food resources both on the refuge and lakes and ponds within flying distance are believed to make this site attractive to nesting pelicans. Although nesting requirements were met previously, predators have become a problem in recent years

Fish

Fish species including northern pike, saugeye, large-mouth bass, black crappie, perch, bluegill, pumpkinseed, bullhead, carp and a variety of

minnows including the state threatened pearl dace and red-belly dace are all found in refuge waters. Rainbow trout are stocked in spring-fed ponds in the sandhills portion of the refuge. Great blue herons, American white pelicans, double-crested cormorants, American bitterns, and western, pied billed, eared, and horned grebes forage for fish in the refuge waters. Selected pools (Pools 3, 4, 7, 10, the trout ponds, and the LWRRA) are open to public fishing.

Threatened and Endangered Species

Table 2 from the South Dakota Natural Heritage Program documents federal and state listed endangered and threatened species found at Lacreek NWR.

Cultural Resources

Prehistoric Resources

Although the number of cultural resources investigations in and around Lacreek NWR have been few, a major discovery was made in 2000 of a large bison bone and stone artifact site located in Pool 8. The site was called the Sierra-Kai site. Mapped and recorded by Service archaeologists in August 2000 during a drawdown of the reservoir, over 1,500 bison bones and numerous stone artifacts were documented. It appears that

the site may have been used to process bison carcasses. A Late Plains period (1500 A.D. to 1800 A.D.) projectile point was recovered with other stone tools. The site covered nearly 20 acres and extended to the northeast. Other indications of prehistoric Native American activity within the boundaries of Lacreek NWR include stone artifact finds near Pool 9 by a Service archaeologist. These sites indicate the potential for other prehistoric sites, usually covered by the waters and vegetation of the reservoirs, to exist along the old creek bed and floodplain dammed in the 1930s to create the reservoirs. It is now known that the Sand Hills and the Badlands areas of Nebraska and South Dakota have evidence of various periods of Native American occupation, possibly going back several thousand years. It is also known from historic records, that the Lacreek NWR area was frequently visited by various tribes during the 18th and 19th centuries; including the Lakota, Cheyenne, Arapahoe and Pawnee, to name a few. Although no prehistoric sites have been determined eligible for nomination to the National Register of Historic Places, future discoveries may change that situation.

Historic Resources

The refuge's early twentieth century history is closely tied to the Civilian Conservation Corps (CCC) and Works Progress Administration (WPA). Young men enrolled in the CCC in the mid- to late 1930s completed much of the dike-construction and

Table 1. Habitat requirements for selected grassland birds

<i>Species</i>	<i>Vegetation Height (inches)</i>	<i>Litter (inches)</i>	<i>Patch Size (acres)</i>	<i>Distance from Trees (feet)</i>
Bobolink	10 to 18	1.3 to 3.6	100	150
Burrowing owl	Less than 5	Minimal	10	Greater than 328
Dickcissel	8 to 40	0.6	25	Prevent woody encroachment
Long-billed curlew	Less than 12	Minimal	104	Avoids areas with high density trees and shrubs
Grasshopper sparrow	8 to 24	Not available	20	164
Sharp-tailed grouse	6 to 16	Use areas that are idle for several years	150	Greater than 164
Short-eared owl	12 to 24	2-8 yrs. of residual cover	183	Not available
Upland sandpiper	1 to 24	1	250	328

Source: Grant 1965; Wiens 1973; Clark 1975; Duebbert and Lokemeon 1977; Redmond et al. 1981; Johnsgard 1983; Prose 1987; Renken 1987; Messmer 1990; Haug et al. 1993; Herkert et al. 1993; Pampush and Anthony 1993; Helzer 1996; Hughes 1996; Madden 1996; Connelly et al. 1998; Clayton and Shemutz 1999; Helzer and Jelinski 1999; Dugger and Dugger 2002; Laubhan et al. 2005.



© 2005 Laura Crawford Williams

Red-winged Blackbird

infrastructure work at the refuge. CCC Company #4723 started work at the refuge in spring 1937 and completed its work in fall 1939. The WPA worked at the refuge from 1937 to 1941. Young men working under the WPA planted thousands of trees and shrubs on the refuge. Both the CCC and WPA were involved in building trails, dikes and landscaping.

The refuge buildings were constructed in 1936 and included a service garage and office, small cabin residence, equipment shed, lookout tower, and barn. All these buildings are still present at the refuge except for the equipment shed. The service garage, barn, and lookout tower were determined to be eligible for the National Register of Historic Places (Register) in 1999, but none of these structures has been formally listed on the Register.

The WPA constructed a picnic shelter at LWRRA in 1940-1941. The original fabric of the picnic shelter has been rebuilt over the years and it was determined to be ineligible for the Register in 2000.

Special Management Areas

Wilderness Review

Lacreek NWR meets the size, scenic, and ecological value criteria for wilderness; however, the refuge has been modified by roads, fences, grazing, agriculture, and wetland drainage. These alternations prevent designation as a wilderness area. To be designated a wilderness area; lands must meet certain criteria as outlined in the Wilderness Act of 1964:

- Generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable;

- Has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and
- May also contain ecological, geological, or other features of scientific, educational, scenic or historical value.

Little White River Recreation Area

The LWRRA is a special management area on the refuge. The land was accepted as a donation in fee title under the Refuge Recreation Act. Historically, it has been a place that surrounding community members have used for recreational purposes. Within the deed, there are provisions for activities not normally found on a wildlife refuge. In this area of the refuge there are opportunities for recreational hunting, fishing, swimming, boating, and camping.

Visitor Services

The refuge offers a variety of recreational opportunities to local residents and other visitors centered on the wildlife resources. Opportunities on the refuge include wildlife-dependent and wildlife compatible uses legislated by Congress and outlined in the National Wildlife Refuge System Improvement Act of 1997. These uses include hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

The refuge is open to hunting for white-tailed and mule deer, ring-necked pheasant, and sharp-tailed grouse. A number of select pools are open for fishing throughout the year. The refuge is a popular destination for viewing migrations of waterfowl, shorebirds, and Neotropical birds. Popular wildlife watching opportunities on the refuge include trumpeter swans, American white pelicans, burrowing owls, and black-tailed prairie dogs. Interpretive displays and brochures are available at refuge headquarters. An auto tour route and nature trails provide opportunities for viewing and photographing wildlife. The LWRRA has facilities for boating, fishing, swimming, and camping.

Fishing

Fishing is permitted year-round on Pools 3, 4, 7, 10, trout ponds, and the LWRRA. Warm water species such as northern pike, channel catfish, and large mouth bass are the species most desired by anglers on the LWRRA. The trout ponds are spring-fed and remain cold enough to support rainbow trout. The refuge coordinates with the South Dakota

Department of Game, Fish and Parks to manage the recreational fishery; the state stocks game fish.

Hunting

A portion of the refuge is open to pheasant and sharp-tailed grouse hunting. The refuge also provides bow and muzzle loading hunting for deer. Special regulations apply to all hunting activities.

Environmental Education and Interpretation

Refuge staff provides educational talks and tours for schools and other groups upon request. Exhibits, educational videos, and informational brochures are available in the visitor center. Informational brochures and refuge maps are also available at two information kiosks located on the refuge.

Wildlife Observation

The refuge provides outstanding opportunities for viewing wildlife. The abundance and variety of wildlife species combined with relatively low visitation provides many opportunities to view wildlife close up. The refuge offers a 4-mile, self-guided auto tour loop, starting at the refuge headquarters and winding around several large wetlands. Waterfowl, shorebirds, wading birds, and raptors are common along the auto tour loop, as are deer, muskrats, and snapping and painted turtles. Trumpeter swans and large concentrations of ducks and geese begin to arrive in October. Numbers generally peak in November. From November through March, trumpeter swans are easily spotted from the auto tour route. Auto tour guides are available at the visitor center and provide interpretive information along the route.

The Bird Walk Trail (0.2 mile) originates at refuge headquarters and takes visitors around a wooded thicket. The Pelican Islands Trail (0.2 mile) provides visitors with a rare opportunity to view American white pelicans nesting on two islands. During late April and early May, visitors can see up to 1,500 pelican, double-crested cormorant, black crowned night herons, and great blue heron nests located on these islands. Black-tailed prairie dogs, and, at times, burrowing owls, are easily viewed in the large prairie dog towns north of the refuge.

Fire and Grazing History

Historically, grasslands in the northern Great Plains co-evolved with various disturbance regimes such as fire and large-scale grazing. Whether

lightning induced or deliberately set by Native Americans, fire has influenced the composition of the plant community at the refuge. A handful of fire-tolerant shrubs such as chokecherry, American plum, and leadplant were present, while other woody species killed by fire were restricted to areas that were protected from fire. The plant community was dominated by a number of species of grasses with many species of forbs dotting the landscape.

It is believed that the historical fire frequency for the mixed grass prairie was 5 to 7 years. Little information is available on the occurrence of wildfire during the early years of the refuge. More recently, the refuge has had up to three wildfires a year. 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 policy to control all wildfires occurring on the refuge.

Refuge staff now uses prescribed fire to simulate the historical influence wildfire had on the plant communities (see appendix F). Most prescribed fires are generally ignited during late winter through greenup in spring. This time of year presents opportunities to complete prescribed burns when temperatures are lower, humidity is higher, and the fire may be more easily controlled. This time frame also coincides with other refuge activities such as wetland management. Wetlands can be drawn down in late winter and prescribed burned, and then be re-flooded to provide spring migratory habitat. Historically, wildfires likely also would have occurred during the summer and fall. Prescribed fire was infrequently used as a management tool for most of the refuge's history. During the last 10 years, prescribed fire has been increasingly used, and refuge staff now completes five to ten prescribed burns each year, covering 1,500 to 3,000 acres.

Similar to fire, grazing greatly influences the structure and composition of grassland



Mule Deer

Tom Koerner/USFWS

communities. Herbivores such as bison, elk, deer, pronghorn, and black-tailed prairie dog interact with soils, plants, other animals, and other processes to produce unique successional patterns in the landscape at multiple scales.

Most plant species have developed 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, and some species have spines to cause injury to grazing animal's mouths.

Historically, Lake Creek and other springs on the refuge were some of the only local water sources available. It is likely that herds of bison spent a considerable amount of time here. Their grazing, trampling, trailing, and related activities likely had a significant impact on the development and maintenance of the plant communities.

Bison and elk are no longer present on the refuge. Instead, refuge staff works with local ranchers to mimic natural disturbances due to 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 warm season grasses and forbs. Wetland and wet meadow grazing may occur for much of the growing season to stress and physically injure aggressive wetland species such as cattails and favor species that provide more seed production, open habitats, and competition to Canada thistle.

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. Refuge staff has found that cattle will actively graze Canada thistle early in the growing season. Follow-up treatments also tend to be easier to complete and more effective after grazing.

Socioeconomics

Population and Demographics

The population in Bennett County grew 11.5 percent from 1990 to 2000. The population estimate for the county in 2004 was 3,522, a 1.5 percent decline from 2000 (U.S. Census Bureau 2005). Martin, the county seat, had a population of 1,106 in 2000.

Farming and livestock ranching are the main agricultural enterprises. About 96 percent of the county land is in farms or ranches. Major crops are winter wheat, alfalfa, hay, proso, sorghum millet, and sunflowers. During wet years, some dry land corn and soybeans are also planted. Movement of grain, livestock, and freight is by truck lines and farm-owned trucks; there is no rail line in the county.

The racial makeup of the county is 40.91 percent White, 0.28 percent African American; 52.07 percent Native American, 0.06 percent Asian, 0.14 percent Pacific Islander, 0.17 percent from other races and 6.38 percent from two or more races (www.en.wikipedia.org/southdakota).

Employment and Income

In 2001, Bennett county had 71 private non-farm employment establishments with paid employees, compared to a total of 24,032 in the state of South Dakota overall. Agriculture is the major employer in the county. A variety of businesses exist in Martin, including health services, education, retail sales, and support services. The median per capita income is \$10,106 (1999) compared with the state which was \$17,562. 39.2 percent of the population was living below the poverty line, compared with the state at 13.2 percent (U.S. Census Bureau QuickFacts 2002).

Air Quality

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



Tom Koerner/USFWS

Cottontail

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

4 Management Direction



4 Management Direction

Introduction

Management Summary

Through integrated restoration, the refuge will strive to restore ecological processes where appropriate and achieve habitat conditions that require reduced management over time. This will be accomplished while recognizing the role of the refuge in the overall landscape and community and the capabilities of refuge staff and resources to complete the proposed management actions during the next 15 years. An emphasis on monitoring the effects of habitat management practices and use of the research results to direct ongoing restoration will be a priority. Current levels of priority public uses and activities will increase (figure 6).

Refuge staff will continue to manage the WMD through monitoring and enforcement of easements.

Management Direction

The objectives and strategies below describe how management of the refuge will be carried out to meet the overall goals for the refuge.

Uplands Goal

Restore and enhance the mixed grass plant community to create a mosaic that reflects the habitat requirements for grassland birds of management concern.



American Avocet

© 2005 Laura Crawford Williams

In the uplands, greater than 20 percent of the habitats in each category (tall, medium, and short) will be restored. Less than 5 percent will be in native fire-tolerant shrubs.

Objectives:

Upland Objective A (tall): In 5 to 10 years, increase floristic quality assessment C score by greater than 10 percent in patches greater than or equal to 125 acres, with vegetation measuring greater than 16 inches in height, as measured during the nesting season (May to July 15) within these patches, and greater than 164 feet from trees greater than 10 feet in height.

Upland Objective B (medium): In 5 to 10 years, increase floristic quality assessment C score by greater than 10 percent in patches greater than or equal to 125 acres, with vegetation measuring between 6 to 16 inches in height, as measured during the nesting season (May to July 15) within these patches, and greater than 164 feet from trees greater than 10 feet in height.

Upland Objective C (short): In 5 to 10 years, increase floristic quality assessment C score by greater than 10 percent in patches greater than or equal to 247 acres, with vegetation measuring less than 6 inches in height, as measured during the nesting season (May to July 15) within these patches, and greater than 328 feet from trees greater than 10 feet in height.

Strategies:

1. Seed 100 to 300 acres/year of formerly cropped or exotic grass dominated uplands totaling 2,000 to 3,000 acres to more than 100 species of native grasses, sedges, and forbs.
2. Within designated grassland patches greater than or equal to 124 acres, remove trees greater than 16 feet in height and all non-native trees.
3. Interseed 100 to 300 acres/year of existing grasslands, totaling 1,500 to 3,000 acres, to more than 100 species of native grasses, sedges, and forbs.
4. Conduct 200 to 1,500 acres of prescribed burning in upland habitats each year to encourage/promote increased FQA C score and plant structure.
5. Conduct 200 to 1,500 acres of prescribed grazing in upland habitats each year to encourage/promote increased FQA C score and plant structure.

Table 2. Habitat requirements for selected grassland birds

<i>Species</i>	<i>Vegetation Height (inches)</i>	<i>Litter (inches)</i>	<i>Patch Size (acres)</i>	<i>Distance from Trees (feet)</i>
Bobolink	10 to 18	1.3 to 3.6	100	150
Burrowing owl	Less than 5	Minimal	10	Greater than 328
Dickcissel	8 to 40	0.6	25	Prevent woody encroachment
Long-billed curlew	Less than 12	Minimal	104	Avoids areas with high density trees and shrubs
Grasshopper sparrow	8 to 24	Not available	20	164
Sharp-tailed grouse	6 to 16	Use areas that are idle for several years	150	Greater than 164
Short-eared owl	12 to 24	2-8 yrs. of residual cover	183	Not available
Upland sandpiper	1 to 24	1	250	328

Source: Grant 1965; Wiens 1973; Clark 1975; Duebbert and Lokemeon 1977; Redmond et al. 1981; Johnsgard 1983; Prose 1987; Renken 1987; Messmer 1990; Haug et al. 1993; Herkert et al. 1993; Pampush and Anthony 1993; Helzer 1996; Hughes 1996; Madden 1996; Connelly et al. 1998; Clayton and Shcmutz 1999; Helzer and Jelinski 1999; Dugger and Dugger 2002; Laubhan et al. 2005.

6. Continue use of IPM strategies to reduce noxious weeds and other invasive species.

Rationale:

The decline of grassland nesting birds has been attributed to habitat loss and conversion, fragmentation, and the disruption of ecological factors such as fire and grazing that created a mosaic of habitat types across the landscape. As a result, many grassland bird species are now considered species of biological concern (Service 2002). Managing natural areas for these bird species involves providing the nesting habitat requirements and food resources essential for production and survival. These requirements include large, treeless patches that contain within them diversity in vegetation structure (Renken and Dinsmore 1987; Johnson and Temple 1990; Volkert 1992; Helzer and Jelinski 1999; DeJong 2001; Herkert et al. 2003; Davis 2004; Fritcher et al. 2004). Through fire, grazing, tree removal, and grassland restoration, habitat for many grassland nesting birds will be provided, but efforts will concentrate on managing for those birds that are of management concern.

Several federal, state, and private “birds of concern lists” were reviewed. These lists are created based on population status and habitat conditions for bird species in certain biological regions. Some birds, such as the long-billed curlew appear on as many as eight different lists. Species that are on many different lists are of the highest management concern and

those species that were confirmed to nest on the refuge were used as the focus for habitat objectives in the CCP. Once those birds were identified, a literature search was conducted to determine the specific habitat requirements for each species.

Requirements such as vegetation height, patch size, and distance from trees were used to create science-based objectives for the CCP (table 4). First, the nesting and foraging habitat requirements were identified and compared. Birds were grouped based on similar requirements. For example, dickcissels, short-eared owls, grasshopper sparrows, and bobolinks nest in patches with a grass/forb mix where vegetation is moderate to tall and where woody edges are at a minimum (Birkenholz 1972; Wiens 1973; Rotenberry and Wiens 1980; Ryan 1986; and Frawley 1989). A vegetation height somewhere in the middle of this range (8 to 30 inches) was assumed to suit the needs of all the birds in this group, and greater than 16 inches was chosen as identified in Objective A (tall). The next requirement that was examined was patch size. Again, a range of acres was determined. It was assumed that an acreage somewhere in the middle (125 acres) could accommodate the birds in the “tall” group, and be provided on the refuge through management actions. The final requirement identified was distance from trees. Trees on a grassland landscape can affect grassland obligates by fragmenting habitat and providing roost sites for avian predators. Trees also create corridors for mammalian predators such as skunks and raccoons (Bakker 2003). In the upland objectives, it was

assumed that anything greater than 10 feet was a tree and anything above this height will provide places for grassland bird predators.

Upland Objective B was developed just as A, using sharp-tailed grouse determine specifics (i.e., vegetation heights, number of acres, and distance from trees). Sharp-tailed grouse nesting requirements include large grassland patches where native grasses and forbs are dominant, of short to moderate heights, and far from trees (Johnsgard 1983; Gregg 1987; Prose 1987; Hanowski et al. 2000). As food and cover are reduced in open habitats throughout the summer, woody vegetation becomes increasingly important because it provides cover and high-energy food resources such as berries (Johnsgard 1983; Prose 1987; Connelly et al. 1998). This is an important consideration for managing sharp-tailed grouse that winter on the refuge.

Finally, species such as long-billed curlew, burrowing owl, and upland sandpiper were used to develop Objective C. These birds require short grass/forb mix (less than 6 inches) patches free from woody vegetation and adjacent to grasslands with moderate vegetation heights for foraging (Redmond and Jenni 1986; Pampush and Anthony 1993; Benedict et al. 1996; Thompson and Anderson 1988; Dechant et al. 1999b; Clayton and Schmutz 1999; Herkert et al. 1993; Bowen and Kruse 1993). However, in this objective, the greatest acreage requirement (247 acres) and distance from trees (382 feet) was chosen based on the habitat needs of the upland sandpiper. The largest figures were chosen because it was assumed these quantities (acres and feet) could be easily achieved through grazing and prescribed fire.

Methods:

To determine whether management actions are providing a diverse native plant community on the refuge, staff will use Floristic Quality Assessment (FQA) methodology to determine plant species diversity and integrity. FQA was developed by Swink and Wilhelm (1979, 1994) to measure the floristic quality of a natural area. It has been used to determine the effectiveness of restoration efforts, monitor natural areas, and determine the floristic intactness of an area in Wisconsin, Illinois, and the Dakotas (Taft et al 1997; USGS 2001; Bernthal 2003). Aspects such as tolerance of a plant species to disturbance and fidelity to specific habitat integrity are used to assign each native plant a coefficient of conservatism (C). The coefficient for each species is determined by its conservatism relative to other species in the area.

Once an area has been surveyed, a mean C value is calculated and the higher C value the higher the quality of a natural area (C = 0 to 10). Given the assumption that the floristic quality of an area



© 2005 Laura Crawford Williams

Burrowing Owls

is correlated to species diversity (Wilhelm and Ladd 1988), it can be said that a high C score is directly related to high native plant diversity. Thus an area with a high C score should also provide the diversity in vegetation structure needed by grassland nesting birds, provided the patches are large enough. That is when sites are compared to those with relatively higher C scores will display a greater diversity in plant structure than a corresponding area with low C scores. To test this assumption, measures of vegetation structure will be taken during the FQA. By talking to scientists who have used the FQA method in the Northern Great Plains and Midwest, it was determined that an increase of greater than 10 percent within a 5- to 10-year period was feasible with persistent grassland restoration efforts on the refuge.

Increasing native plant species diversity in formerly cropped areas or in degraded grasslands has received significant attention, particularly in the tallgrass prairie portions of the Great Plains (Steinauer et al. 2003). Wide varieties of techniques have been used to harvest and process seed, prepare a seedbed, complete the seeding, and manage the seeding. Similar techniques can be adapted for use in the mixed-grass prairie and utilized for high diversity seeding and management at the refuge. Local seed sources will be utilized to collect over 100 species of native grasses, forbs, and sedges to include in these high diversity seedings. Follow-up management of prescribed burning, grazing, mowing, and haying will be used to help the Service achieve goals and objectives.

Sandhills Goal

Preserve and maintain the ecological integrity of indigenous flora and fauna of the sandhills portion of the refuge.

Objectives:

Sandhills Objective A: Maintain the composition of the sandhills in greater than 90 percent native grasses and forbs to meet the needs of

the lark sparrow and sharp-tailed grouse. Plant composition will consist of approximately 60 to 90 percent grasses (i.e., blue and hairy grama grass, sand lovegrass, needle and thread, little and big bluestem, prairie sandreed, Junegrass, sand bluestem, switchgrass, and Indian grass), 5 to 15 percent forbs/woody vegetation (*Puccoon* spp., *Penstemon* spp., sand cherry, yucca, prickly poppy, and *Liatris* spp.) and 5 to 10 percent bare ground.

Sandhills Objective B: Eradicate invasive plant species, such as leafy spurge, from the sandhills within 15 years.

Strategies:

1. Conduct annual monitoring to detect invasive species.
2. Utilize IPM techniques (i.e., biological, mechanical, chemical, and cultural techniques).
3. Conduct annual vegetation monitoring to determine if objectives are being met.
4. Investigate potential for introduction of blowout penstemon (*Penstemon haydenii*).

Rationale:

The sandhills prairie is distinctive because of the particular combination of plant communities found there. Typical short-, mixed-, and tall-grass species are all located in the sandhills because differences in topography and available moisture create conditions that allow each to persist (Kaul 1990). Plant species that have a marked ability to conserve water often occur on dune tops where surface water and organic matter is limited. While cool-season grasses and plants that use water less efficiently tend to be located in the interdunal valleys. Pool (1914) recognized six communities in the sandhills: four upland communities and a wet meadow and marsh community. All these communities are found within the sandhills portion of the refuge, and each will be used to define the ecological integrity of indigenous flora and fauna to be maintained on the refuge.

The Bunchgrass Community: Plant species in this community consist of little bluestem, junegrass, needle and thread, prairie sandreed, and switchgrass, blue grama, lovegrass, and ricegrass, sages, milkweeds, penstemon, puccoon, cactus, aster, and pea plant. Some low shrubs such as sand cherry and wild rose also occur.

Sand Muhly Community: The species of this community are characteristic of places with dry and unstable slopes that are undergoing succession following disturbances such as fire and blowouts. Common species are sand muhly, sand bluestem, needle-and-thread, prairie sandreed, hairy grama, puccoon, and yucca.

The Blowout Community: Few plants occur in this community because of aridity and instability of the sand. Species include blowout grass, prairie sandreed, sand muhly, ricegrass, sand lovegrass, and lemon scurf-pea. Blowout penstemon, although not on the refuge, is found in this community type.

The Meadow Community: Sandhill meadows occur in level areas between dunes where water is readily available. Grass species commonly found here are slender and western wheatgrass, needle and thread grass, porcupine grass, switchgrass, Indiangrass, and junegrass.

Woody Vegetation: Trees and shrubs are abundant near permanent water and areas on the sides and bottoms of north-facing slopes (Schmidt 1986). Species include plains cottonwood, green ash, cedar, wild plum, chokecherry, buffaloberry, and dogwood and provide habitat for lark sparrow, Bell's vireo, and sharp-tailed grouse.

Lark sparrow and sharp-tailed grouse habitat requirements were identified and used to develop Sandhills Objective A. The lark sparrow appears on two North American Bird Conservation Initiative lists for region 19 (breeding and wintering) and is found on Lacreek NWR. Finkbeiner and Johnson (2002) found it exclusively occurred in the sandhills portion of the refuge, perhaps due to the open areas interspersed with native grass, forbs, and yucca. Lark sparrows are found in areas with a mix of native grass, forbs, small trees and shrubs, and bare ground (Bock and Webb 1984; Howe et al. 1985; Fannes and Lingle 1995; Martin and Parrish 2000; Lusk et al. 2003). Lusk et al. (2003) recommended management that focused on creating abundant structural cover with moderate levels of litter accumulation and bare ground. There was more variation in structural cover among successful nests than unsuccessful ones, and successful nests had nearly twice as much litter cover. Additionally, nests placed near structural cover may provide thermal cover and protection from predation (Lusk et al. 2003).

As mentioned previously, grassland habitats are essential breeding areas for sharp-tailed grouse, and woody areas are equally important for overwinter survival. The refuge is an important breeding and wintering area in Bennett County. By maintaining the integrity of the sandhills, these habitat requirements will be provided in order to sustain the population that occurs on the refuge.

There are 2 to 3 acres of leafy spurge in the sandhills portion of the refuge. Leafy spurge is sprayed each year and new patches are monitored and mapped when detected. Leafy spurge has been sprayed for three consecutive years beginning in 2002; the number of acres infested remains constant. Leafy spurge is perhaps the greatest threat to habitat in the sandhills. It

has demonstrated an ability to invade native grasslands in portions of the Great Plains and significantly degrade wildlife habitat.

Wet Meadows Goal

Restore and enhance the wet meadow plant community using a diversity of native species to create a habitat mosaic that meets the requirements for birds of management concern dependent on the wet meadow community. As part of the plant community, native fire-tolerant shrubs, such as indigo bush, dogwood, and native willow, will be allowed to persist.

In wet meadow habitats, more than 20 percent of the habitats in each category (tall, medium, and short) will be restored. Between 0 and 10 percent will be in the riparian shrub community.



Sandhill Crane

© 2005 Laura Crawford Williams

Objectives

Wet Meadow Objective A (tall): In 5 to 10 years, increase floristic quality assessment C score by greater than 10 percent in patches greater than 25 acres with vegetation measuring greater than 24 inches in height, as measured during the nesting season (May to July 15).

Wet Meadow Objective B (medium): In 5 to 10 years, increase floristic quality assessment C score by greater than 10 percent in patches greater than 25 acres with vegetation measuring from 12 to 24 inches in height, as measured during the nesting season (May to July 15).

Wet Meadow Objective C (short): In 5 to 10 years, increase floristic quality assessment C score by greater than 10 percent in patches greater than 25 acres with vegetation measuring less than 12 inches in height, as measured during the nesting season (May to July 15).

Wet Meadow Objective D (shrubby component): Maintain 0 to 10 percent of wet meadow habitat dominated (canopy cover greater than 75 percent) by native shrubs.

Wet Meadow Objective E: Investigate techniques and complete a feasibility study by 2009 for restoration of the hydrology of Lake Creek.

Strategies:

1. By 2016, interseed 30 to 150 acres annually, totaling 300 to 1,500 acres of wet meadow that has been historically sprayed with herbicides.
2. Conduct 200 to 1,500 acres of prescribed burning in wet meadow habitats each year to encourage/promote increased FQA C scores and plant structure.
3. Conduct 200 to 1,500 acres of prescribed grazing in wet meadow habitats each year to encourage/promote increased FQA C scores and plant structure.
4. Utilize prescribed burning and prescribed grazing on an adaptive management basis.
5. Utilize IPM to achieve acceptable levels of control for noxious weeds.
6. Encourage beaver dam construction in areas with no management conflict.

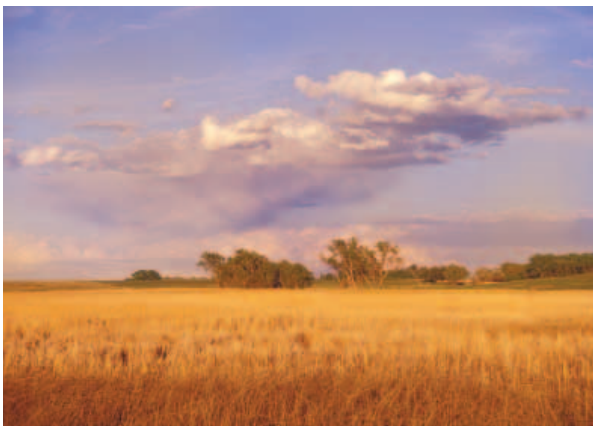
Rationale:

Wet meadows are characterized by ecotones between emergent wetland and perennial uplands. The soils are moist to saturated with standing water present for only brief to moderate periods during the growing season. Vegetation includes a wide variety of herbaceous species, from sedges and rushes to forbs and grasses. Woody vegetation, if present, accounts for less than 10 percent of the total area covered. Wet meadow habitat on the refuge occurs at the perimeter of wetland areas, along riparian corridors, and at springs emerging from the sandhills. Vegetation includes prairie cordgrass, Canada bluejoint, switchgrass, foxtail barley, barnyard grass, wooly sedge, slough sedge, Nebraska sedge, golden doc, mint, golden rod, Nuttall's sunflower, wild licorice, spike rush, Baltic rush, blue vervain, stinging nettle, sandbar willow, red-osier dogwood, and false indigo.

This habitat type provides nesting and foraging requirements for marshbirds, raptors (e.g., harriers and short-eared owls), some shorebirds, and passerines. Virginia rail, sora, and American bittern are common in wetlands where the soils are moist to shallow, the vegetation is dense and tall (24 to 51 inches) with very little (5 percent to 30 percent) open water habitat. These marsh birds prefer areas

with a high diversity of wetland vegetation such as cattail, bulrush, cordgrass, and wildrice.

Wet meadows provide nesting and foraging requirements for marshbirds, raptors (e.g., harriers and short-eared owls), some shorebirds, and passerines. The objectives for this habitat type were developed in much the same way the upland objectives were: by creating a list of birds that was used to focus management; identifying specific numbers for vegetation height, patch sizes, and the role of trees based on scientific literature; grouping birds with similar habitat requirements; and then determining what number would accommodate all birds in the group. These specific acres and heights were then incorporated into Objectives A through D. For Objective A, Virginia rail, sora,



© 2005 Laura Crawford Williams

Meadow

and American bittern were grouped into the “tall” category. These birds are common in wetlands where the soils are moist to shallow, the vegetation is dense and tall (24 to 51 inches) with very little (5 percent to 30 percent) open water habitat. These marsh birds prefer areas with a high diversity of wetland vegetation such as cattail, bulrush, cordgrass, and wildrice.

To develop Objective B, northern harriers and short-eared owls were used to determine the appropriate vegetation heights and number of acres. These raptors are often associated with wet meadow areas because they require large tracts (greater than 247 acres) of tall, dense vegetation adjacent to upland areas interspersed with stands of shrubs. These areas should be idle for 2 to 5 years to allow the accumulation of litter and the persistence of small shrubby species such as snowberry, a key species associated with harrier nesting locations (Duebbert and Lokemoen 1977; Kantrud and Higgins 1992; Murphy 1993).

Objective C was developed by looking at the habitat requirements for a group of shorebirds. Grazed and burned areas adjacent to wetlands can provide the habitat requirements of shorebirds

such as long-billed curlew, Wilson’s phalarope, and marbled godwit. These species utilize shorter (less than 12 inches) grassland areas adjacent to seasonal, semi-permanent wetlands that contain native vegetation such as green needlegrass, western wheatgrass, and inland saltgrass (Dechant et al. 2000, 2001, 2003; Duggar and Duggar 2002).

Finally, Objective D was determined by examining the needs of two species that require riparian corridors and woody draws: Bell’s vireo and willow flycatcher. Bell’s vireo declined at a rate of 2.4 percent between 1966 and 1987 and is currently listed on the U.S. Fish and Wildlife Service Birds of Conservation Concern list, the North American Bird Conservation Initiative list for regions 17 and 19, and on the National Audubon Society Watch List. Bell’s vireo nests in relatively open, low, dense, shrubby habitats throughout its range (Overmire 1963; Brown 1993; Martin 1996; Swanson 1999). Wild plum thickets were found to be especially important nesting areas in western South Dakota. Martin (1996) found that 77 percent of all nests occurred in these areas. The remaining nests were located in buckbrush, dogwood, and chokecherry bushes. Willow flycatcher is on the National Audubon Society Watch List and is a bird strongly associated with the presence and abundance of willow throughout its range (Taylor 1986; Sedwick and Knopf 1992; and Sanders and Edge 1998).

Developed Wetlands Goal

In managed wetlands, mimic natural wet/dry cycle with an emphasis on seed production, submerged aquatic vegetation, and invertebrate production.

Definitions:

For the purposes of this goal and associated objectives, the definitions below for water regimes from Cowardin et al (1998) were modified within the context of the refuge’s managed wetlands. Natural basins fluctuate due to groundwater levels and surface runoff. Water levels within managed wetlands can generally be manipulated, with some management constraints.

Semi-permanently flooded. Surface water persists throughout the growing season in most years.

Seasonally flooded. Surface water is present for extended periods, especially early in the growing season. Surface water may again be present after the growing season in the fall and winter. When surface water is absent, the water table is often near the surface.

Temporarily flooded. Surface water is present for brief periods during the growing season. Plants that grow both in uplands and wetlands are characteristic of the temporarily flooded regime.

Objectives:

Developed Wetland Objective A (temporary water regime): From 2006-2021, manage 25 to 50 percent of managed wetland acres with a temporary water regime; greater than 50 percent of the unit area will be dominated by desirable plant species (see appendix G).

Developed Wetland Objective B (seasonal water regime): From 2006-2021, manage 25 to 50 percent of managed wetland acres with a seasonal water regime; greater than 50 percent of the unit area will be dominated by desirable plant species (see appendix G).

Developed Wetland Objective C (semi-permanent regime): From 2006-2021, manage 25 to 50 percent of managed wetland acres with a semi permanent water regime; greater than 50 percent of the unit area will be dominated by desirable plant species (see appendix G).

Strategies:

1. Surface water will be diverted to or released from managed wetland units to provide the mix of temporary, seasonal, and semi-permanent water regimes outlined in objectives.
2. Conduct 200 to 1,500 acres of prescribed burning in developed wetlands to reduce plant litter depths, encourage germination and growth of desirable species, and improve effectiveness of grazing and IPM in this habitat.
3. Conduct 200 to 1,500 acres of prescribed grazing in developed wetlands each year to reduce plant litter depths, encourage germination and growth of desirable plant species, injure aggressive perennial wetland plant root systems, and create openings in wetland vegetation.
4. Utilize IPM to achieve acceptable levels of control for noxious weeds.

Rationale:

Wetland birds are a diverse group of species that can have broadly contrasting habitat requirements. Species such as trumpeter swan, American coot, and American white pelican use deeper (31 to 144 inches) semi-permanent water to meet their natural history requirements. Canada geese and redheads can utilize deeper water as well, but often obtain food resources in shallower (1 to 12 inches) more seasonal water. Seasonal wetlands are essential for dabbling ducks such as blue-winged teal, mallards, and northern pintails because these wetlands provide optimum foraging depth for these species and typically produce more abundant seed and aquatic invertebrate resources (Frederickson and Reid 1988). Seasonal wetlands often contain proportionately more waterfowl pairs than other

wetland classes (Ruwaldt et al 1979). Finally, Wilson's phalarope, godwit, willet, and long-billed curlew use mostly seasonal or temporary wetlands that measure 1 to 7 inches deep.

On the refuge, requirements of all these birds can be met by managing for different water regimes in the various units. Semi-permanent, seasonal, and temporary wetland habitats can all be provided on the refuge through the manipulation of water levels. Water control structures (WCS) allow staff to mimic the wet-dry cycle of the Plains. The manipulation of water levels to mimic wet/dry hydrologic cycles is one tool used by wetland managers to influence vegetative productivity, composition, and structure (Kadlec 1962; Frederickson and Taylor 1982). The continuance of static water levels can create anaerobic conditions that limit decomposition and nutrient cycling (Brinson et al. 1981). High, static water levels can also adversely influence the growth of Submergent Aquatic Vegetation (SAV) by limiting light penetration and allowing water temperatures to remain cool. Proper water level manipulations can create hemi-marsh habitats that can provide open water areas that may contain SAV and shallow areas that may provide emergent food resources and cover for many wetland-dependent species (Weller and Frederickson 1974; Murkin et al. 1997).

Refuge staff have utilized water level manipulations to increase wetland plant diversity and nutrient cycling, and promote the growth of SAV. Wetlands that were once dominated by cattail and bulrush in emergent zones, are now interspersed with species such as arrowhead, beggarticks, and wild rice (*Zizania aquatica*). Arrowhead is carbohydrate-rich and especially important to swans in the winter and spring. Beggarticks contains high amounts of protein (Paullin 1973; Squires 1991; Eaggars and Reed 1997). Additionally, the establishment of species such as waterweed and sago pondweed has occurred in open water areas after drawdowns, both important food resources for trumpeter swans (Shea 1979; Hughlett et al. 1984; Mitchell 1994).

A secondary effect of increasing wetland plant diversity is the assemblage of invertebrates (Frederickson and Reid 1988). Invertebrate groupings are often influenced by the species of wetland vegetation present. For instance, the structure of macrophytes present can influence the species and number of invertebrates available, because a plant species that is more complex has more surface area available for invertebrates than a species that has a simple leaf structure such as wild celery (Frederickson and Reid 1988). This is important because invertebrates are crucial for providing protein needed for egg, muscle, and feather development, and having high densities and diversity of invertebrates can provide for many types of waterbirds.

Water level manipulations are believed to have added benefits of controlling rough fish populations and snapping turtles. Rough fish, primarily carp, can thrive under static high water management. The carp attain population levels great enough to remove most desirable emergent and submerged aquatic vegetation and significantly increase turbidity levels. This factor can severely limit food resources for wetland-dependent migratory birds. Snapping turtles also thrive in similar environments. The stable water levels, especially during overwinter periods, can increase survival of snapping turtles. These long-lived predators can reach unusually high population numbers under these conditions, and may have a significant impact on brood survival for trumpeter swans, Canada geese, ducks, and other waterbirds. Varying water levels may kill snapping turtles overwintering in bottom sediments.

Prairie Dogs Goal

Maintain a viable population of black-tailed prairie dogs within the boundary of the refuge.

Objectives:

Prairie Dog Objective A: Support a minimum of 300 acres of occupied black-tailed prairie dog towns within the biologically and socially compatible zone identified in appendix E, over the next 15 years.

Strategies:

1. Fully implement an approved refuge black-tailed prairie dog management plan.
2. Within the socially incompatible zone, control will be considered for use as part of mixed grass prairie restoration efforts.
3. Within the biological/social compatible zone, prairie restoration will utilize herbicide, interseeding, burning, grazing, and other habitat restoration techniques.
4. Conduct grazing, mowing and prescribed burning activities adjacent to black-tailed prairie dog towns in socially compatible zones when the occupied area falls below 300 acres.
5. Work cooperatively with Bennett County Weed Board and the state of South Dakota on management of black-tailed prairie dogs on the refuge.
6. If black-tailed prairie dogs are extirpated within the boundaries of the refuge, and do not re-establish passively within 3 years, planning for translocation will be initiated.
7. Establish buffer zones for prairie dog towns that are located along the exterior boundaries of the refuge adjacent to private range and hay land

or private residences. Coordinate with adjacent landowners on control efforts.

Rationale:

Black-tailed prairie dogs are an integral part of the wildlife community and it is appropriate to maintain a viable population on the refuge. Many wildlife species associate with or depend upon prairie dogs during some portion of their life cycle. Over 167 vertebrate species have been documented using prairie dog towns (Campbell and Clark 1981; Clarke et al. 1982; Knowles 1994; Reading et al. 1989; Sharps and Uresk 1991). Some species feed on prairie dogs, but others utilize the burrow systems or the unique habitat to fulfill their needs. Vacant burrows are used by cottontail rabbits, several species of small rodents, tiger salamanders, prairie rattlesnakes, bull snakes, and by burrowing owls. Most active towns on the refuge have had successful nesting by burrowing owls. As the size and number of prairie dog towns have increased, so has the documented sightings of burrowing owls on the refuge. Many other passerine species, such as meadowlark, grasshopper sparrow, lark bunting, McCown's longspur, and horned lark, prefer the sparsely vegetated habitat created on prairie dog towns due to the greater visibility of seeds and insects (Agnew et al. 1986). In addition to their importance to other wildlife species, prairie dogs provide an opportunity for wildlife observers and photographers. Management should focus on maintaining a large enough acreage to maintain prairie dogs and associated species while still allowing for prairie restoration and other grassland management objectives.

During the CCP scoping process, management of prairie dogs on the refuge received considerable attention. Neighboring landowners and local government such as the Bennett County Weed and Pest Board and the Bennett County Conservation District were concerned that towns established along the refuge boundary were causing prairie dogs to spread onto adjacent private lands, where they are undesirable. Control of prairie dogs on private land is difficult as these areas are quickly re-colonized from refuge lands.

A second issue concerning prairie dog management relates to prairie restoration efforts. Large expanses of exotic grasses and other invasive species occur in the refuge's uplands. A large seed bank of these undesirable species exists and must be removed with tillage and herbicides. Rapid expansion and dispersal of prairie dogs have been noted after discing or herbicide applications for noxious weed control. Prairie dogs also expand into newly seeded fields and repeated prescribed burning and mowing may be needed to aid in establishment of prairie species. The ability to manage prairie dogs on the refuge is needed to aid with an aggressive prairie restoration effort.



Prairie Dog

A refuge-specific prairie dog management plan has been approved that designates a portion of the refuge in which prairie dogs will be allowed to expand and contract without direct control efforts. A large portion of the refuge is considered to be unsuited to prairie dog occupation based on soils and hydrology. The remainder of the refuge will provide for a buffer adjacent to private hay and rangeland or residences and control will be authorized in these areas. Prairie dogs also may be controlled to facilitate grassland restoration efforts.

Trumpeter Swan Goal

Contribute to a long-term viable population of wild, free ranging trumpeter swans in the High Plains Flock, as outlined in the High Plains Flock Management Plan (Central Flyway Swan subcommittee).

Objectives:

Trumpeter Swan Objective A: From October to March, when less than 10 percent of wetland habitat remains open, and greater than 25 swans concentrate on the trout ponds, restrict access by the visiting public and staff within 164 feet of trout ponds.

Trumpeter Swan Objective B: From April through September, restrict access by the visiting public and staff within 820 feet of occupied trumpeter swan nesting territories.

Trumpeter Swan Objective C: Investigate lead concentrations on refuge wetlands occupied by swans by 2009. Eliminate known lead contributors (i.e., fishing sinkers) by 2009.

Trumpeter Swan Objective D: Continue to monitor the High Plains Flock by conducting population surveys in the fall and summarize results in an annual report for public review.

Trumpeter Swan Objective E: Complete new management plan for High Plains Flock coordinated through the Central Flyway by 2006.

Strategies:

1. Implement regulations restricting use of lead sinkers for fishing on the refuge.
2. Educate public about impacts of lead on swans and waterfowl through the use of signs, brochures, and other outreach activities.
3. Monitor swan behavior starting in March 2006, and every March through the life of the plan to determine possible nesting territories.
4. Attend Central Flyway Committee and Trumpeter Swan Society Meetings to disperse information, maintain network, and coordinate on management of this flock.
5. Conduct annual fall survey and coordinate with Nebraska Game and Parks Commission on publication of results.
6. Pursue research with partners to identify lead concentrations, inventory wintering habitats, or other research topics needed for management of this flock.

Rationale:

Trumpeter swans are sensitive to disturbance. This can cause nest abandonment, movement from foraging areas, and ultimately result in poor body condition and lowered reproductive success (Holton 1982; Lockman et al. 1987; Henson and Grant 1991). However, the types of disturbance do affect the reaction of the birds. Henson and Grant (1991) found that aircraft and passing road traffic alerted birds but did not cause females to leave the nest. Additionally, the study found that swans are sensitive to noise and the visible presence of stopped vehicles, pedestrians, and researchers. The study recommended posting wetlands where swans nest to limit disturbance and restrict the use of airboats by staff during nesting periods.

Limiting disturbance of winter foraging areas is also important. Activities disrupting foraging or causing excessive energy use may cause fatality or loss of reproductive potential because the female prelaying nutrition is lowered (Gale et al. 1987; Mitchell 1994). Approximately 100 to 200 swans winter on the refuge, and limiting disturbance at key foraging areas where swans concentrate might increase the probability of survival and reproduction. Trumpeter swans will concentrate at the trout ponds when temperatures are extremely cold for an extended period. This area may be disturbed by the public and access should be restricted during these periods. The loop trail that crosses the dam of trout pond #2 and a buffer of

approximately 164 feet around these ponds will be signed as closed to the public during these periods. The trail leading onto private land to the south will remain open. Conflicts with fishermen will be negligible at this time as ice around the shore prevents fishing at this time.

Swans are particularly susceptible to lead poisoning which may affect swans as young as three weeks old (Mitchell 1994). Lead deposits in the High Plains are generally thought to be the result of shot and fishing sinkers. According to a study done by Pelizza (2001), elevated levels of lead were found in 50 percent of all swans tested from the refuge. Additionally, 12 swans died on the refuge as a result of lead poisoning from 1979 to 1994. Although lead has been found in swans that use the refuge, the source of the lead is unknown. Lead shot had been banned for waterfowl hunting, but there may be residual lead in the environment. Hunting clubs from Nebraska frequently hunted the Lacreek area in the early 1900s and it was noted as favorite hunting spot (Farrar 1994). More research is needed to determine how much lead is in the environment at the refuge, so that it may be removed. Also, use of lead sinkers for fishing must be eliminated in order to keep the area from being further contaminated.

American White Pelicans Goal

Maintain and protect the nesting colony on two islands in Pool 9 over the long term.

Objectives:

American White Pelican Objective A: Minimize disturbance from April 15 to August 15 within 1,312 to 2,625 feet of both islands. Critical period for young is hatching to day 16 (late May to early June).

American White Pelican Objective B: By March 20 each year, reduce 80 percent of herbaceous vegetation on both islands to 4 inches or less.

Strategies:

1. Prescribed burn or mow the vegetation on the islands by March 1.
2. Use all effective, legal, and the most humane control for predators on and adjacent to islands from May 15 to July 30 each year. Increase efforts when Pool 9 water levels are drawn down.
3. Implement a limited coyote hunt on Pool 9 during late winter period.
4. Keep trail and overlook a minimum of 1,312 feet from islands.
5. Reduce disturbance from April 15 to August 15 by suspending the use of the refuge airboat near islands.
6. Conduct drawdowns only once every 3 to 5 years.

Rationale:

American white pelicans are most sensitive to disturbance during courtship to brooding periods (Jonhson and Sloan 1976; Bunnell et al. 1981; Doran et al. 2004; Knopf 2004). Interference of the colony by humans and predators during this time can cause displacement of birds, abandonment of nests, trampling of eggs and young, and exposure of young to temperature stress and mammal and avian predators (Johnson and Sloan 1976; Bunnell et al 1981; Doran et al. 2004; Knopf 2004). Young are extremely vulnerable from hatching to day 16 because they have the inability to thermoregulate (Abraham and Evans 1999). Brooding by adults up until this time helps young maintain temperatures and reduces the chances of mortality due to exposure. To increase the probability of successful production, Doran et al. (2004) recommended a 1,312 to 2,625 feet buffer zone around the nesting island that is free from disturbance from March to August. After the brooding period has ended, adults will leave the colony for extended foraging



Tom Koerner/USFWS

Trumpeter Swans

trips as far as 75 miles away from nesting island (Findholt and Anderson 1995). The absence of adults for extended periods makes young vulnerable to mammalian predators, especially coyotes, and avian predators until they have fledged in August (Bunnell et al. 1981; Knopf 2004).

Pelicans are colonial nesters that nest on islands in freshwater lakes and rivers (Doran et al. 2004) and prefer non-vegetated islands with a sand or soil surface on at least part of the island (Stepney 1986; Knopf 2004). Two nesting islands are on the refuge: both with trees. Nesting once occurred on both islands; however, in recent years only the north island has been used. It may be that the pelicans are no longer using the south island because the vegetation has grown above the desired height. In spring 2005, the south island was burned to reduce vegetation height with the intention of promoting nesting. Although no nesting occurred on the island, pelicans once again made use of the island as a loafing area soon after their arrival.

The loss of all young and dispersal of most adults that occurred in 2005 is believed to have been a result of predation and disturbance by coyotes. It appears that coyotes swim to the islands to feed on the eggs and young. Visitors have reported seeing coyotes on the island or swimming to and from it. Tracks, young with bite marks on the neck, and broken egg shells also have been noted. If this disturbance is allowed to continue, total abandonment of the site for nesting is likely. Control measures will be implemented to prevent this from occurring and to eliminate the predation and disturbance by coyotes.

Finally, water level fluctuations may be associated with reproductive output. During years when water levels are lower, access to nesting colonies by mammalian predators increases, and this disturbance may cause the loss of young and abandonment of nesting colonies by adults. If abandonment occurs early in the growing season, vegetation may quickly overtake the area making it less attractive to nesting in subsequent years. Alternatively, the newly exposed surface can create additional nesting habitat and lower water levels can concentrate prey resources (Knopf 2004). A periodic drop in water levels is not thought to affect the long-term reproductive output of the species (Evans 1972; Knopf 1976; Doran et al. 2004). A return to higher water levels in ensuing years restores breeding habitat by keeping islands free of vegetation and reducing access to mammalian predators; thus, pelicans generally recolonize the areas. However, annual drawdowns repeatedly allow mammalian predator's access to nesting colonies and this disturbance may cause permanent abandonment of nesting sites.

Threatened and Endangered Species Goal

Protect, where appropriate restore, and manage habitats to support all threatened or endangered species that may occur on the refuge.

Objectives:

Threatened and Endangered Species Objective A:

Continue to evaluate the effects of all refuge management activities that may impact threatened or endangered species likely to occur on the refuge. When appropriate, conduct Section 7 Intra-service consultation with Ecological Services.

Threatened and Endangered Species Objective B:

Within 10 years of approval of this CCP, complete transplanting a minimum of 300 blowout penstemon in one blowout on the refuge.

Strategies:

1. Conduct intra-service consultation with South Dakota/Nebraska Ecological Services.
2. Consult with state of South Dakota on transplanting.
3. Pursue grant funding coordinated with the University of Nebraska to secure transplants.
4. Communicate with neighbors about transplants.

Rationale:

The blowout penstemon is a federally listed endangered species found only in the Nebraska Sandhills. Extensive surveys were conducted in the sandhills of South Dakota to document this species; however, it was never detected (Stubbendieck, pers. comm. 2005). Consultations with Dr. Jim Stubbendieck of the University of Nebraska-Lincoln indicate that suitable habitat is available in limited quantities on the refuge. Any additional populations established outside of the existing populations in Nebraska will benefit the long-term survival of this species.

Past efforts in the Nebraska Sandhills have included both seeding and transplanting plants grown from seed into active blowouts. The seeding efforts have had limited success while the transplants have fared much better. Based on past efforts, starting a site with transplants and then supplementing the site for several years with additional transplants is the best strategy. This increases the odds that this relatively short-lived perennial has at least one favorable year to produce seed in order to sustain itself over the long term. Due to the limited availability of transplants, perpetually protected sites, such as the refuge, are the first candidates for transplants.

Coordination with the state of South Dakota will be pursued prior to moving a federally listed species across state lines. Listed plant species are not protected on private land under the ESA; therefore, in the unlikely event that this species becomes established on private lands due to the transplanting on the refuge, neighboring landowners will not be affected. They will continue to be able to conduct weed control, grazing, haying, seeding, and all other activities that may occur in or adjacent to a blowout.

Predator Management Goal

Conduct predator management activities in developed wetlands and Pelican Islands to increase nest success of migratory birds and species of management concern such as American white pelicans.

Objectives:

Predator Management Objective A: Within 1 year of approval of the CCP, initiate management of coyotes and other predators prior to and during the nesting season, on and adjacent to the two Pelican Islands in Pool 9.

Predator Management Objective B: Within 1 year of approval of the CCP, initiate control of striped skunks and raccoons within the developed wetland units, using the most humane methods available.

Strategies:

1. Conduct management trapping activities using live traps and cubby sets along dikes and check daily during inspection of water control structures.
2. Hire a contractor to seasonally conduct predator management activities in managed wetlands and Pelican Islands.
3. Conduct special hunts of coyotes and other predators on islands prior to and during the nesting season.
4. Investigate and utilize other predator control techniques to cause an aversion to the nesting islands.

Rationale:

Predator populations in the Great Plains have been directly affected by extensive habitat changes. Some predator species common and widely distributed before European settlement vanished from all or most of the region (e.g., swift fox and gray wolf), whereas populations of other species that were scarce and narrowly distributed expanded greatly (e.g., raccoon). The elimination of the gray wolf had a profound impact on mesopredators, especially the other canids (i.e., red fox and coyote). Wolves are highly territorial

and intolerant of other canids. Thus, fox and coyote abundance was limited and somewhat controlled by wolves. However, after the extermination of gray wolves from the prairies, fox and coyote populations grew.

In areas where habitat is limited (i.e., fragmented) and predator populations are high, nest success of waterfowl is potentially less than optimum. Cowardin et al. (1998) reported that mallard nest success averaged only 8 percent in central North Dakota during 1977-80 and concluded that this rate was insufficient to maintain the local breeding population without immigration. Klett et al. (1988) also concluded that nest success was too low for population stability of mallard, gadwall, blue-winged teal, northern shoveler, and northern pintail in North Dakota, South Dakota, and Minnesota. Researchers have also concluded that breeding populations of these species were not self-sustaining in many years. Predators mainly destroy duck eggs but some species also take ducklings and incubating hens. Many other migratory bird species, including long-billed curlew, marbled godwit, upland sandpiper, and trumpeter swan, are also negatively affected by egg predation by raccoons and striped skunks during the nesting season.

American white pelicans are colonial nesters that typically nest on islands surrounded by open water. It is believed that islands are selected due to the protection from predators provided. Coyotes are known predators on eggs and young of white pelicans. They have recently been documented as preying on young pelicans and their eggs and are believed to have caused the total abandonment of nesting and subsequent loss of all young in 2005. Individual coyotes are likely to continue to swim to the islands after learning this behavior. Removing individual animals and causing an aversion of remaining coyotes for these islands will help to prevent abandonment of nesting on these islands in future years.

Currently, coyotes are frequently observed on the refuge and are one of the most common predators detected during annual scent post surveys, but red fox are rarely seen on the refuge. Recent research in the Northern Great Plains indicates that coyotes have a significant influence on the population of other nest and egg predators, especially red fox. Where coyotes are found in low numbers, red fox tend to fill the vacated predatory niche. The removal of large numbers of coyotes could result in an increasing occurrence of red fox on the refuge. This will be counterproductive for increasing the nest success and hatchling survival of waterfowl. Therefore, coyotes will not be one of the target predators for removal, except on and adjacent to the Pelican Islands.

Research Goal

Objectives:

Use sound science, monitoring, and applied research to advance the understanding of natural resources and management within the Lake Creek Valley, sandhills and surrounding grasslands.

Research Objective A: Initiate one research project every 2 years with an emphasis on grassland restoration, wetland management, prairie dog management, or other topics of interest to refuge staff.

Strategies:

1. Fund and build a bunkhouse to support research, and provide support resources for conducting research activities.
2. Secure two additional travel trailers for use by researchers.
3. Develop a refuge-specific list of research to be conducted on the refuge that will assist the Service with adaptive management.
4. Increase networking with universities and colleges to foster possible research projects and support that is available at the refuge.

Rationale:

The foundation of sound management should be a thorough knowledge of the biotic and abiotic factors affecting the plant and animal communities on the refuge and surrounding landscape. Refuge staff will be conducting significant management and restoration activities that will affect the plant and animal communities. There is much yet to be learned from this to guide future management on and off the refuge. The lack of housing currently limits research opportunities. By providing housing, staff will be able to attract researchers to aid with achieving this goal.

Hunting Goal

Provide quality hunting opportunities that are compatible with purposes and other uses on the refuge.

Objectives:

Hunting Objective A: Within 4 years of approval of the CCP, expand youth hunting opportunities to include at least one additional hunt, in coordination with the state of South Dakota.

Hunting Objective B: Within 5 years of approval of the CCP, explore opening additional species for hunting (e.g., cottontail rabbit, mourning dove,



Coyote

USFWS



Cottontail

Tom Koerner/USFWS

Hungarian partridge, youth waterfowl, coyote, and turkey) outside of LWRRA, where compatible.

Hunting Objective C: Within 2 years of approval of the CCP, pursue closing of hunting from primary traveled road ditches adjacent to the refuge (see figure 6, public use map).

Hunting Objective D: Within 2 years of approval of the CCP, adjust the boundary of the area open to deer hunting to include a small unit referred to as Unit 6S-1.

Strategies:

1. In partnership with the state of South Dakota, draft the refuge's step-down hunting management plan.
2. When compatible, on request, provide special use permits for physically challenged hunters.
3. Complete a redesign and printing of the refuge's hunting and fishing brochure.
4. Update the refuge website at least quarterly.

Rationale:

Hunting is one of the priority public uses allowed on the refuge. When determined to be compatible with refuge purposes, this is one of six priority uses. The presence of wintering trumpeter swans has historically created a need to provide significant portions of the refuge that are closed to hunting. This strategy has been very effective at providing staging and wintering habitat for up to 250 trumpeter swans at a time. The portions of the refuge open to hunting of sharp-tailed grouse, ring-necked pheasant, and deer are used relatively little by trumpeter swan.

Several requests were made to increase the areas of the refuge open to ring-necked pheasant, sharp-tailed grouse, and waterfowl hunting. The sandhills and the Brown Ranch portions of the refuge were specifically mentioned. The quality of the muzzle load hunt was a significant factor in originally designating a portion of the refuge open only to deer hunting (Kraft, pers. comm. 2004). In addition, having portions of the refuge closed to all hunting serves to provide a “refuge” for many other species of wildlife. This helps maintain the quality of other priority wildlife-dependent recreational activities such as wildlife observation, wildlife photography, and environmental education and interpretation.

A large population of Canada geese typically winters on the refuge, as spring flows provide open water and surrounding private croplands supply food resources. This has created a predictable concentration of geese and has become a very popular hunt on adjacent private lands. Three sections of county road have been identified as a potential safety concern adjacent to the refuge. These sections of road receive the majority of vehicle traffic and also the majority of pass shooting from the road ditches. A rule change by the South Dakota Game, Fish, and Parks Commission will be required to restrict hunting from both sides of the road ditches in these sections. Pass shooting will still be permitted around the remainder of the refuge boundary.

Goose hunters have been allowed to shoot at geese outside of the refuge boundary, provided that they are unarmed when entering portions of the refuge that are closed to waterfowl hunting to retrieve geese. At times, a significant amount of disturbance results as hunters enter the refuge and attempt to find and retrieve geese. Hunters will still legally be allowed to pass shoot at geese outside of the refuge boundary, but will not be allowed to shoot over refuge property or enter onto portions of the refuge closed to waterfowl hunting to retrieve geese.

Currently, the refuge participates in the youth pheasant hunt. In coordination with the South Dakota Game, Fish, and Parks, additional

opportunities for youth only hunts on the refuge will be explored. Allowing hunting of cottontail rabbits, mourning dove, partridge, and turkey in areas open to ring-necked pheasant and sharp-tailed grouse will also be explored and coordinated with the South Dakota Game, Fish, and Parks.

Fishing Goal

Provide quality sport fishing opportunities that are compatible with refuge purposes and other uses on the refuge.

Objectives:

Fishing Objective A: Within 2 years of approval of the CCP, annually sponsor at least one youth fishing activity at the refuge or at a site within the local community.

Fishing Objective B: Within 3 years of approval of the CCP, implement an educational campaign that results in at least 75 percent of the fishermen understanding the hazards of lead sinkers to trumpeter swans and the need to eliminate use on the refuge.

Fishing Objective C: Within 3 years of approval of the CCP, implement a regulation prohibiting the use of lead fishing sinkers on all refuge waters outside of the LWRRA.

Strategies:

1. In partnership with the state of South Dakota, revise and rewrite a refuge sport fishing plan.
2. Provide signage, brochures, news releases, and information on the refuge’s website explaining need for lead sinker ban.



Tom Koerner/USFWS

Waterfowl on Trout Ponds

3. In partnership with the state of South Dakota, support trout stocking in trout ponds and other game fish stocking in LWRRA to support a recreational fishery.
4. Consider requests for fishing tournaments at LWRRA by issuance of a special use permit. Consider other requests on a case-by-case basis.
5. Sponsor a youth fishing day on the refuge or support other local fishing day efforts such as at Cottonwood Wildlife Management Area in Merriman.
6. Complete a redesign and printing of the refuge's hunting and fishing brochure.
7. Update the refuge's website at least quarterly.

Rationale:

Sport fishing is one of the priority public uses for the System. Where compatible, this public use should be considered. Current and proposed wetland management for all areas of the refuge, except the trout ponds and the LWRRA, will support a very limited recreational fishery. The trout ponds and the LWRRA have deeper and more stable water levels to support a recreational fishery. These sites are locally important, due to the lack of public fishing opportunities in western South Dakota. Past management has centered on periodic stocking of sport fish and has provided recreational opportunities for fishermen. Stocking operations on the LWRRA has been halted until any modifications to the dam are complete. Once this is completed, stocking sport fish into the LWRRA may again be considered.

The trout ponds are seasonally important to trumpeter swans and other waterfowl. During periods of extreme cold, the springs feeding the trout ponds help to keep some open water available. Fishing on the trout ponds is difficult at this time because the ice is not safe enough to walk on. A seasonal closure on the trout ponds will have little to no impact on recreational fishing opportunities, but will prevent disturbance during this critical period. The ban on use of lead fishing sinkers is needed to prevent ingestion of lead by trumpeter swans and other waterfowl. Canada geese and trumpeter swans have been found dead on the refuge and were determined to have been killed by ingestion of lead. Lead sinkers are the only known contributor of lead to the environment that is still allowed on the refuge. Non-toxic sinkers are now readily available to fishermen at a reasonable cost. Their use will eliminate a known source of lead.

Wildlife Observation and Wildlife Photography Goal

Provide quality opportunities for wildlife observation and wildlife photography, where compatible with purposes and other uses throughout the refuge.

Objectives:

Wildlife Observation and Wildlife Photography

Objective A: Within 5 years of completion of the CCP, design, sign, and construct a minimum of three walking trails on the refuge that allow visitors to experience a range of refuge habitats (i.e., Pelican Islands, Wetland Loop, and Sandhills).

Wildlife Observation and Wildlife Photography

Objective B: Within 5 years of approval of the CCP, construct an accessible portion of the Pelican Islands Trail that leads to an accessible observation platform within view of the islands.

Strategies:

1. Provide adequate signage to direct visitors and enhance the recreational experience.
2. Complete a design and printing of a refuge wildlife observation brochure.
3. Consider making a seasonal blind available for public use near a reliable sharp-tailed grouse lek.
4. Make personal contacts with neighboring federal, state, and tribal governments to inform and educate about opportunities for wildlife observation on the refuge.
5. Maintain current signage directing visitors to the refuge. Add additional directional signs.
6. Increase distribution of refuge brochures
7. Work with Bennett County Road Department to improve the condition of main access to the refuge.
8. Maintain wildlife observation and wildlife photography as the primary public uses on the auto tour loop south of the refuge headquarters.
9. Update the refuge's website at least quarterly.

Rationale:

Wildlife observation and wildlife photography are two of the priority public uses on the refuge. Where compatible, these public uses should be allowed. The relatively low visitation and abundant wildlife provide frequent opportunities for wildlife observation and wildlife photography. The wide open spaces provide excellent opportunities for viewing mixed grass prairie, wetlands, and sandhills in one location. Currently, these public uses are allowed on the entire refuge. Many new

U.S. Fish & Wildlife Service
Lacreek National Wildlife Refuge
 Bennett County, South Dakota

Public Use Map

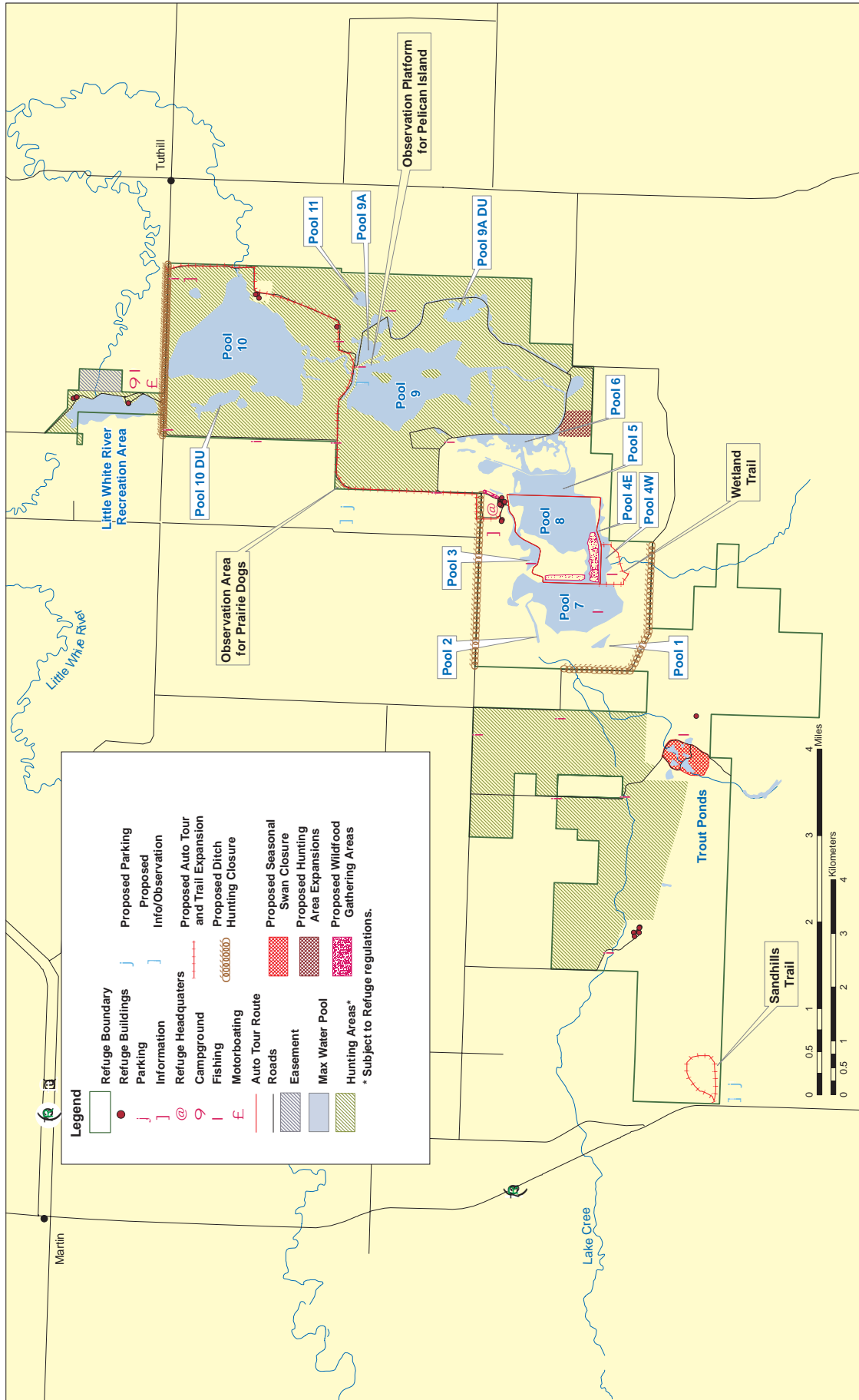


Figure 6. Public use map

or first time visitors are reluctant to explore the refuge off of the designated tour route. Development of a refuge wildlife observation guide, combined with development of three walking trails, will help new visitors to the refuge experience a range of habitats and wildlife.

Environmental Education and Interpretation Goal

Provide and actively support opportunities for environmental education and interpretation that are compatible with purposes and other uses on the refuge.

Objectives:

Environmental Education and Interpretation

Objective A: Update interpretive messages presented throughout the refuge to reflect habitat based decision making within 6 years of approval of the CCP.

Environmental Education and Interpretation

Objective B: Upon approval of the CCP, sponsor/ conduct a minimum of two theme related educational or interpretive events each year.

Environmental Education and Interpretation

Objective C: Actively work with local educators to incorporate wildlife and habitat based studies into curriculum and utilize refuge resources to support this with a minimum of five environmental education programs, within 4 years of completing the CCP.

Environmental Education and Interpretation

Objective D: Within 5 years of approval of the CCP, in partnership with the South Dakota Highway Department, seek funds to complete a pull out and informational kiosk along Highway 73, to interpret refuge resources and opportunities for refuge visitors.

Strategies:

1. Complete design and construction of updated visitor contact station.
2. Complete a redesign and printing of the refuge's general brochure.
3. Complete a redesign and printing of the refuge's auto tour route brochure and installation of updated signage.
4. Seek funding to complete pull out along Highway 73 in cooperation with South Dakota Department of Transportation.
5. Conduct visits with local educators to inform and encourage use of refuge as an outdoor classroom.
6. Update the refuge's website at least quarterly.

Rationale:

Environmental education and interpretation are two of the priority public uses for the refuge, and should be supported where compatible. Tremendous opportunities exist for educating and informing the local community and refuge visitors about refuge resources. Improvement of signage, designated trails, and brochures available to the public will significantly improve the quality of visits to the refuge.

Non-Wildlife-Dependent Public Use Goal

Provide limited non-wildlife-dependent uses where compatible and supported by refuge resources, and when they further the Fish and Wildlife Service's or the refuge's mission and goals.

Objectives:

Non-Wildlife-Dependent Public Use Objective A:

Allow the non-wildlife-dependent uses of camping, picnicking, and swimming only on the LWRRA.

Non-Wildlife-Dependent Public Use Objective B:

Consider other compatible, non-wildlife-dependent uses where conflicts are minimized with other refuge uses.

Strategies:

1. Permit the harvesting of native berries and fruits throughout the refuge.
2. Permit the harvesting of limited quantities of native plant materials, for non-commercial use through the issuance of special use permits.
3. Update Lacreek NWR website at least quarterly.

Rationale:

All of the non-wildlife-dependent public use on the refuge occurs on the LWRRA. The title to the LWRRA was accepted with encumbrances providing for hunting, fishing, boating, camping, and picnicking attached. The intent of the LWRRA was clearly for providing recreational opportunities, as indicated by establishing authority: "for public recreation on...developments adjacent to conservation areas in existence" (16 USC 460K-K4). This factor separates regulations for and management of the LWRRA from the remainder of the refuge.

The major consideration for this unit is the availability of resources to administer these recreational uses. Currently, management centers on operation and maintenance of the dam, road, and facilities. Increased law enforcement patrols are required to reduce vandalism and provide for safe

and quality recreational opportunities for visitors. The existing partnership with the state of South Dakota helps provide for fisheries management.

Other non-wildlife-dependent uses are evaluated to determine if they are compatible with refuge purposes and establishing authority. The low visitation encountered on the refuge often allows for public uses that at higher use levels will likely be considered incompatible. Activities such as berry picking for personal use or harvest of chokecherry branches for use by Native Americans may be allowed and contribute to local support of the refuge.

Cultural Resources Goal

Identify, value, and preserve the cultural resources and history of the refuge and WMD to connect refuge staff, visitors, and community to the area’s past.

Objectives:

Cultural Resources Objective A: By 2012, identify cultural resources and protect them from degradation.

Strategies:

1. Conduct routine law enforcement patrols to protect undocumented resources from theft and vandalism.
2. Continue to conduct site-specific surveys for lands and facilities that may be disturbed by refuge management activities.
3. Conduct a refuge wide survey to determine the presence of cultural resources on the refuge, upon securing funding.
4. Continue to follow established procedures for all private lands projects to ensure protection of cultural resources.
5. Continue to protect structures built by the CCC.

6. Complete a design and printing of a refuge historical brochure.

Rationale:

Federal laws and policies mandate the identification and protection of cultural resources.

Staffing and Resources Goal

Ensure that minimum staffing and resources are available to facilitate achievement of the Service’s and refuge’s goals and objectives.

Strategies:

1. Continue to advocate for minimum staffing as outlined in the refuge’s minimum staff chart.
2. Replace two existing refuge houses with single-family dwellings upon securing funding.
3. Construct a bunkhouse upon securing funding.

Rationale:

Lacreek NWR requires an extensive amount of management to reach stated goals and objectives. A large infrastructure of dikes and diversions are used to manage wetland habitats. Many upland acres are being restored to native grasses and forbs, with thousands of acres to complete. Invasive species require aggressive management. The use of prescribed fire and grazing is needed to manage upland and wetland habitats. A public use program requires maintenance of buildings and roads, interpretation for school groups, and a law enforcement program. All of this activity requires staff, equipment, and resources to complete. The minimum staffing level is designed to provide basic maintenance, operations, and administration support for the refuge.

Capital Improvements Goal

Ensure that all refuge facilities and structures meet accepted agency and industry standards.

Table 3. Current and proposed staff, Lacreek NWR

<i>Staff</i>	<i>Current Positions</i>	<i>Proposed Positions</i>
Management	Refuge Complex Project Leader, GS-12 Refuge Operations Specialist, GS-11 (unfunded)	None
Biological	Refuge Complex Biologist, GS-11 Private Lands Biologist, GS-11 Habitat Biologist, GS-11 (unfunded) Biological Technician, GS-6 (unfunded)	None
Administrative	Administrative Support Assistant, GS-7	None
Maintenance	Maintenance Worker WG-6 Engineering Equipment Operator, WG-8	None
Fire Management	Prescribed Fire Specialist, GS-9	None



Shapins Associates

View of Lacreek NWR from Above

Objectives:

Capital Improvements Objective A: Complete any required modifications to the Little White River Dam, based upon either final designs completed in 2005 or a re-evaluation of the hazard classification, by 2009.

Strategies:

1. Complete a re-evaluation of the hazard classification for the LWRRA.
2. Consider modification of the Standard Operation Procedure to lower hazard classification.
3. Consider modification of the dam to lower hazard classification.

Rationale:

The Little White River Dam has been classified as a “Significant Hazard Dam.” This classification is based on potential impacts to downstream structures. A final design has been completed for modification of the existing dam to facilitate passage of the probable maximum flood event without breaching the dam. Upon completion, a probable maximum flood event would still impact downstream structures; however, the dam would remain intact. The final design includes construction of a secondary emergency spillway, reworking the existing emergency spillway, replacement of the outlet works, and raising the dam 1 foot to add more freeboard. The project will not increase the storage capacity of the reservoir, nor will it improve the fisheries. Initial estimates for completion of this work were set at \$5,000,000.

The original dam was constructed in 1937 and has undergone only minor modifications in 68 years. In 2001, the emergency spillway was modified and armored with sheet pile and large riprap to address head cutting that had occurred downstream of the spillway. A comparison of the

as-built topographic survey and a 1985 topographic survey completed by the South Dakota Game, Fish and Parks indicates that over 70 percent of the storage capacity behind the dam had silted in. It is unknown how much additional siltation has occurred in the last 20 years; however, additional storage has been lost. The significant cost for an aging dam has been considered.

Currently, the dam facilitates filling of several of the refuge’s wetland units with surface water. Wildlife use of the site includes use by waterfowl and other waterbirds during spring and fall migrations, use by pelicans, herons, and egrets in the summer, and year round use by beaver, muskrats, pheasants, and other resident species. A marginal fishery exists with largemouth bass, northern pike, black crappie, saugeye, and carp. The site also continues to provide recreational opportunities to the residents of Bennett County not provided at other sites. Camping, boating, fishing, and picnicking are common uses at the site.

The service is currently evaluating the hazard classification for the dam. Pending an outcome that determines the hazard classification should remain as Significant, modifications to the dam will be made according to the final designs completed in 2005. Pending an outcome that determines a downgrading of the hazard classification is warranted, the need for completion of the modifications will be revisited.

Partnerships Goal

A wide range of partners, including non-governmental organizations and federal, state, tribal, and local entities, join with Lacreek NWR to support research and management, promote awareness, and foster appreciation for the Lake Creek Valley, Nebraska Sandhills, and surrounding grasslands.

Objectives:

Partnerships Objective A: Continue to participate in partnerships that promote sound wildlife management or contribute to the Fish and Wildlife Services or Lacreek NWR’s mission.

Partnerships Objective B: Continue to support an active private lands program that facilitates achievement of the Service’s and refuge’s goals and objectives.

Strategies:

1. Attend Bennett County Weed Board Meetings to exchange information.
2. Attend Bennett County Commissioners meeting annually.

3. Attend Bennett, Todd, and other County Conservation District Board Meetings.
4. Hold Open House, Appreciation Day, or other similar event annually for refuge’s neighbors and friends.

Rationale:

The refuge is part of the larger landscape and community. Activities that occur on the refuge have the potential to affect neighbors and the surrounding community and vice versa. Establishing open lines of communication will help build support for the refuge and provide an avenue for discussion. The Service recognizes that partnerships are vital to the Service mission. The Partners for Fish and Wildlife Program clearly follows this belief. The landowner steps forward and voluntarily makes their land available for the establishment and improvement of wildlife habitat. The Conservation District helps to administer funding and coordinates with the landowner. Other agencies such as South Dakota Game, Fish, and Parks, Ducks Unlimited, Inc., or the Natural Resources Conservation Service contribute financial and/or technical assistance to the project. The Service contributes technical and financial assistance and often acts as the primary contact to see the project through completion with the landowner.

Refuge staff will continue to seek out new opportunities and foster existing relationships to help with achieving mutually beneficial goals and objectives.

Personnel

Current staffing at the refuge consists of seven permanent FTEs. Three additional unfunded positions remain on the staffing chart for the refuge. No additional staff is proposed to fully implement the CCP. Staffing and funding are requested for the 15-year period of the CCP.

Funding

Projects required to implement the CCP are funded through two separate systems. Actions, projects, and maintenance needs for the refuge are displayed from the Refuge Operating Needs System (RONS) and the Maintenance Management System (MMS). RONS identifies staffing needed to carry out projects above the existing base budget. MMS documents the refuge’s needs regarding equipment, buildings and the repair and replacement of facilities. Appendix H identifies the RONS and appendix I identifies the MMS requirements for the refuge.

Step-down Management Plans

This CCP is intended as a broad umbrella plan that provides general concepts and specific wildlife, habitat, endangered species, public use, and partnership objectives over the next 15 years.

Table 4. Step-down management plans for Lacreek NWR

<i>Plan/Proposal</i>	<i>Completed Plan, Year Approved</i>	<i>New or Revised Plan, Completion Year</i>
Black-tailed Prairie Dog Management Plan	-	2005
Disease Management Plan	2004	2010
Fire Management Plan	2001	2006
Habitat Management Plan	-	2010
Hazardous Waste Management Plan	2002	2012
Integrated Pest Management Plan	2004	2014
Lacreek (High Plains) Flock Trumpeter Swan Management Plan	1982	2006
Occupant Emergency Plan	-	2010
Predator Management Plan	1994	2006
Prescribed Burning (Annual)	2005	2006
Spill Prevention Control and Countermeasures Plan	-	2007
Refuge Safety Plan	2001	2010
Visitor Services Plan	1980	2012
Water Management Plan	2005	2006
Wildlife Inventory and Monitoring Plan	2004	2010

The purpose of step-down management plans is to provide greater detail to managers and employees who will implement the strategies described in the CCP. Step-down management plans provide greater detail for implementing specific actions authorized by the CCP. Table 6 presents those plans needed for Lacreek NWR, their current status, and next revision date.

Monitoring and Evaluation

Adaptive management is a flexible approach to long-term management of biotic resources. It allows for management to be shaped and directed over time by the results of ongoing monitoring activities and other information discovered (see figure 7). More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan. On-the-ground observations of responses to management by habitats and wildlife are also factored in. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions. Changes and adjustments to management and operations are considered utilizing the best information that is currently available.

Plan Amendment and Revision

This CCP will be reviewed annually to determine the need for revision. A revision will occur if and when significant information becomes available, such as a change in ecological conditions. The final CCP will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the CCP goals and objectives. Revisions to the CCP and the step-down management plans will be subject to public review and NEPA compliance. At a minimum, this plan will be evaluated every 5 years and revised after 15 years.

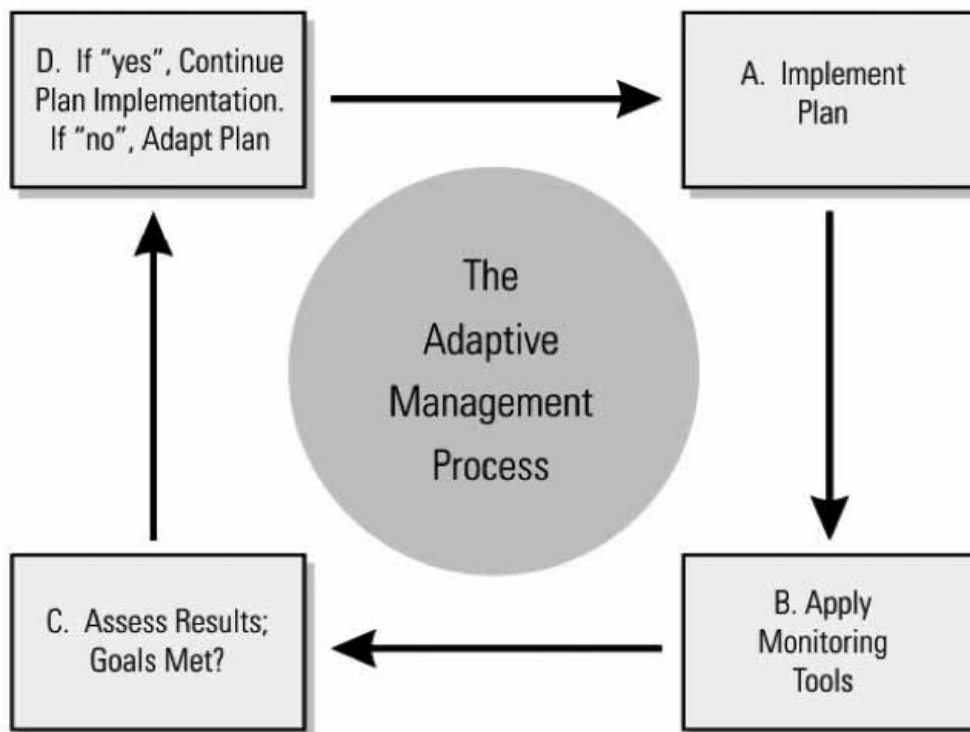


Figure 7. Adaptive management

Glossary of Terms



Glossary

Accessible: Areas and activities allowing physical access to people of different abilities, especially those with physical impairments.

Adaptive Management: The 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 implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alternative: 1) A reasonable way to solve an identified problem or satisfy the stated need (40 CFR 1500.2). 2) Alternatives are different means of accomplishing refuge purposes and goals and contributing to the System mission (Draft Service Manual 602 FW 1.5).

Amphibian: A class of cold-blooded vertebrates including frogs, toads or salamanders.

Baseline: A set of critical observations, data, or information used for comparison or a control.

Biological Control: The use of organisms or viruses to control invasive plants or other pests.

Biological Diversity: The 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 National Wildlife Refuge System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as Biodiversity.

Biomass: The total amount of living material, plants and/or 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.

Canopy: A layer of foliage, generally the uppermost layer, in a vegetative stand. Can be used to refer to mid-level or understory vegetation in

multi-layered stands. Canopy closure is an estimate of the amount of overhead vegetative cover (also canopy cover).

C score: Coefficient of conservatism that ranges from 0 to 10 and represents an estimated probability that a plant is likely to occur in a landscape unaltered from what is believed to be a pre-settlement condition.

CCP: see comprehensive conservation plan.

Colony: The nests or breeding place of a group of birds (such as herons or gulls) occupying a limited area.

Compatible Use: A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the director of the U.S. Fish and Wildlife Service, will not materially interfere with or detract from the fulfillment of the Mission of the 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 System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

Concern: See definition of "Issue."

Conspecific: Individuals or pair of the same species.

Cover: present vegetation of an area (also cover type or canopy cover).

Cool-season grasses: grasses that begin growth earlier in the season and often become dormant in the summer. These grasses will germinate at lower temperatures. Examples of cool-season grasses at the refuge are western wheatgrass, needle and thread, and green needlegrass.

Cultural Resources: The remains of sites, structures, or objects used by people in the past.

Cultural Resource Inventory: A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve

various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

Cultural Resource Overview: A 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).

Dense Nesting Cover (DNC): A composition of grasses and forbs that allow for a dense stand of vegetation which protects nesting birds from the view of predators. Usually consists of one to two species of wheatgrass, alfalfa, and sweet clover.

Depredation: Damage inflicted upon agricultural crops or ornamental plants by wildlife.

Developed Wetland: A wetland that can have water levels in it manipulated through various dikes, dams, diversions, and water control structures.

DNC: see dense nesting cover.

Drawdown: The act of manipulating water levels in an impoundment to allow for the natural drying out cycle of a wetland.

Ecological Diversity: The 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).

Ecosystem: A dynamic and interrelating complex of plant and animal communities and their associated non-living 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.

Emergent: A plant rooted in shallow water and having most of the vegetative growth above water. Examples are cattail and hardstem bulrush.

Endangered Species (Federal): A 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): A 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.

Environmental Assessment (EA): A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an Environmental Impact Statement or Finding of No Significant Impact (40 CFR 1508.9).

Extinction: The complete disappearance of a species from the earth; no longer existing (Koford et al. 1994).

Extirpate: The extinction of a population; complete eradication of a species within a specified area.

Fauna: All the vertebrate and invertebrate animals of an area.

Federal Trust Resource: A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States of America as a result of federal acts and treaties. Examples are species listed under the Endangered Species Act, migratory birds protected by international treaties, and native plant or wildlife species found on a national wildlife refuge.

Federal Trust Species: All species where the federal government has primary jurisdiction including federally endangered or threatened species, migratory birds, anadromous fish, and certain marine mammals.

Flora: All the plant species of an area.

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.

Friends Group: Is defined as any formal organization whose mission is to support the goals and purposes of its associated refuge and the National Wildlife Refuge Association (NWRA) overall. This includes friends organizations and cooperative and interpretive associations.

Fragmentation: The alteration of a large block of habitat which 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.

Geographic Information System (GIS): A 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 non-geographic attributes such as species and age (Koford et al. 1994).

Global Positioning System (GPS): A system which 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).

Grassland Block: A contiguous area of grassland without fragmentation.

Habitat: Suite of existing environmental conditions required by an organism for survival and reproductions. The place where an organism typically lives and grows.

Habitat Disturbance: Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., timber harvest, discing).

Habitat Type (vegetation type, cover type): A land classification system based on the concept of distinct plant associations.

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

Integrated Pest Management (IPM): Methods of managing undesirable species (such as invasive plants) including: education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods.

Interseeding: Seeding into an existing stand of vegetation with a drill or broadcast. Increasing species diversity is one of the primary goals of interseeding

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

Inviolate sanctuary: A place of refuge or protection where animals and birds may not be hunted.

Invasive plant: a species that is non-native to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

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).

Maintenance Management System (MMS): A national database which contains the unfunded maintenance needs of each refuge. Projects included are 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 Alternative: See alternative.

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 birds: Birds which follow a seasonal movement from their breeding grounds to their “wintering” grounds. Waterfowl, shorebirds, raptors, and song birds are all migratory birds.

Mission: Succinct statement of purpose and/or reason for being.

Mitigation: Measures designed to counteract environmental impacts or to make impacts less severe.

Mixed-grass prairie: A 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.

MMS: see maintenance management system.

Monitoring: The process of collecting information to track changes of selected parameters over time.

National Wildlife Refuge (National Wildlife Refuge): “A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include Coordination Areas.” Find a complete listing of all units of the System in the current Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service.

National Wildlife 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, or 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. Clearly 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 System; and 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: A species that other than as a result of an introduction historically occurred or currently occurs in that ecosystem.

Neotropical migrant: A bird species that breeds north of the United States and Mexican border and winters primarily south of this border.

Nest success: The percentage of nests that hatch (one or more eggs hatch) successfully of the total number of nests initiated in an area.

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

Noxious weed: 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), a noxious weed (i.e., 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. (also see invasive plant)

Objective: An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will 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 and time-specific and should

be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively (Draft Service Manual 602 FW 1.5).

Over-water 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.

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

Pass Shooting: Hunting waterfowl from a stationary location where waterfowl are expected to fly by.

Patch: An area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

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

PIF: see Partners in Flight.

Plant Community: An 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.

Prescribed Fire: The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, etc., 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.

Proposed Action: The alternative proposed to best achieve the refuge purpose, vision, and goals; contributes to the refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.

Priority public use: one of six uses authorized by the refuge Improvement Act of 1997 to have priority if found to be compatible with a refuge's purposes. This includes hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

Public: Individuals, organizations, and groups; officials of federal, state, and local government agencies; 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: A 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.

Purpose of the refuge: The purpose of a refuge is 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: A carnivorous bird (such as a hawk, falcon, or vulture) that feeds wholly or chiefly on meat taken by hunting or on carrion (dead carcasses).

Refuge Operations Needs System (RONS): A national database which contains the unfunded operational needs of each refuge. Projects included are those required to implement approved plans, and meet goals, objectives, and legal mandates.

Refuge Purpose: see purpose of the refuge.

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: A species inhabiting a given locality throughout the year; non-migratory species.

Rest: Free from biological, mechanical, or chemical manipulation; referring to refuge lands.

Restoration: Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy upland habitats and aquatic systems.

Riparian area or zone: Refers to an area or habitat that is transitional from terrestrial to aquatic ecosystems; including streams, lakes wet areas, and adjacent plant communities and their associated soils which 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 any and all

plant-life growing on the land adjoining a stream and directly influenced by the stream.

RONS: see refuge operations needs system

Rough fish: A fish that is neither a sport fish nor an important food fish.

Scoping: The 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 or glaciers.

Service: U.S. Fish and Wildlife Service.

Shelterbelts: 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 (as a plover or a snipe) that frequent the seashore or mud flat areas.

Spatial: Relating to, occupying, or having the character of space.

Special-status species: Plants or animals which have been identified through either 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; U.S. Fish & Wildlife Service 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: A 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 general 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 which are (1) documented or apparent populations declines, (2) small or restricted populations, or (3) dependence on restricted or vulnerable habitats.

Species richness: The absolute number of species in an assemblage or community; the number of species in a given area (Koford et al. 1994).

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

Strategy: A 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: a vascular or non-vascular hydrophyte, either rooted or non-rooted, which lies entirely beneath the water surface, except for flowering parts in some species.

Tame species: see dense nesting cover

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): A 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.

Travel Corridor: A 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.

Trust Species: see Federal Trust Species.

U.S. Fish and Wildlife Service (Service): The 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 which distributes millions of dollars in the Federal Aid program which distributes

the 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 & Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and plants and their habitats for the continuing benefit of the American people.

U.S. Geological Survey (USGS): A federal government 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: A concise statement of the desired future condition of the planning unit, based primarily upon the System mission, specific refuge purposes, and other relevant mandates (Draft Service Manual 602 FW 1.5).

Visual obstruction: A measurement of 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): A method of visually quantifying vegetative structure and composition.

VOR: see visual obstruction reading

Wading birds: Birds that have long legs that enable them to wade in shallow water. Includes egrets, great blue herons, black crowned night herons, and bitterns.

Warm-season grasses: Grasses that begin growth later in the season (early June). These grasses require warmer soil temperatures to germinate and actively grow when temperatures are warmer. Examples of warm season grasses are Indiangrass, switchgrass, and big bluestem.

Water Control Structure: A metal and/or concrete structure placed in an earthen dam or dike which is used to control the flow of water. Two kinds are generally used. A slide or screw gate moves a metal plate in front of a pipe, restricting or stopping the flow of water into the pipe. A drop board structure uses metal or wooden boards that are dropped into grooves in front of the pipe. Water is blocked until it reaches the top of the board, at which time the water flows freely over the top.

Waterfowl: A category of birds that includes ducks, geese, and swans.

Watershed: The region draining into a river, river system, or body of water.

Weedy Trees: Native and non-native trees established on their own and cause a management issue or problem.

Wetland Management District (WMD): Land which the Service's Refuge System acquires (with Federal Duck Stamp funds), restores, and manages primarily as prairie wetland habitat critical to waterfowl and other wetland birds.

Wetland Reserve Program: A voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland-restoration efforts. The NRCS goals are to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. (www.nrcs.usda.gov/programs/wrp)

Wildlife-dependent recreational use: "A use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, 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. The Service also will consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence.

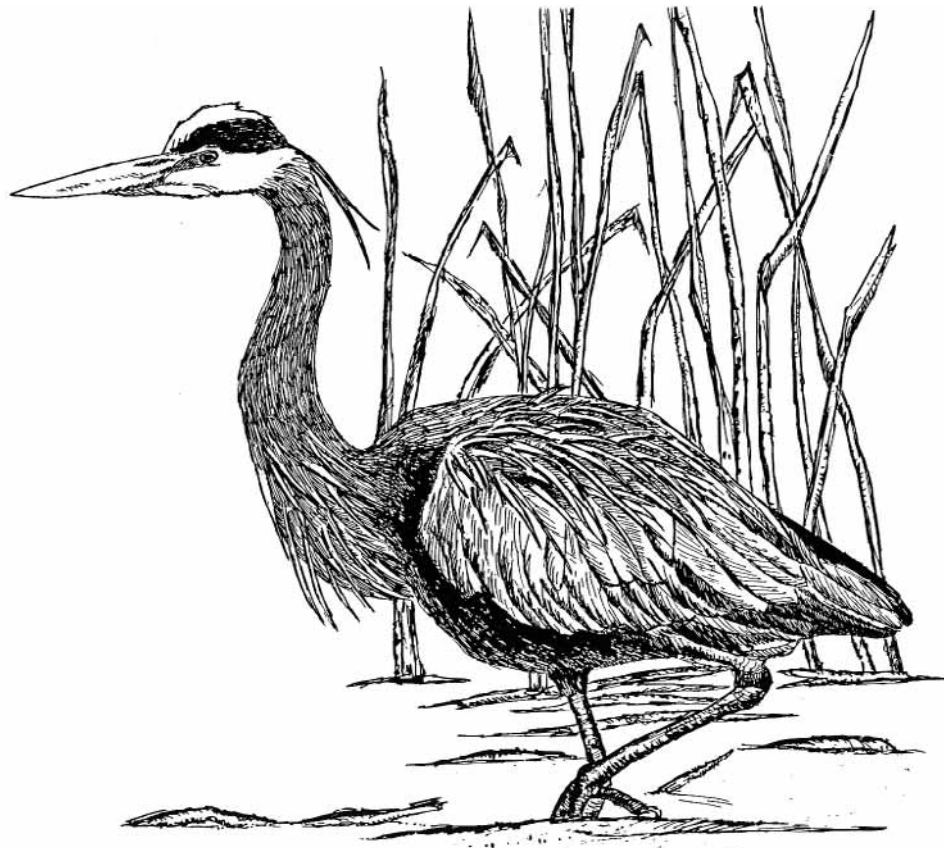
Wildland fire: A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildlife-dependent Recreation: A use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the System.

WMD: see wetland management district.

Woodland: Open stands of trees with crowns not usually touching (generally forming 25- to 60-percent cover).

Appendices



Appendix A

Compatibility Determinations

Refuge Name: Lacreek National Wildlife Refuge

Establishing and Acquisition Authority: Executive Order 7160, August 26, 1935; Migratory Bird Conservation Act 45 Stat 1222; Refuge Recreation Act 1962 76 Stat 653

Refuge Purposes:

“...as a refuge and breeding grounds for migratory birds and other wildlife...” Executive Order 7160, dated August 26, 1935

“...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” USC 715d (Migratory Bird Conservation Act)

“...the Secretary is authorized to cooperate with public and private agencies, organizations, and individuals, and he may accept and use, without further authorization, donations of funds and real and personal property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors when such covenants are deemed by the Secretary to be compatible with the purposes of the wildlife refuges...” 16 USC 460k-2 (Refuge Recreation Act (16 USC 460k-460-k), as amended)

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.”

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 special-use permit by private individuals. Currently these economic uses are used as tools to manage habitat for wildlife.

Currently approximately 100 acres of uplands are farmed per year. Farming conducted for the sole purpose of grassland restoration. Cattle grazing is used as a grassland and wetland management tool. Grazed acreages have varied from 1,200 to 4,000 acres annually over the past five years. Haying is sporadically used as a grassland management tool. It is utilized to control noxious weeds, prepare areas for upland restoration, and to prepare areas for prescribed burns.

The CCP proposes to increase grassland restoration activities on the refuge. Farming would subsequently be used on 100 to 500 acres per year until grassland restoration activities on the refuge are completed. Cooperative farming activities are compatible only on areas that are not native prairie. 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, and spring wheat.

The CCP proposes to utilize grazing as a management tool for wetland and upland habitats. Specific acreages have not been identified in the CCP because habitat conditions within wetland and upland areas can change rather dramatically on a yearly basis due to precipitation and temperatures. An adaptive approach will be used when prescribing grazing treatments to refuge habitats.

Availability of Resources: The needed resources necessary to administer haying, grazing, and farming programs is sufficient at current staffing and budgetary levels. Changes proposed in the CCP should not increase the amount of staff time or financial resources necessary to administer these programs. Haying, grazing, and farming programs are generally conducted through special-use permits or cooperative farming agreements minimizing staff time and refuge assets to complete work.

Anticipated Impacts of the Use: Over a 5-year period, grazing has been conducted on 1,500 to 4,000 acres annually. While annual acreages have not been specified in the CCP, it is expected that future refuge grazing will fall into this range. Farming acres will likely increase from the current level of 100 acres annually up to 500 acres annually. Haying is only used sporadically at the refuge and this use is not anticipated to change.

Without management, wetland and upland habitat conditions would deteriorate due to long periods of rest. Cool season invasive species would likely increase and infest additional areas without the use of spring grazing. While all these activities disturb habitat and wildlife in the short term, long-term habitat and wildlife benefits outweigh these disturbances. Farming causes decreases in wildlife habitat availability; however, habitat conditions will improve following grassland restoration activities.

No cultural resources would be impacted. No impact to endangered species should occur.

Determination: The use of haying, grazing, and farming as habitat management tools is compatible.

Stipulations Necessary to Ensure Compatibility:

- Monitor vegetation and wildlife to assess the effects of the management tools
- Require general and special conditions for each permit to ensure consistency with management objectives
- Restrict farming permittees to a list of approved chemicals that are less detrimental to wildlife and the environment
- Restrict haying to after August 1 to avoid disturbance to nesting birds unless the refuge manager deems it necessary to hay earlier to control invasive plants or restore grasslands

Justification: To maintain and enhance the habitat for migratory birds and other wildlife, some habitat manipulation needs to occur. Upland and wetland habitat conditions would deteriorate without the use of a full range of management tools. Migratory bird habitat and ecological diversity would decrease as habitat suitability declines. Exotic and invasive plant species would increase and habitat diversity would decrease if grazing practices did not continue on the refuge. Farming provides a means to restore degraded grasslands for the benefit of grassland dependent species.

Mandatory 15-year Re-evaluation Date: 2020

2. Description of Proposed Use: Environmental Education and Interpretation

Provide opportunities for environmental education and interpretation. Environmental education consists of activities conducted by refuge staff, volunteers, and teachers. Interpretation occurs in less formal activities with refuge staff volunteers or through exhibits, educational trunks, signs, and brochures. Currently, environmental education and interpretation activities are conducted at the refuge office and on the refuge. Refuge staff provide tours and interpretation for these groups.

The lack of an Outdoor Recreation Planner coupled with the fact that the area is sparsely populated contributes to a rather small environmental education and interpretation program at the refuge. While the amount of environmental education and interpretation activities is limited, excellent opportunities are available at the refuge. Although additional positions devoted to outreach have not been identified in the CCP,

the CCP proposes to continue with current uses as well as improve environmental education and interpretation for all visitors through:

- Redesign and expand the auto tour route
- Add an interpretive kiosk along Highway 73
- Create a sandhills and wetland hiking trail
- Update the existing bird walk trail
- Improve the Pelican Islands Trail and construct an accessible platform
- Update and improve refuge signs
- Update existing brochures to the Service graphic standards

Availability of Resources: Implementing new facilities outlined in the CCP is closely tied to funding requests in the form of refuge operation needs system (RONS) and maintenance management system (MMS) projects. Existing programs such as current refuge signs and brochures can be updated with available resources.

Anticipated Impacts of Use: Minimal disturbances to wildlife and wildlife habitat would result from these uses at the current and proposed levels. Adverse impacts are minimized through careful timing and placement of activities. Some disturbance to wildlife would occur in areas frequented by visitors. There would be some minor damage to vegetation, littering, and increased maintenance. Location and time limitations placed on environmental education and interpretation activities would ensure that this activity would have only minor impacts on wildlife and would not detract from the primary purposes of the refuge.

No cultural resources would be impacted. No impact to endangered species should occur.

Determination: Environmental education and interpretation are compatible.

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 environmental assessment (EA) and the draft CCP, it is determined that environmental education and interpretation within the Lacreek National Wildlife Refuge would not materially interfere with or detract from the purposes for which this refuge was established.

Environmental education and interpretation are priority public uses listed in the National Wildlife Refuge System Improvement Act of 1997. By facilitating environmental education, refuge visitors would gain knowledge and an appreciation of fish, wildlife, and their habitats, which would lead to increased public awareness and stewardship of natural resources. Increased appreciation for natural resources would support and complement the Service's actions in achieving the purposes of the refuge and the mission of the Refuge System.

Mandatory 15-year Re-evaluation Date: 2020

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 the above uses and add the following to improve wildlife observation and wildlife photography:

- Update and improve refuge signs
- Redesign and expand the auto-tour route
- Add an interpretive kiosk along Highway 73
- Create a sandhills and wetland hiking trail
- Update the existing birdwalk trail
- Improve the Pelican Islands Trail and construct an accessible platform
- Update and improve refuge signs
- Update existing brochures to the Service graphic standards

Availability of Resources: Implementing new facilities outlined in the CCP is closely tied to funding requests in the form of refuge operation needs system (RONS) and maintenance management system (MMS) projects. Existing programs such as current refuge signs and brochures can be updated with available resources.

Determination: Wildlife observation and wildlife photography are compatible.

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 above and in the EA, it is determined that wildlife observation and wildlife photography on the Lacreek National Wildlife Refuge would not interfere with the habitat goals and objectives or purposes for which it was established.

Wildlife observation and wildlife photography are priority public uses listed in the Improvement Act. By facilitating these uses, visitors would gain knowledge and an appreciation of fish and wildlife, which would lead to increased public stewardship of wildlife and their habitats. Increased public stewardship would support and complement the Service's actions in achieving the purposes of the refuge and the mission of the Refuge System.

Mandatory 15-year Re-evaluation Date: 2020

4. Description of Use: Recreational Fishing

Continue to Provide for Recreational Fishing at Designated Fishing Areas in Accordance with State Regulations.

The primary game fish are rainbow trout, northern pike, and catfish. The designated fishing areas include the trout ponds, refuge impoundments 3, 4, 7, and 10, and the LWRRA reservoir. Boating is allowed on all areas; however, no wake zones are required within 500 feet of shore on the trout ponds and in refuge Pools 3, 4, 7, and 10.

Fishing visitation and success on the refuge pools vary according to management activities. Recent dewatering of refuge pools has virtually eliminated the game fishery in Pools 3, 4, 7, and 10. The trout ponds are maintained as a put and take fishery and are stocked twice annually by the South Dakota Game Fish and Parks.

Availability of Resources: The current fishing program is administered using available resources. The CCP does not call for the implementation of any new fishing programs.

Anticipated Impacts of Use: Fishing and other human activities cause disturbance to wildlife. Fishing near water control structures and bridges may displace migratory birds such as American white pelicans and double crested cormorants that gather in these locations to feed on fish. Disturbance on Pools 3, 4, 7, and 10 will be minimal since the game fishery has been virtually eliminated on these pools during recent drawdowns. Restricting fishing to designated

fishing areas would minimize the disturbance to migratory birds and other wildlife and would not affect other 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
- Monitor existing use to ensure that facilities are adequate and disturbance to wildlife continues to be minimal
- Designate a “no wake zone” that includes all waters within 500 feet of the shoreline or emergent marsh areas.

Justification: Based on the biological impacts addressed above and in the EA, it is determined recreational fishing would not materially interfere with the habitat goals and objectives or purposes for refuge establishment.

Fishing is a priority public use as listed in the National Wildlife Refuge System Improvement Act of 1997.

Mandatory 15-year Re-evaluation Date: 2020

5. Description of Use: Recreational Hunting

Allow recreational hunting of deer, ring-necked pheasant, sharp-tailed grouse, mourning dove, cottontail rabbit, wild turkey, and Hungarian partridge on designated portions of the refuge. Continue hunting of all species according to state regulations on the LWRRA.

Hunting on the refuge currently includes seasons for ring-necked pheasants, sharp-tailed grouse, archery deer, and a limited quota muzzleloader deer season. Additional species and seasons have been proposed in the CCP as well for mourning dove, cottontail rabbit, wild turkey, and Hungarian partridge on areas currently open to hunting. Hunting on the LWRRA for migratory birds, upland game birds, big game, predators, and furbearers is permitted according to state of South Dakota regulations.

Availability of Resources: Currently, sufficient resources are available to implement the proposed recreational hunting program.

Anticipated Impacts of Use: Some wildlife disturbance will occur during recreational hunting activities at the refuge. All of the refuge outside of

the LWRRA is closed to migratory bird hunting. This will ensure that adequate area remains undisturbed for the benefit of migratory birds. Approximately 50 percent of the refuge, excluding the LWRRA, is closed to all hunting. This will ensure adequate resting areas for resident and migratory species.

Other public use activities at the LWRRA such as boating, swimming, and recreational fishing will be minimally impacted by recreational hunting. Recreational use of the LWRRA is relatively low and other activities generally do not occur during the hunting season. While recreational hunting will disturb wildlife at the LWRRA, this area was acquired as a donation under the authority of the Refuge Recreation Act of 1962. The LWRRA was accepted by the Service to mitigate for the loss of public recreational opportunities that resulted with the establishment of Lacreek NWR. Public hunting is one of the restrictive covenants imposed for the LWRRA by the donors.

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.

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 outside the LWRRA
- Require that hunting be in accordance with federal and state regulations
- Promote sound hunting practices for hunter safety and quality experiences

Justification: Hunting on national wildlife refuges has been identified as a priority public use in the National Wildlife Refuge System Improvement Act of 1997. 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 Lacreek National Wildlife Refuge would not materially interfere with or detract from the purposes for which this refuge was established or its habitat goals and objectives.

Mandatory 15-year Re-evaluation Date: 2020

6. Description of Proposed Public Use: Boating, Swimming, Picnicking, and Camping at the Little White River Recreation Area

Continue recreational activities including boating, swimming, picnicking, and camping at the LWRRA in accordance with state and refuge regulations.

Boating, swimming, picnicking, and camping at the refuge are only allowed at the LWRRA at the north side of the refuge. This area was donated to the refuge and was formally accepted in 1981 under the authority of the Refuge Recreation Act of 1962.

Availability of Resources: The CCP is not proposing any changes recreational activities allowed at the LWRRA. Facilities and programs are adequately maintained at current staffing levels.

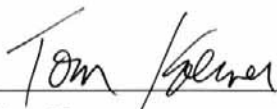
Anticipated Impacts of the Use: Recreational activities proposed in the CCP for the LWRRA will have detrimental effects on wildlife and wildlife habitat. Increased public use activities may create disturbance to nesting waterfowl. Recreational hunting and fishing also occur at the LWRRA; however there should be minimal conflicts between the uses.

Determination: Boating, swimming, picnicking, and camping at the LWRRA are compatible.

Stipulations Necessary to Ensure Compatibility:

- Activities are conducted in accordance with state and refuge regulations
- Limit the use of camping to designated campsites
- Install informational signs.

Justification: The LWRRA was officially accepted as a donation in 1982 under the authority of the 1962 Refuge Recreation Act. The Refuge Recreation Act of 1962 authorized the Secretary to acquire lands for recreational development and authorizes the development, operation and maintenance of the lands for recreational purposes. The Refuge Recreation Act of 1962 permitted donations to be accepted by the Secretary with restrictive covenants imposed by donors when such covenants are deemed by the Secretary to be compatible with the purposes of the wildlife refuge. A number of specific encumbrances are listed in multiple documents pertaining to the LWRRA. These include swimming, fishing, hunting, and picnicking. It is clear that this area was intended to provide public recreation to offset the loss of opportunities that resulted with the establishment of Lacreek NWR. There is documentation to this effect as far back as 1939, when the first attempt to donate the LWRRA was made.



Tom Koerner
Refuge Manager
Lacreek National Wildlife Refuge and Wetland
Management District
Martin, SD

FEB 23 2006

Date



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

FEB 23 2006

Date



David Wiseman Refuge Program Supervisor
U.S. Fish and Wildlife Service, Region 6
Lakewood, CO

FEB 23 2006

Date

Appendix B

Key Legislation and Policies

Americans With Disabilities Act (1992): Prohibits discrimination in public accommodations and services.

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 for major wetland modifications.

Criminal Code of Provisions of 1940 as amended, (18 U.S.C. 41): States the intent of Congress to protect all wildlife within federal sanctuaries, refuges, fish hatcheries, and breeding grounds. Provides that anyone (except in compliance with rules and regulations promulgated by authority of law) who hunts, traps, or willfully disturbs any such wildlife, or willfully injures, molest, or destroys any property of the United States on such land or water, shall be fined up to \$500 or imprisoned for not more than 6 months or both.

Emergency Wetland Resources Act of 1986: Authorizes the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act also requires the Secretary to establish a National Wetlands Priority Conservation Plan, requires the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amount equal to import duties on arms and ammunition.

Endangered Species Act of 1973 and recent amendments (16 U.S.C. 1531-1543; 87 Stat. 884) as amended (Establishing legislation.): Provides for conservation of threatened and endangered species of fish, wildlife, and plants by federal action and by encouraging state programs. Specific provisions include:

- The listing and determination of critical habitat for endangered and threatened species and consultation with the Service on any federally funded or licensed project that could affect any of these agencies;
- Prohibition of unauthorized taking, possession, sale, transport, etc., of endangered species;
- An expanded program of habitat acquisition;
- Establishment of cooperative agreements and grants-in aid to states that establish and

maintain an active, adequate program for endangered and threatened species; and

- Assessment of civil and criminal penalties for violating the Act or regulations.

Environmental Education Act of 1990 (20 U.S.C. 5501 5510; 104 Stat. 3325): Public Law 101 619, signed November 16, 1990, established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program.

Responsibilities of the Office include developing and supporting programs to improve understanding of the natural and developed environment, and the relationships between humans and their environment; supporting the dissemination of educational materials; developing and supporting training programs and environmental education seminars; managing a federal grant program; and administering an environmental internship and fellowship program. The Office is required to develop and support environmental programs in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.

Executive Order 11988, Floodplain Management: This Executive Order, signed May 24, 1977, prevents federal agencies from contributing to the “adverse impacts associated with occupancy and modification of floodplains” and the “direct or indirect support of floodplain development.” In the course of fulfilling their respective authorities, federal agencies shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996): Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the system.

Executive Order 13007 Indian Sacred Sites (1996): Directs federal land management agencies to accommodate access to and ceremonial use 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.

Fish and Wildlife Act of 1956 (70 Stat. 1119; 16 U.S.C. 742a-742J), as amended: Establishes a comprehensive fish and wildlife policy and directs the Secretary of the Interior to provide continuing research; extension and conservation of fish and wildlife resources.

Fish and Wildlife Improvement Act of 1978: Improves the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.

Land and Water Conservation Fund Act (LWCFA) of 1965: Provides funds from leasing bonuses, production royalties and rental revenues for offshore oil, gas, and sulphur extraction to the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service, and state and local agencies for purchase of lands for parks, open space, and outdoor recreation.

Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715d, 715e, 715f-715r): Establishes the Migratory Bird Conservation Commission, which consists of the Secretaries of the Interior (chairman), Agriculture, and Transportation, two members from the House of Representatives, and an ex-officio member from the state in which a project is located. The Commission approves acquisition of land and water, or interests therein, and sets the priorities for acquisition of lands by the Secretary for sanctuaries or for other management purposes. Under this Act, to acquire lands, or interests therein, the state concerned must consent to such acquisition by legislation. Such legislation has been enacted by most states.

Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-s, 45 Stat. 1222), as amended: Authorizes acquisition, development, and maintenance of migratory bird refuges; cooperation with other agencies, in conservation; and investigations and publications on North American birds. Authorizes payment of 25 percent of net receipts from administration of national wildlife refuges to the country or counties in which such refuges are located.

Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat. 51), as amended: The “Duck Stamp Act,” as this March 16, 1934, authority is commonly called, requires each waterfowl hunter 16 years of age or older to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited in a special Treasury account known as the Migratory Bird Conservation Fund and are not subject to appropriations.

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 50 CFR Subchapter B), as amended: Implements treaties with Great Britain (for Canada) and Mexico for protection of migratory birds whose welfare is a federal responsibility. Provides for regulations to control taking, possession, selling, transporting, and importing of migratory birds and provides penalties for violations.

National and Community Service Act of 1990 (42 U.S.C. 12401; 104 Stat. 3127): Public Law 101 610, signed November 16, 1990, authorizes several programs to engage citizens of the U.S. in full and/or part time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Several provisions are of particular interest to the U.S. Fish and Wildlife Service.

American Conservation and Youth Service Corps: As a federal grant program established under Subtitle C of the law, the Corps offers an opportunity for young adults between the ages of 16 25, or in the case of summer programs, 15 21, to engage in approved human and natural resources projects which benefit the public or are carried out on federal or Indian lands.

To be eligible for assistance, natural resources programs will focus on improvement of wildlife habitat and recreational areas, fish culture, fishery assistance, erosion, wetlands protection, pollution control and similar projects. A stipend of not more than 100 percent of the poverty level will be paid to participants. A Commission established to administer the Youth Service Corps will make grants to states, the Secretaries of Agriculture and Interior and the Director of ACTION to carry out these responsibilities.

Thousand Points of Light: Creates a non profit Points of Light Foundation to administer programs to encourage citizens and institutions to volunteer in order to solve critical social issues, and to discover new leaders and develop institutions committed to serving others.

National Historic Preservation Act of 1966 (16 U.S.C. 470 470b, 470c 470n): Public Law 89 665, approved October 15, 1966, (80 Stat. 915) and repeatedly amended, provides for preservation of significant historical features (buildings, objects and sites) through a grant in aid program to

the states. It establishes a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468 468d).

The Act establishes an Advisory Council on Historic Preservation, which was made a permanent independent agency in Public Law 94 422, approved September 28, 1976 (90 Stat. 1319). That Act also creates the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.

As of January 1989, 91 historic sites on national wildlife refuges have been placed on the National Register. There are various laws for the preservation of historic sites and objects:

Antiquities Act (16 U.S.C. 431 433): The Act of June 8, 1906, (34 Stat. 225) authorizes the President to designate as National Monuments objects or areas of historic or scientific interest on lands owned or controlled by the United States. The Act required that a permit be obtained for examination of ruins, excavation of archaeological sites and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army, and provided penalties for violations.

Archaeological Resources Protection Act (16 U.S.C. 470aa 470ll): Public Law 96 95, approved October 31, 1979, (93 Stat. 721): Largely supplants the resource protection provisions of the Antiquities Act for archaeological items.

This Act establishes detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from federal or Indian lands. It also establishes civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from federal or Indian land in violation of any provision of federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any state or local law.

Public Law 100 588, approved November 3, 1988, (102 Stat. 2983): Lowers the threshold value of artifacts triggering the felony provisions of the Act from \$5,000 to \$500, makes attempting to commit an action prohibited by the Act a violation, and requires the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the Nation.

Archeological and Historic Preservation Act (16 U.S.C. 469 469c): Public Law 86 523, approved June 27, 1960, (74 Stat. 220) as amended by Public Law 93 291, approved May 24, 1974, (88 Stat. 174) to carry out the policy established by the Historic Sites Act (see below), directed federal agencies

to notify the Secretary of the Interior whenever they find a federal or federally assisted, licensed or permitted project may cause loss or destruction of significant scientific, prehistoric or archeological data. The Act authorizes use of appropriated, donated and/or transferred funds for the recovery, protection and preservation of such data.

Historic Sites, Buildings and Antiquities Act (16 U.S.C. 461 462, 464 467): The Act of August 21, 1935, (49 Stat. 666) popularly known as the Historic Sites Act, as amended by Public Law 89 249, approved October 9, 1965, (79 Stat. 971) declares it a national policy to preserve historic sites and objects of national significance, including those located on refuges. It provides procedures for designation, acquisition, administration and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this Act. As of January 1989, 31 national wildlife refuges contained such sites.

National Environmental Policy Act of 1969 (P.L. 91 190, 42 U.S.C. 4321 4347, January 1, 1970, 83 Stat. 852) as amended by P.L. 94 52, July 3, 1975, 89 Stat. 258, and P.L. 94 83, August 9, 1975, 89 Stat. 424): Declares national policy to encourage a productive and enjoyable harmony between humans and their environment. Section 102 of that Act directs that “to the fullest extent possible:

- The policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and
- All agencies of the federal government shall...insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic technical considerations...”

Section 102(2)c of NEPA requires all federal agencies, with respect to major federal actions significantly affecting the quality the quality of the human environment, to submit to the Council on environmental Quality a detailed statement of:

- the environmental impact of the proposed action;
- any adverse environmental effect which cannot be avoided should the proposal be implemented;
- alternatives to the proposed action;
- the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and

- any irreversible and irretrievable commitments of resources which would be involved in the proposed action, should it be implemented.

National Wildlife Refuge System Administration Act of 1966 (Public Law 89-669; 80 Stat. 929; 16 U.S.C. 668dd-668ee), as amended:

This Act defines the National Wildlife Refuge System as including wildlife refuges, areas for protection and conservation of fish and wildlife which are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and WPAs. The Secretary is authorized to permit any use of an area provided such use is compatible with the major purposes for which such area was established. The purchase consideration for rights-of-way go into the Migratory Bird Conservation Fund for the acquisition of lands. By regulation, up to 40 percent of an area acquired for a migratory bird sanctuary may be opened to migratory bird hunting unless the Secretary finds that the taking of any species of migratory game birds in more than 40 percent of such area would be beneficial to the species. The Act requires an Act of Congress for the divestiture of lands in the system, except (1) lands acquired with Migratory Bird Conservation Commission funds, and (2) lands can be removed from the system by land exchange, or if brought into the system by a cooperative agreement, then pursuant to the terms of the agreement.

National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, October 9, 1997, Amendment to the National Wildlife Refuge System Administration Act of 1966):

This Act defines the mission of the National Wildlife Refuge System:

“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.”

Key provisions include the following:

- A requirement that the Secretary of the Interior ensures maintenance of the biological integrity, diversity, and environmental health of the National Wildlife Refuge System;
- The definition of compatible wildlife-dependent recreation as “legitimate and appropriate general public use of the [National Wildlife Refuge] System;”
- The establishment of hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation as “priority public uses” where compatible with the mission and purpose of individual national wildlife refuges;

- The refuge managers’ authority to use sound professional judgment in determining which public uses are compatible on national wildlife refuge and whether or not they will be allowed (a formal process for determining “compatible use”@ is currently being developed); and
- The requirement of open public involvement in decisions to allow new uses of national wildlife refuges and renew existing ones, as well as in the development of comprehensive conservation plans for national wildlife refuges.

North American Wetlands Conservation Act (103 Stat. 1968; 16 U.S.C. 4401 4412): Public Law 101 233, enacted December 13, 1989, provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico.

The Act converts the Pittman Robertson account into a trust fund, with the interest available without appropriation through the year 2006 to carry out the programs authorized by the Act, along with an authorization for annual appropriation of \$15 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act.

Available funds may be expended, upon approval of the Migratory Bird Conservation Commission, for payment of not to exceed 50 percent of the United States share of the cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands). At least 50 percent and no more than 70 percent of the funds received are to go to Canada and Mexico each year.

Refuge Recreation Act of 1962: Authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area’s primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Refuge Recreation Act of 1966 (Public Law 87-714; 76 Stat. 653-654; 16 U.S.C. 460k et seq.): Authorizes appropriate, incidental, or secondary recreational use on conservation areas administered by the Secretary of the Interior for fish and wildlife purposes.

Refuge Revenue Sharing Act (16 U.S.C. 715s): Section 401 of the Act of June 15, 1935, (49 Stat. 383) provides for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges.

Public Law 88 523, approved August 30, 1964, (78 Stat. 701) makes major revisions by requiring that all revenues received from refuge products, such as animals, timber and minerals, or from leases or other privileges, be deposited in a special Treasury account and net receipts distributed to counties for public schools and roads.

Public Law 93 509, approved December 3, 1974, (88 Stat. 1603) requires that moneys remaining in the fund after payments be transferred to the Migratory Bird Conservation Fund for land acquisition under provisions of the Migratory Bird Conservation Act.

Public Law 95 469, approved October 17, 1978, (92 Stat. 1319) expands the revenue sharing system to include National Fish Hatcheries and Service research stations. It also includes in the Refuge Revenue Sharing Fund receipts from the sale of salmonid carcasses. Payments to counties were established as:

1. On acquired land, the greatest amount calculated on the basis of 75 cents per acre, three fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land; and
2. On land withdrawn from the public domain, 25 percent of net receipts and basic payments under Public Law 94 565 (31 U.S.C. 1601 1607, 90 Stat. 2662), payment in lieu of taxes on public lands.

This amendment also authorizes appropriations to make up any difference between the amount in the Fund and the amount scheduled for payment in any year. The stipulation that payments be used for schools and roads was removed, but counties were required to pass payments along to other units of local government within the county which suffer losses in revenues due to the establishment of Service areas.

Refuge Trespass Act of June 28, 1906 (18 U.S.C. 41; 43 Stat. 98, 18 U.S.C. 145): Provides first federal protection for wildlife on national wildlife refuges. This Act makes it unlawful to hunt, trap, capture, willfully disturb, or kill any bird or wild animal, or take or destroy the eggs of any such birds, on any lands of the United States set apart or reserved as refuges or breeding grounds for such birds or animals by any law, proclamation, or executive order, except under rules and regulations of the Secretary. The Act also protects government property on such lands.

Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41. Stat 686) B Section 41 of the Criminal code, title 18: Consolidates the penalty provisions of various acts from January 24, 1905 (16 U.S.C. 684-687; 33 Stat. 614), through March 10, 1934 (16 U.S.C. 694-694b; 48 Stat. 400) and restates the intent of Congress to protect all wildlife within federal

sanctuaries, refuges, fish hatcheries and breeding grounds. The Act provides that anyone (except in compliance with rules and regulations promulgated by authority of law) who hunts, traps or willfully disturbs any wildlife on such areas, or willfully injures, molest or destroys any property of the United States on such lands or waters, shall be fined, imprisoned, or both.

Rehabilitation Act of 1973 (29 U.S.C. 794), as amended: Title 5 of P.L. 93-112 (87 Stat. 355), signed October 1, 1973, prohibits discrimination on the basis of handicap under any program or activity receiving federal financial assistance.

Transfer of Certain Real Property for Wildlife Conservation purposes Act of 1948: Provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.

Wilderness Act of 1964: Public Law 88-577, approved September 3, 1964, directs the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems for inclusion in the National Wilderness Preservation System.

Administration of national wildlife refuges is governed by bills passed by the United States Congress and signed into law by the President of the United States, and by regulations promulgated by the various branches of the government. Following is a brief description of some of the most pertinent laws and statues establishing legal parameters and policy direction for the National Wildlife Refuge System:

Fish and Wildlife Conservation Act of 1980 (Public Law 96-366, September 29, 1980, 16 U.S.C. 2901-2911, as amended 1986, 1988, 1990 and 1992): Creates a mechanism for federal matching funding of the development of state conservation plans for non-game fish and wildlife. Subsequent amendments to this law require that the Secretary monitor and assess migratory nongame birds, determine the effects of environmental changes and human activities, identify birds likely to be candidates for endangered species listing, and identify conservation actions that would prevent this from being necessary. In 1989, Congress also directed the Secretary to identify lands and waters in the Western Hemisphere, the protection, management or acquisition of which would foster conservation of migratory nongame birds. All of these activities are intended to assist the Secretary in fulfilling the Secretary's responsibilities under

the Migratory Bird Treaty Act and the Migratory Bird Conservation Act, and provisions of the Endangered Species Act implementing the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere.

Refuge Revenue Sharing Act of 1978 (Public Law 95-469, October 17, 1978, [amended 16 U.S.C. 715s]; 50 CFR, part 34): Changes the provisions for sharing revenues with counties in a number of ways. It makes revenue sharing applicable to all lands administered by the Service, whereas previously it was applicable only to areas in the National Wildlife Refuge System. The new law makes payments available for any governmental purpose, whereas the old law restricted the use of payments to roads and schools. For lands acquired in fee simple, the new law provides a payment of 75 cents per acre, 3/4 of 1 percent of fair market value or 25 percent of net receipts, whichever is greatest, whereas the old law provided a payment of 3/4 of 1 percent adjustment cost or 25 percent of net receipts, whichever was greater. The new law makes reserve (public domain) lands entitlement lands under Public Law 94-565 (16 U.S.C. 1601-1607, and provides for a payment of 25 percent of net receipts.

The new law authorizes appropriations to make up any shortfall in net receipts, to make payments in the full amount for which counties are eligible. The old law provided that if net receipts were insufficient to make full payment, payment to each county would be reduced proportionality.

Section 401 of the Federal Water Pollution Control Act of 1972 (Public Law 92-500; 86 Stat. 816, 33 U.S.C. 1411): Requires any applicant for a federal license or permit to conduct any activity which may result in a discharge into navigable waters to obtain a certification from the state in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over navigable waters at the point where the discharge originates or will originate, that the discharge will comply with applicable effluent limitations and water quality standards. A certification obtained for construction of any facility must also pertain to subsequent operation of the facility.

Section 404 of the Federal Water Pollution Control Act of 1972 (Public Law 92-500, 86 Stat. 816):

Authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearing, for discharge of dredged or fill material into navigable waters of the United States, including wetlands, at specified disposal sites. Selection of disposal sites will be in accordance with guidelines developed by the Administrator of the Environmental Protection Agency in conjunction with the Secretary of the Army. Furthermore, the Administrator can prohibit or restrict use of any defined area as a disposal site whenever she/he determines, after notice and opportunity for public hearings, that discharge of such materials into such areas will have an unacceptable adverse effect on municipal water supplies, shellfish beds, fishery areas, wildlife, or recreational areas.

Regulations:

National Wildlife Refuge Regulations for the most recent fiscal year (50 CFR 25-35, 43 CFR 3103.2 and 3120.3-3): Provides regulations for administration and management of national wildlife refuges including mineral leasing, exploration, and development.

Rights-of-Way General Regulations (50 CFR 29.21; 34 fr 19907, December 19, 1969): Provides for procedures for filing applications. Provides terms and conditions under which rights-of-way over, above, and across lands administered by the Service may be granted.

Use of Off-Road Vehicles on Public Lands (Executive Order 11644, Federal Reg. Vol. 37, No. 27, February 9, 1972): Provides policy and procedures for regulating off-road vehicles.

Wilderness Preservation and Management] (50 CFR 35; 78 Stat. 890; 16 U.S.C. 1131-1136; 43 U.S.C. 1201): Provides procedures for establishing wilderness units under the Wilderness Act of 1964 on units of the National Wildlife Refuge System.

Appendix C

Public Involvement

Public Scoping

Public scoping was completed in December 2004. A public meeting was held in Martin South Dakota on November 30, 2004.

Ten people attended the meeting and in addition 13 written comments were received during the open comment period. Comments received identified biological, social, and economic concerns regarding management.

Public comments were reviewed and used throughout the planning process. Issues and concerns in the draft CCP and EA were identified through discussions with planning team members and through the public scoping process. Comments were received orally at meetings, via e-mail and in writing.

Public Comments

The following issues, concerns and comments are a compilation and summary of those expressed during the January-February 2006 comment period for the draft CCP and EA. Comments were provided by the public, federal and state agencies, local and county governments, private organizations and individuals concerned about the natural resources and public use of Lacreek NWR and WMD.

Wildlife

Comment:

Several comments were made regarding the management and control of prairie dogs. Commentors want the refuge implement controls that would reduce prairie dog town expansion off the refuge onto private lands.

Response:

The CCP outlines management goals, objectives and strategies to address prairie dog management on the refuge. Black-tailed prairie dogs are an integral part of the wildlife community and it is appropriate to maintain a viable population on the refuge. The step down prairie dog management plans also addresses the implementation of biological controls of prairie dogs on the refuge.

Comment:

Trumpeter Swan Management should include maintaining a reserve of water during severe cold periods to maintain open water for winter

habitat and winter public viewing opportunities for the public. Pool 7 should be the preferred location to reserve water for winter use by swans.

Response:

Limiting disturbance of Trumpeter Swans at key foraging areas during winter is important as well as providing open water. During periods of extremely cold weather, the swans concentrate at the trout ponds. By closing the loop trail that crosses trout pond #2 will reduce disturbance and might increase the probability of survival and reproduction.

Public Use

Comment:

Several comments both verbal and written, sportsmen, landowners and neighbors were made regarding the closure of ditches to pass shooting both for and against it. Some commentors requested that the refuge not pursue a rule change by the South Dakota Game, Fish, and Parks Commission to restrict hunting from both sides of the road ditches in three sections of county roads, while others supported it.

Response:

Three sections of county road have been identified as potential safety concern adjacent to the refuge. These sections of road receive the majority of vehicle traffic and also the majority of pass shooting from road ditches. Closing these sections of road will address safety concerns. However, pass shooting will still be permitted around the remainder of the refuge boundary.

Comment:

Several comments were received in support of continued management of the Little White River Recreation Area goals, objectives and strategies under the proposed action.

Response:

No Change. The service has adopted the proposed action.

Upland Habitat Management

Comment:

The plan does not adequately describe “weedy trees” or “other native trees”.

Response:

Agree. A definition of weedy trees and other native trees has been added to the document.

Comment:

The plan does not describe the purpose for allowing tree breaks to deteriorate for future removal and how that provides optimal habitat for resident species.

Response:

The goals and objectives for upland habitat focus on habitat requirements for grassland birds of management concern. Although resident species are part of the overall management of the refuge, the management of grassland birds of management concern is the priority for uplands.

Capital Improvement Goal

Little White River Recreation Area Project

Comment:

Several comments were received supporting implementation of the project.

Response:

Agree. The service will complete any required modifications to the Little White River Dam.

Proposed Action Alternative B

Comment:

Several comments were received in support the Proposed Action Alternative B integrated restoration.

Response:

The service has adopted this alternative.

Wetland Habitat

Comment:

Comments were received on pool, filling in ditches and carp management. Commentors were revolved around techniques for pool management, the creation of wetlands, and control of carp and manage turtles.

Fire Management

Comment:

Comments were received in support of using fire as a management tool.

Response:

Agree. The refuge will use fire as a management tool to control invasive plants and develop habitat.

Invasive Species

Comment:

Comments were received asking the refuge to do a better job controlling Canada thistle.

Response:

The CCP outlines strategies to control noxious weeds.

List of Recipients

The following list of recipients was developed for this CCP.

Federal Officials

U.S. Representative Stephanie Herseth,
Washington DC,
Rapid City, SD, Area Director

U.S. Senator Tim Johnson, Washington, DC,
Rapid City, SD, Area Director

U.S. Senator John Thune, Washington, DC
Rapid City, SD, Area Director

Federal Agencies

Oglala Sioux Tribal Council, Pine Ridge, SD

Rosebud Sioux Tribal Council, Rosebud, SD

U.S. Geological Survey, Northern Prairie Research
Center, Jamestown, SD

U.S. Geological Survey, Fort Collins Science
Center, Fort Collins, CO

U.S. Fish and Wildlife Service, Ecological Services,
Pierre SD

U.S. Fish and Wildlife Service, SD, Sand Lake
NWR and WMD Huron, WMD, Lake Andes NWR
and WMD, Karl Mundt NWR, Madison WMD,
Waubay NWR and WMD

USDA Forest Service, Chadron, NE

USDA, Natural Resources Conservation Service,
Martin Service Center, Martin, SD

Badlands National Park, Interior, SD

South Dakota State Officials

Representative Cooper Garnos, Presho

Representative Barry Jensen, White River

Representative Jim Bradford, Pine Ridge

Representative, Paul Valandra, Pine Ridge

Senator, Theresa Two Bulls, Pine Ridge

Senator, John Koskan, Wood

Governor Mike Rounds, Pierre

State Agencies

Department of Agriculture, Pierre

Department of Emergency Management, Pierre

Department of Environment and Natural Resources, Pierre

Department of Game, Fish and Parks, Pierre

Division of Water Rights, Pierre

State Historic Preservation Officer, Pierre

State Conservationist, Pierre

Farm Bureau Federation, Huron, SD

Local Agencies

City of Martin South Dakota, SD

Bennett and Shannon County Conservation District, Martin, SD

Bennett County Government, Martin, SD

Media

Individuals (15 persons)

Appendix D

Planning Team and Contributors

Planning Team

This plan is the result of the efforts by members of the planning team for Lacreek NWR. The Comprehensive Conservation Plan was written by refuge staff and the refuge planning with input from other team members.

<i>Name</i>	<i>Title</i>	<i>Agency</i>
Linda Kelly	Planning Team Leader	USFWS
Tom Koerner	Project Leader	USFWS
Shilo Comeau-Kingfisher	Refuge Biologist	USFWS
Matt Sprenger	Assistant Refuge Manager	USFWS
Ann Harris	Administrative Support	USFWS
Mark Ely	Regional Office GIS Specialist	USFWS
Bob Barrett	Refuge Supervisor	USFWS
Tom Beck	Conservation Officer	SDGFP
Benny Ayres	Heavy Equipment Operator	USFWS
Pat Harty	Prescribed Fire Specialist	USFWS
Joe Nichols	Private Lands Biologist	USFWS
Ryan Mueller	Maintenance Worker	USFWS
Bill Kocourek	Tractor Operator	USFWS
Steve Nueharth	Tractor Operator	USFWS

Other Contributors

The Service would like to acknowledge the efforts of the following individuals toward the completion of this CCP.

<i>Name</i>	<i>Title</i>	<i>Organization</i>
Murray Laubhan	Ecologist	USGS, Jamestown, ND
Rachel Laubhan	Biologist	USFWS, Jamestown, ND
Meg Van Ness	Regional Archaeologist	USFWS, Lakewood, CO
Mimi Mather	Planner	Shapins Associates, Boulder, CO
Tom Gibney	Planner	Shapins Associates, Boulder, CO
Melvie Uhland	Outdoor Recreation Planner	USFWS, Lakewood, CO
Cindy Souders	Outdoor Recreation Planner	USFWS, Lakewood, CO
Galen Green	Fire Ecologist	USFWS, Lakewood, CO

Appendix E

Black-tailed Prairie Dog Management Plan, Lacreek National Wildlife Refuge

BLACK-TAILED PRAIRIE DOG MANAGEMENT PLAN

Lacreek National Wildlife Refuge
Martin, South Dakota

INTRODUCTION

In July 1998, the National Wildlife Federation petitioned the U.S. Fish and Wildlife Service (USFWS) to list the black-tailed prairie dog as threatened under the Endangered Species Act. In March of 1999, a moratorium of all black-tailed prairie dog control on U.S. Fish and Wildlife Service lands was issued by the Director. In May 2000, the USFWS concluded that this species warranted listing, but was precluded from being listed due to other higher priority species concerns and resource constraints. In August of 2004, an updated evaluation of the best available scientific information led the U.S. Fish and Wildlife Service to determine that the black-tailed prairie dog should be removed as a candidate for listing.

In March of 2005, the South Dakota legislature passed Senate Bill 216. This measure sets forth conditions under which prairie dogs will be considered pests by the state. It also outlines a formalized complaint process by which private landowners may file complaints against adjacent landowners. If the adjacent private landowner does not comply with controlling a 1 mile buffer or mutually agreed to buffer, then the County Weed Board may be authorized to enter onto private lands to control prairie dogs and bill the landowner for that work. The state Department of Agriculture will attempt to negotiate control measures on federal and Tribal lands where formal complaints are received from adjacent private landowners.

During this same 1999-2005 period, a severe drought hit western South Dakota. A cessation of all control activities on federal lands combined with a severe drought precipitated a rapid increase in total acres occupied by black-tailed prairie dogs in southwestern South Dakota. The number of occupied acres on Lacreek National Wildlife Refuge (NWR) showed a similar trend, and increased an estimated 343% from 1997 to 2004 and the number of individual prairie dog towns increased from 3 in 1997 to 10 in 2004 (refuge files).

Lacreek NWR completed the Comprehensive Conservation Plan (CCP) in February 2006. Recent emphasis by refuge staff on prairie restoration and management has raised some interesting dilemmas with regards to prairie dog towns on Lacreek NWR. One of the most effective means available for control of noxious weeds such as Canada thistle and replacement of monotypic stands of crested wheatgrass and smooth brome grass in previously farmed sites is to farm for 3 to 5 years and then reseed. Future seedings will include 100+ species of locally collected grass, sedge, and forb species. The inability to control prairie dogs and plow through these sites in order to remove undesirable plants and prepare a seedbed for high diversity seeding would necessarily cause staff to table attempts at prairie restoration utilizing this technique. The alternatives listed for upland management in the CCP would need to be revised to reflect this. The scoping process for this CCP also identified prairie dog management as one of the major issues for adjacent landowners and residents of Bennett County. These facts have led us to believe a management plan is needed to guide us in management of black-tailed prairie dogs on Lacreek NWR.

Establishing Authority for Lacreek NWR:

- *Executive Order, August 26, 1935* “...as a refuge and breeding ground for migratory birds and other wildlife...”
- *Migratory Bird Conservation Act* “...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”
- *Refuge Recreation Act* “...for public recreation on...developments adjacent to conservation areas in existence.”

Historical Occurrence of Black-tailed Prairie Dogs on Lacreek NWR

Records indicate that black-tailed prairie dogs were present at the time of acquisition of the Refuge in 1935. The Annual Narrative Report for the Refuge in 1976 stated that black-tailed prairie dogs were absent from the Refuge from about 1940 until the middle 1960's. Aggressive control of prairie dogs was conducted during this period. A memo in the refuge files indicates that 2 towns “with 12 burrows and mounds of dirt” were detected in the summer of 1967. By 1969, 2 towns of 2.3 acres each were recorded in Units 9NW-1 and 6E-4. A significant reduction in control efforts occurred starting in 1972 due to the issuance of Presidential Executive Order 11643 by President Nixon, which prohibited toxicant use on federal lands with federal funds. This Executive Order was rescinded in 1975. By 1979, 4 prairie dog towns had become well established on Units LCN-6b (10 acres), LCN-2f (350 acres), 9NW-1 (75 acres), and 10 NW-1 (50 acres). Aggressive control efforts began again in 1979 which eliminated the towns in Units LCN-6b and LCN-2f. The dog towns in Units 9NW-1 and 10 NW-1 were reduced, with zinc phosphide oats and sodium nitrate gas cartridges, to 55 and 40 acres. Throughout the 1980's and into the 1990's, prairie dogs were controlled to keep these 2 towns about the same size and prevent new ones from establishing. All control efforts were halted in 1999 and black-tailed prairie dogs have been allowed to expand to the current estimate of 11 towns totaling 501.7 acres in March of 2005.

Importance of Prairie Dogs

The Refuge Manual addresses our requirements as refuge managers to “focus on native species and natural communities...” and to “strive to maintain populations of breeding individuals that are genetically viable and functional.” under 601 FW 3, Biological Integrity, Diversity, and Environmental Health. This policy outlines that refuges that currently support black-tailed prairie dogs should strive to maintain viable populations.

Black-tailed prairie dogs are an integral part of the wildlife community and it is appropriate to maintain a viable population on Lacreek NWR. Many wildlife species associate with or depend upon prairie dogs during some portion of their life cycle. Over 167 vertebrate species have been documented using prairie dog towns (Campbell and Clark 1981, Clarke et al. 1982, Knowles 1994, Reading et al. 1989, Sharps and Uresk 1991). Some species feed on prairie dogs, but others utilize the burrow systems or the unique habitat to fulfill their needs. Vacant burrows are used by cottontail rabbits, several species of small rodents, tiger salamanders (Kolbe et al. 2002), prairie rattlesnakes (Knowles 1994), bull snakes, and by burrowing owls (refuge files). Our most active towns have had successful nesting by burrowing owls and as the size and number of dog towns have increased, so has the documented sightings of burrowing owls on the Refuge. Many other passerine species, such as meadowlarks, grasshopper sparrows, lark buntings, McCown's longspurs, and horned larks prefer the sparsely vegetated habitat created on dog towns due to the

greater visibility of seeds and insects (Agnew et al. 1986). In addition to their importance to other wildlife species, prairie dogs are also important to wildlife observers and photographers.

SITE DESCRIPTION

Lacreek NWR is located in the Lake Creek Valley in southern Bennett County on the northern edge of the Nebraska Sandhills. The refuge covers 16,410 acres. The original refuge (9,362 acres) was acquired in 1935 primarily as waterfowl nesting habitat. In 1972, the 6,665 acre Brown Ranch was added to the refuge. In 1981 a clear title was received to the 223 acre Little White River Recreation Area, and the 160 acre Charles Emley inholding was purchased in 1985.

The uplands are composed of approximately 4,560 acres of native grasses, 5,500 acres of restored/introduced grasslands, and a mixture of croplands, non-commercial forest, seasonally and semi-permanently flooded basins, and the choppy sandhills. The primary water sources are Lake Creek, Cedar Creek, Elm Creek, and several smaller spring-fed creeks that flow from the sandhills.

Soils

Dominant soil types at Lacreek NWR as listed in the Bennet County Soil Survey:

Marsh (Ma) – 0-2% slope, VIIIw1 = Marshes having more than 50% vegetation not suited for grazing. Best suited for wildlife and recreation.

Valentine fine sand – rolling (VaC) – VIIe7 = Deep, sandy and very sandy soils on gently undulating to rolling (2-15% slope) uplands. These soils have very severe wind erosion hazards. They are not suited for cultivation.

Valentine fine sand – hilly (VaD) – VIIe1 = Deep, very sandy soils on rolling to very hilly (9-50% slope) uplands. These soils have a very severe wind erosion hazard.

Mosher –Minatare Complex (Mm) –

Mosher part IVs2 = moderately well drained soils with 4-10 inches of friable, loamy surface layers over dense, very slowly permeable, claypan subsoils that contain salts. They occur in nearly level (0-2% slope) upland swales and on uplands.

Minatare part VI-s1 = Moderately well to poorly drained soils on nearly level to sloping (0-9%) uplands or in depressions. Dense, compact subsoils near the surface, salts, or ponding, or a combination of these limitations make these soils generally unsuitable for cultivation.

Minatare (Me) VI-s1 Moderately well to poorly drained soils on nearly level to sloping (0-9%) uplands or in depressions. Dense, compact subsoils near the surface, salts, or ponding, or a combination of these limitations make these soils generally unsuitable for cultivation.

Loup fine sandy loam – (Lo) Vw3 = Very poorly drained and poorly drained sandy soils in depressions and on bottoms with water tables at or near the surface during much of the growing season. These soils are too wet for crops but may be suited to tame grasses.

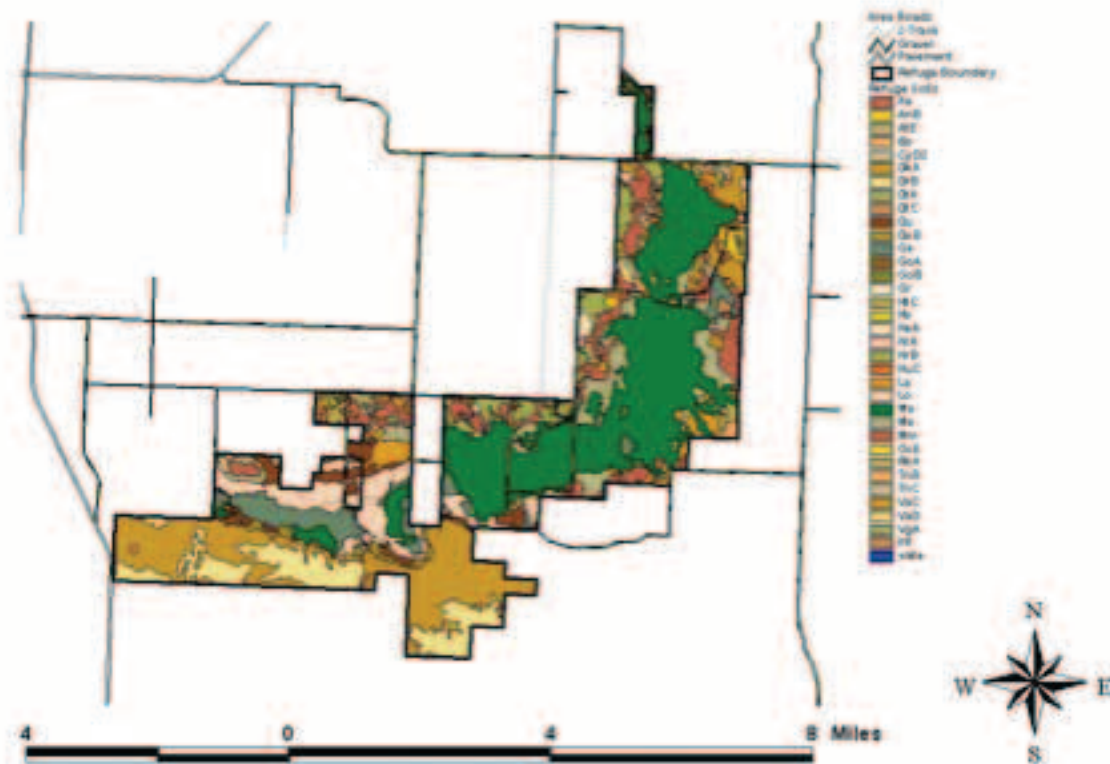
Gannett fine sandy loam – (Ga) Vw3 = Very poorly drained and poorly drained sandy soils in depressions and on bottoms with water tables at or near the surface during much of the growing season. These soils are too wet for crops but may be suited to tame grasses.

Keith-Rosebud silt loams – (KrB) II-c2 = Deep, and moderately deep, loamy, well drained soils on nearly level (0-2%) uplands. Moisture is inadequate in most years and these soils have a slight to moderate wind erosion hazard.

Dunday and Elsmere loamy fine sands (Du)

Dunday part VI-e7 = Deep, sandy and very sandy soils on gently undulating to rolling (2-15%) uplands. These soils have very severe wind erosion hazards. Not suited for cultivation.

LaCreek NWR Soils Units



Compatible Soils and Potential Habitat for Black-tailed Prairie Dogs

Soil type is a significant factor in determining where towns may exist (Koford 1958). Sandy soils are unsuitable for maintaining an extensive burrow system. Hydric soils also are unsuitable, as the burrows would extend below the groundwater table in most places on Lacreek NWR. An evaluation of soil types in 2002 indicated that a total of 4,086 acres or 25% of Lacreek NWR’s total acres contain compatible soil types and likely could support black-tailed prairie dog towns. They lie in a relatively narrow band primarily on the north and east sides of the refuge and most are adjacent to private land. It is also important to recognize that nearly 70% of the refuge contains soils unsuitable for prairie dog towns, and historically never supported prairie dogs.

Surrounding Land Uses

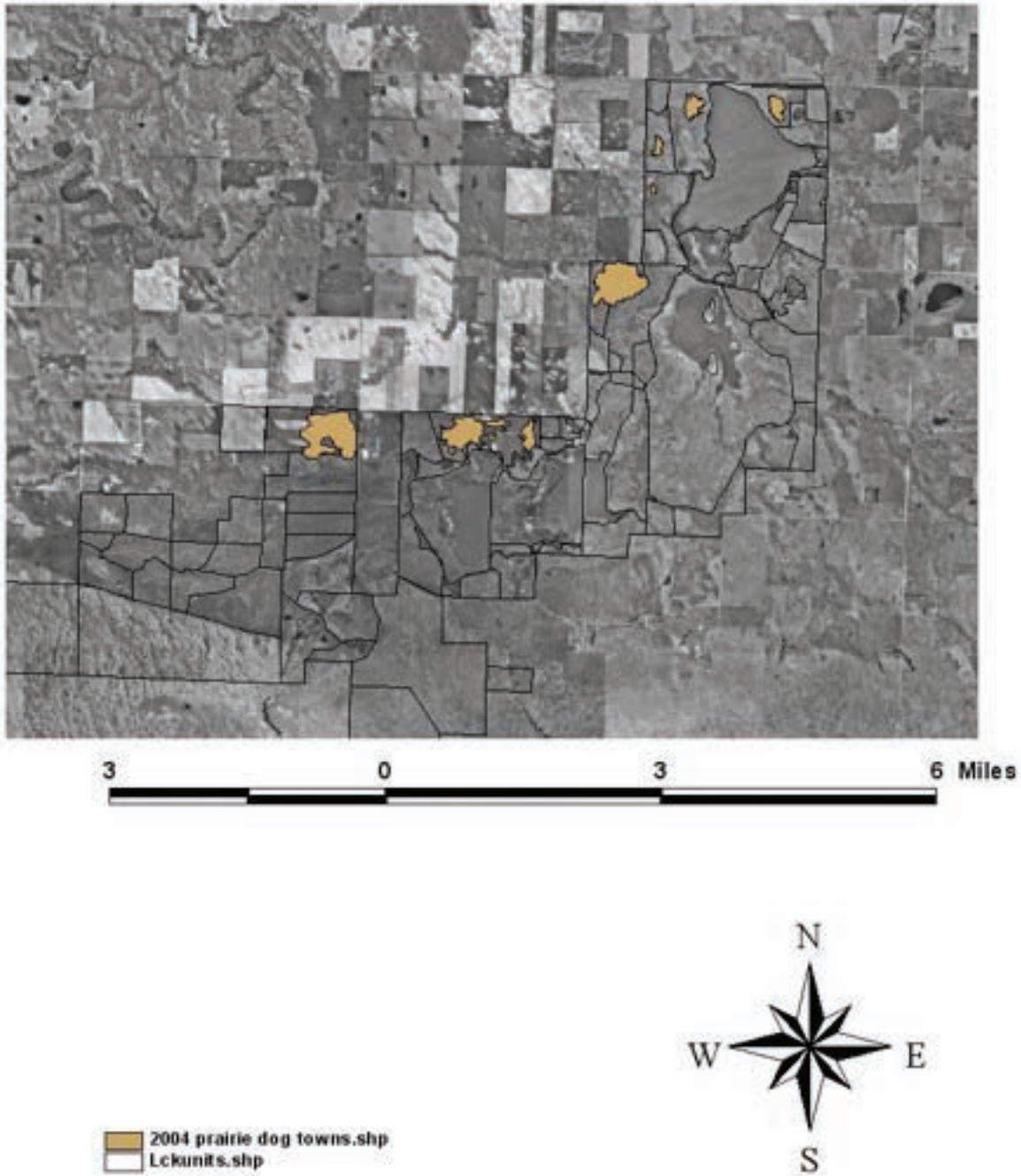
The major industry and source of income throughout Bennett County is livestock production and dryland farming. Native mixed grass prairie, planted cool season grasses, and alfalfa make up the majority of the pasture and hayland. The major crops planted are winter wheat, hay, proso, and sorghum millet, and sunflowers. During wet years, some dryland corn and soybeans are

also planted. Farmsteads are sparsely scattered across Bennett County. The main community is Martin located 12 miles to the northwest (1,100 residents). No moratorium on black-tailed prairie dog control was imposed on private lands. It is unknown how many acres of private land in Bennett County contain prairie dogs; however staff have observed a number of active towns on private rangelands within 3 miles of the refuge. Extensive acreages of black-tailed prairie dog towns currently exist on both the Pine Ridge and Rosebud Indian Reservations adjacent to Bennett County.

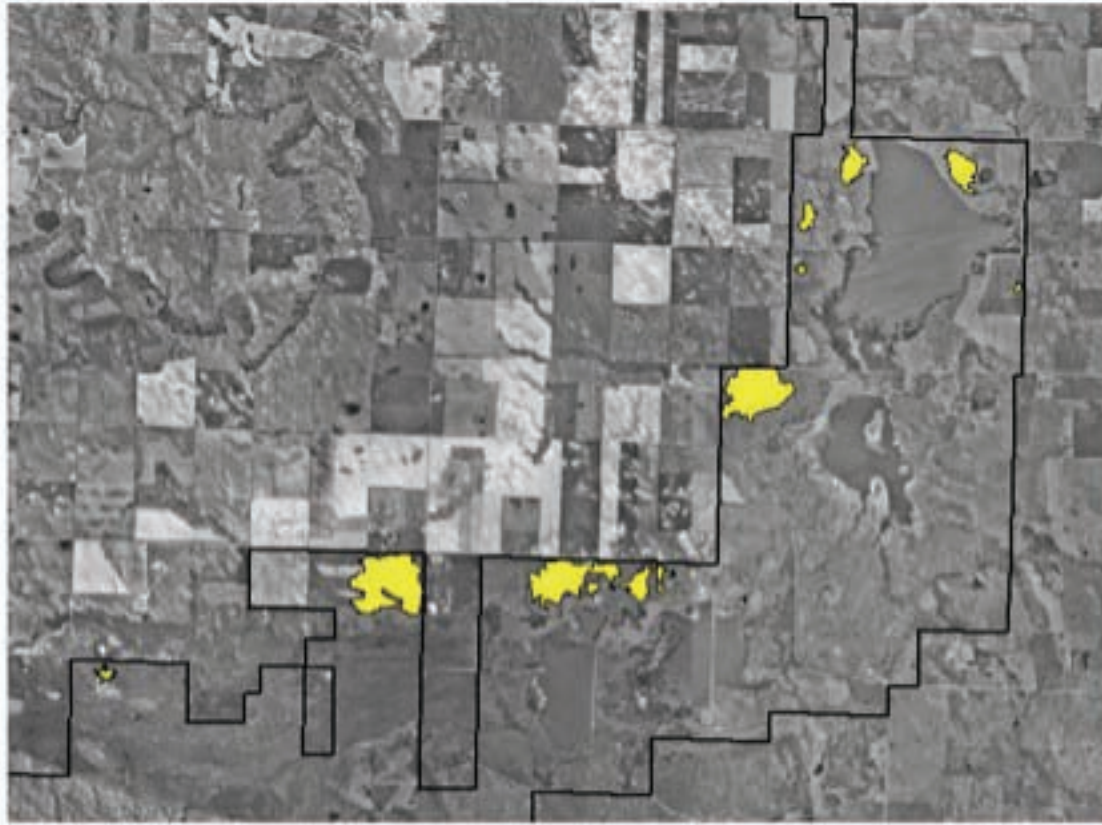
Current Black-tailed Prairie Dog Population Estimates and Distribution on Lacreek NWR

Both the size and number of prairie dog towns has rapidly expanded during the last six years on Lacreek NWR. No estimates have been made of the total number of individual black-tailed prairie dogs on Lacreek NWR, however we plan to begin estimating population size in 2005. A survey completed in March of 2005 by refuge staff indicated there were 11 active prairie dog towns covering 501.7 acres. This is an increase of 55.1 acres from April 2004 to March 2005. Two towns merged into one town and 2 additional towns started during this period (refuge files).

2004 LaCreek NWR Mapped Black-tailed Prairie Dog Towns



March - 2005 Mapped Prairie Dog Towns LaCreek National Wildlife Refuge



3000 0 3000 6000 Miles

 Lckown_line.shp
 Prairiedog05.shp



ISSUES

Lacreek NWR held scoping meetings for the development of its CCP in November 2004. A number of issues with regards to black-tailed prairie dog management were identified and explored during this process. Several issues related to potential conflicts with current and planned future management and restoration. Many of the issues related to adjacent private lands. A more detailed discussion of these issues follows.

High Diversity Seedings (Prairie Restoration)

As mentioned earlier, plans for prairie restoration present refuge staff with a dilemma. A significant portion of the uplands in what would be considered mixed grass prairie was farmed prior to acquisition or during the early years of the refuge. These areas were typically seeded to crested wheatgrass, smooth brome grass, and/or intermediate wheatgrass and may have contained alfalfa, sweetclover, or other legume. Over time, these stands deteriorated and many were invaded by Canada thistle, Kentucky bluegrass, and other introduced species. Management of these introduced grasslands has utilized periodic grazing, haying, and prescribed burning. Significant effort is targeted towards control of Canada thistle and other invasive species. The CCP includes objectives and strategies which address this, including:

UPLAND SUBGOAL: Restore and enhance the mixed grass plant community to create a mosaic that reflects the habitat requirements for grassland dependent birds of management concern. In the uplands, greater than 20 percent of the habitats will be in each of the tall/medium/short categories and less than 5 percent in native fire tolerant shrubs.

Upland Objective A (tall): In 5 to 10 years, increase floristic quality assessment index by 10-25% in patches ≥ 50 hectares, with vegetation structures >40 cm in height, as measured during the nesting season within these patches, and >50 m from trees >5 meters in height.

Upland Objective B (medium): In 5 to 10 years, increase floristic quality assessment by 10-25% in patches ≥ 50 hectares with vegetation structures ranging from 15 cm to 40 cm in height, as measured during the nesting season, within these patches, and >50 m from trees >5 meters in height.

Upland Objective C (short): In 5 to 10 years increase floristic quality assessment index by 10% in patches >100 hectares with vegetation structures from ranging from 5 cm to 15 cm in height, as measured during the nesting season, and 100 meters from trees >5 meters in height.

Strategies:

1. Seed 100-300 acres/year of formerly cropped or exotic grass dominated uplands totaling 2,000 – 3,000 acres to >100 species of native grasses, sedges, and forbs.
2. Within designated grassland patches ≥ 50 hectares, remove trees > 5 meters in height and all non native trees.
3. Interseed 100-300 acres/year of existing grasslands totaling 1,500 – 3,000 acres to >100 species of native grasses, sedges, and forbs.
4. Conduct 200 to 1,500 acres of prescribed burning in upland habitats each year to encourage/promote increased FQA and plant structure.

5. Conduct 200 to 1,500 acres of prescribed grazing in upland habitats each year to encourage/promote increased FQA and plant structure.
6. Continued use of IPM strategies to reduce noxious weeds and other invasive species.

During the last 7 years, refuge staff have converted several of these fields to native grasses. The fields were farmed for one or more years to prepare a seedbed and control Canada thistle, crested wheatgrass, and smooth brome grass. The fields were seeded to 5 to 7 native warm and cool season grasses. Follow-up treatment included prescribed burning and herbicide applications. No forbs were included in the mix, due to the uncertainty of how much follow-up herbicide spraying would be needed, which would have killed most forbs. These fields currently have little Canada thistle and any noxious weeds that are present can be spot sprayed. They are relatively low in species diversity, and are primarily composed of 2 or 3 native grass species.

Refuge staff believes that farming remaining stands of exotic grasses for 3 to 5 years will remove the majority of invasive species. The sites could be treated by spot spraying after seeding, allowing for the incorporation of a larger number of native species, including forbs, in the seeding mix. During 2004, 114 grass, sedge, and forb species were harvested to be included in 2005 seedings on the refuge. Based on past results, we believe that enough seed can be harvested to plant up to 200 acres each year with 100+ native species.

The majority of prairie dog towns have established on the refuge in these prior farmed exotic grasslands. A similar pattern was also noted on Badlands National Park (Doug Albertson, personal communication). Several publications have indicated that prairie dogs are often associated with old farmsteads or areas where the ground has previously been disturbed (Koford 1958, Smith 1967, Cincotta 1985). The inability to remove prairie dogs prior to farming a site would lead to rapid re-establishment of prairie dogs. Significant dispersal of prairie dogs onto adjacent private lands would also be likely as a result of the tillage. The inability to farm these exotic grasslands after removal of prairie dogs would almost certainly lead to the failure to remove exotic grass and invasive species from the site.

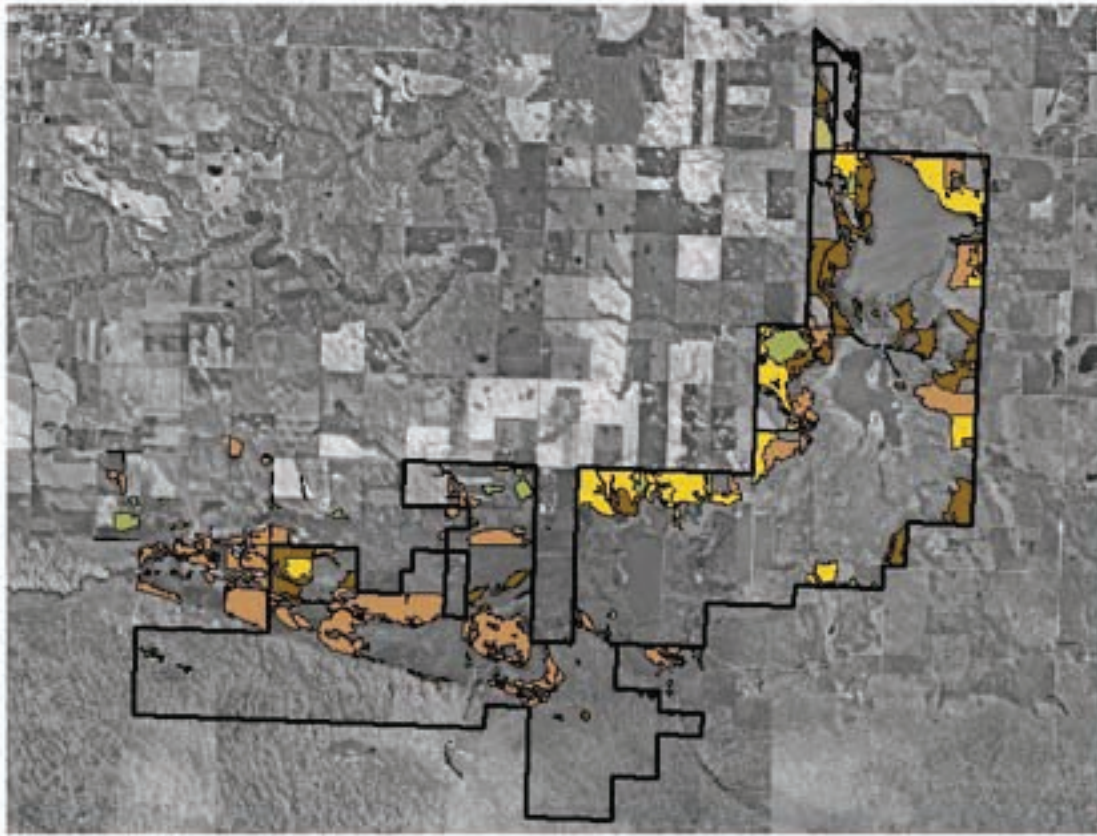
Many of the 11 towns currently established are a small part of larger fields to be restored. Farming everything except the small part of the field containing prairie dog burrows would lead to expansion into the newly tilled fields. Annual tillage would restrict the rate of expansion, however once the field is seeded, the opportunity for rapid town expansion would exist. Follow-up treatments of mowing and prescribed burning needed to assist with native species establishment may further encourage expansion and establishment of prairie dog towns.








Management for Grassland-dependent Bird Species

Although these introduced grasslands do provide migratory bird habitat (Finkbeiner 2002), the extensive weed control required and the very simple plant community make the areas less attractive to the suite of grassland dependent species found on the refuge. Refuge staff recognize that a diverse grassland plant community will support diverse grassland bird populations.

We also know that vegetative height, structure, and residual cover are important factors to consider for many species of grassland birds (Table 1.) (Skinner 1975, Ryan 1986, Renken and Dinsmore 1987, Kantrud and Higgins 1992, Volkert 1992, and Bakker 2003). Providing a mix of short, medium, and tall grassland through prescribed burning, grazing, and haying provide a mix of

LaCreek NWR Cool Season Exotics



-  IWR Boundary
-  *Agropyron cristatum* - (*Pascopyrum smithii*, *Hesperostipa comata*) Semi-natural Herbaceous Vegetation
-  *Agropyron intermedium* Semi-Natural Herbaceous Vegetation
-  Blacktailed Prairie Dog Town Grassland Complex
-  *Bromus inermis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation
-  *Cirsium arvense* - Weedy Forb Great Plains Herbaceous Vegetation (Provisional)
-  *Poa pratensis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation

habitat for the suite of grassland birds encountered on the refuge. We know that prairie dog towns typically lack medium and tall emergent grassland vegetation and have little residual cover due to the foraging and burrowing activities of the prairie dogs (M.S. Sid, et al. 1991). One study determined that over 80% of the forage (standing and residual vegetation) was removed by prairie dogs by August (Knowles 1986). Under the current management scenario of no direct control, prairie dogs may occupy a majority the grasslands north of Lake Creek and limit the available habitat for species requiring tall or medium grassland cover with residual vegetation.

Table 1. Nesting and foraging habitat requirements for selected grassland birds.

Species	Vegetation height	litter	Patch size	Distance from trees
Bobolink	25 to 45 cm	3.4 to 9.1 cm	40 ha	45 m
Burrowing owl	<13 cm	minimal	4 ha	>100 m
Dickcissel	21 to 100 cm	1.6 cm	10 ha	Prevent woody encroachment
Long-billed Curlew	<30 cm	minimal	42 ha	Avoids areas with high density trees and shrubs
Grasshopper sparrow	20 to 60 cm	Not available	8 ha	50 m
Sharp-tailed grouse	15 to 40 cm	Use areas that are idle for several years	60 ha	>50 m
Short-eared owl	30 to 60 cm	2-8 yrs. of residual cover	74 ha	Not available
Upland sandpiper	3 to 60 cm	2.3 cm	100 ha	100 m

Burning, Grazing, Mowing

A document titled Management of Black-tailed Prairie Dogs on Fish and Wildlife Service Lands (November 24, 2003) issued by the Regional Office, along with comments received by neighbors, partners, and reviewers of previous drafts of this plan indicate that burning, grazing, and mowing should not be completed on or adjacent to dog towns. The bare ground/low vegetation created may encourage prairie dog expansion. If this were incorporated into management as a hard and fast rule, management for grassland health would become more difficult on much of the refuge.

When prescribed fire is used as a management tool, typically units are burned with the safest boundaries, utilizing roads, field edges, open water, etc. to safely conduct a burn. A 3 acre prairie dog town in the middle of a burn unit plus a buffer around the town would require the unit to be split into many units to burn separately. The firebreaks utilized would no longer be determined by safety considerations. There is no guarantee that prairie dogs will not move and establish new towns, no matter how large a buffer that is created.

Burning or grazing conducted to improve the vigor and health of native vegetation may actually increase the vegetative height and discourage prairie dog expansion in certain situations. An evaluation completed by Matt Sprenger in 2002 looked at this management dilemma. He found that the dog towns which had expanded at the greatest rates actually had no management conducted. It appears that applying restrictions on management with a broad brush may not be the best strategy.

We believe that management should continue to be directed towards maintaining and/or improving plant health, which often includes prescribed burning or grazing. The cessation of the most effective grassland management tools available will almost certainly lead to a continual decline in the health of the grassland community, while providing a limited deterrent to prairie dog expansion.

We must also recognize that the expansion of prairie dog towns may in fact be encouraged by prescribed burning, grazing or mowing on some sites. Particularly during extended droughts in exotic grasslands that do not recover quickly following management. This will be factored into planning efforts for grazing, mowing, and prescribed burning.

Human Health and Safety Concerns

Local residents have expressed a number of human health and safety concerns associated with the occurrence of black-tailed prairie dogs. These are not major concerns for refuge staff and visitors; however they are real concerns as expressed by adjacent private landowners and community residents.

Prairie rattlesnakes are generally only observed on or near black-tailed prairie dog towns at Lacreek NWR by refuge staff. Although human bites have not been reported, several hunting dogs were reported to have been bitten on or near towns adjacent to the Refuge. Prairie rattlesnakes do use prairie dog burrows as winter hibernaculum, especially where no quality denning sites in rock outcrops are available (Knowles 1994). This phenomenon is observed on Lacreek NWR, as concentrations of rattlesnakes are observed in September and October on several towns used as hibernaculum. The abundance of small mammals on prairie dog towns may also attract rattlesnakes (Agnew et al 1987). These factors may lead to an increase in human and rattlesnake encounters, especially adjacent to occupied farmsteads during the fall denning period.

Prairie rattlesnakes are a native species found throughout the mixed and short grass prairies. Allowing rattlesnakes to exist in suitable habitat on Lacreek NWR is supported by current policy and management. We do believe, however, that increased human-rattlesnake encounters are likely to occur when prairie dog towns lie adjacent to occupied residences. The U.S. Forest Service also recognizes this in its management of prairie dog towns on National Grasslands adjacent to occupied residences, and actively controls prairie dogs in these areas (Greg Schenbeck, personal communication).

The possibility of humans contracting sylvatic plague due to the presence of prairie dogs is frequently cited as a concern. People usually get plague from being bitten by a rodent flea that is carrying the plague bacterium or by handling an infected animal. Black-tailed prairie dogs are known to be flea carriers. In the United States, the last urban plague epidemic occurred in Los Angeles in 1924-25. Since then, human plague in the United States has occurred as mostly scattered cases in rural areas (an average of 10 to 15 persons each year) (Center For Disease Control Website: <www.cdc.gov>).

Modern antibiotics are effective against plague, but if an infected person is not treated promptly, the disease is likely to cause illness or death. Early detection may be difficult, as flu like symptoms are

commonly reported, and infected individuals may not realize the seriousness of the illness. Most human cases in the United States occur in two regions: 1) northern New Mexico, northern Arizona, and southern Colorado; and 2) California, southern Oregon, and far western Nevada (Center for Disease Control Website: <www.cdc.gov>). According to the South Dakota Department of Health, there has not been a case of human plague reported in South Dakota since 1923. It appears that the possibility of a human contracting plague from fleas associated with prairie dogs is extremely remote. For some individuals, however, the concern still exists.

Monkey pox was recently a high profile news story with regards to prairie dogs. The origin of the outbreak was traced to a shipment of prairie dogs in the pet trade. These prairie dogs then infected humans which handled them. United States Department of Agriculture, Animal and Plant Health Inspection Service immediately placed restrictions on the trade and handling of prairie dogs. It does not appear that this disease is established in wild populations of prairie dogs.

The burrowing activities associated with dog towns frequently raises concern within the local community. While not a direct human health and safety issue, horseback riding in dog towns may become difficult as horses may stumble due to the mounds and holes created. Riders may be thrown from the horse as it stumbles. Livestock are also widely reported to suffer injury due to stepping in holes. This is not well documented in the literature, however it is widely circulated in local discussions. These are not concerns on the refuge, however they become a concern to neighboring landowners when prairie dogs on the refuge are perceived to or in fact do re-populate dog towns that have been controlled on adjacent private lands.

We also have one cemetery that lies as an in holding within the refuge boundary. We expect that left unmanaged, prairie dogs will expand onto private hay land adjacent to this cemetery. The owners of the cemetery and family members of the deceased will not likely tolerate prairie dog burrowing activities within the cemetery and will look to the refuge for relief. The U.S. Forest Service also recognizes this in its management of prairie dog towns on National Grasslands adjacent to cemeteries, and actively controls prairie dogs in these areas (Greg Schenbeck, personal communication). Preventing prairie dog towns from expanding to areas immediately adjacent to the cemetery, using a combination of tools, is needed.

Local Perceptions and Attitudes

The general local perception and attitude towards prairie dogs appears to be consistent with recent research conducted on the subject (Lamb and Kline, 2003). Those having more direct experience with prairie dogs tend to focus on the adverse effects of and need to control prairie dogs. The most common opinions expressed emphasize the competition with livestock for grazing, changes in plant communities (grass to annual forbs) due to burrowing (Coppock 1981), and soil erosion caused by bare ground and burrowing activities. Lamb and Kline also indicate that those with little direct contact with prairie dogs tend to place more value on prairie dogs and their role in the ecosystem.

Another indication of local perceptions of prairie dogs is Senate Bill 216 passed by the South Dakota Legislature. The bill outlines when prairie dogs may be considered pests. Legal

requirements have been included that would require control up to 1 mile from your boundary, with penalties enforced for non compliance, when official complaints are filed against a private landowner.

Damage to Private Rangelands

There have been numerous studies concerning the competition for grazing between livestock and prairie dogs. Research findings have shown that the competition is minimal (O’Meilia et al. 1982). Compensatory factors such as increased forage quality and nutrient cycling offset the above ground grazing and forage clipping done by prairie dogs (Whicker and Detling 1988). The fact that prairie dogs burrow and create bare ground and that they clip vegetation to the ground either to eat, store as hay, or to reduce visual obstruction is readily apparent to the casual observer. This has also been confirmed in many studies (Agnew et al. 1986, Sid et al. 1991, Knowles 1994). It is an illogical argument to most private landowners that there is little to no competition between prairie dogs and cattle for grazing, however prairie dogs remove up to 80% of the forage.

Private rangeland adjacent to the refuge is primarily used for livestock grazing and hay production. The burrowing, clipping, and grazing are primary factors given for control of prairie dogs on private lands. Mounds created make haying difficult to nearly impossible and the standing hay crop is nearly eliminated where prairie dogs are established. The level of control varies from landowner to landowner, but in general tolerance is low for any newly establishing towns or for towns that have expanded across ownership boundaries.

Drought

Climactic data indicates that Bennett County has been in an extended drought. During above average precipitation years in mixed grass prairies, increased vegetative growth may limit expansion of existing towns and the establishment of new towns. During periods of below average precipitation, expansion rates may increase dramatically. This is the pattern that appears to have been repeated in western South Dakota. We expect that during extended droughts, increases in direct prairie dog management may be needed. During periods of average to above average precipitation, less direct control will be required. We also expect that the level and frequency of grassland management through prescribed burning, grazing, and haying may need adjustment during a drought.

MANAGEMENT

Management includes any activity conducted to control the size of a prairie dog town, maintain the habitat suitability for black-tailed prairie dogs, and/or ensure the long term viability of black-tailed prairie dogs on Lacreek NWR.

It is our belief that the significant increase in occupied acres on the Refuge is due to a combination of many factors. The cessation of all control activities, an extended drought, and the presence of suitable soils types have been major contributors. The refuge also contains large areas of monotypic stands of exotic grasses, which have shallow root systems and grow little during droughts, compared to native prairie species. This favors the expansion of existing prairie dog towns and the establishment of new towns. We recognize that black-tailed prairie dogs are a

keystone species and their presence supports other species of concern such as burrowing owls and ferruginous hawks. In the CCP, we have recognized this and included the following goal, objective, and strategies:

Prairie Dog Subgoal: Maintain a viable population of black-tailed prairie dogs within the boundary of Lacreek NWR.

Prairie Dog Objective A: Upon approval of a station specific prairie dog management plan, support a minimum of 300 acres of occupied black-tailed prairie dog towns within the biologically and socially compatible zone over the next 15 years.

STRATEGIES

1. Fully implement an approved station black-tailed prairie dog management plan.
2. Within the socially incompatible zone, control will be considered for use as part of mixed grass prairie restoration efforts.
3. Within the biological/social compatible zone, prairie restoration will utilize herbicide, interseeding, burning, grazing, and other habitat restoration techniques not requiring farming.
4. Conduct grazing, mowing and prescribed burning activities adjacent to black-tailed prairie dog towns in biological/social compatible zones when the occupied acres fall below 300 acres.
5. Work cooperatively with Bennett County Weed Board and the state of South Dakota on management of black-tailed prairie dogs on the refuge.
6. If black-tailed prairie dogs are extirpated within the boundaries of Lacreek NWR, and do not re-establish passively within 3 years, planning for translocating will be initiated.
7. Establish buffer zones for prairie dog towns that are located along the exterior boundaries of the refuge adjacent to private range and hay land or private residences. Coordinate with adjacent landowners on control efforts.

We also recognize that left unmanaged, black-tailed prairie dogs will continue to colonize additional sites and existing towns will likely continue to expand. Based upon an analysis of soil types alone, black-tailed prairie dogs could potentially occupy up to 25% of the total refuge acreage, which comprises over 70% of our mixed grass acres. At this level, we would not be reaching our objectives of providing habitat for the suite of grassland species requiring tall and medium height grassland structure with residual cover, such as dickcissel, bobolink, and lark sparrow (Sinner 1975, Ryan 1986, Volkert 1992, Allen and Johnson 2003).

MANAGEMENT SCENARIO

The map below the management scenario at Lacreek NWR. Listed on the map are buffers around residences and adjacent private rangeland, soils which are believed to be incompatible for prairie dogs, and an area believed to be biologically and socially compatible with prairie dog occupation. Nearly 11,000 acres on the refuge are considered incompatible for prairie dog colonization due to soils or hydrology. These areas include the sandhills, wetlands, and meadows where the water table is near the surface at some point during the year.

A buffer area around residences will provide the opportunity for mixed grass prairie restoration efforts and reduce conflicts. The buffer placed adjacent to private rangeland will serve to reduce the occurrence of prairie dogs established on the refuge expanding to adjacent private lands. Buffers were not placed next to agricultural land adjacent to the refuge because prairie dogs have not been noted to cause intolerable damage to adjacent cropland due to the annual tillage. After removing these areas, 1,787 acres have been identified as being biologically and socially compatible for prairie dog colonies. This acreage is over 3 times the area (501.7 acres) that was occupied by prairie dogs during the spring 2005 mapping.

It is unknown what range of acreage of occupied prairie dog towns may have historically existed on the refuge. Some speculation has been made that from 3% to 10% of large regions were occupied by prairie dogs (Flath and Clark 1986, Clark 1989). The current level of 501 acres of prairie dog towns is 3% of the total acreage of the refuge (16,410 acres) and 12% of the total area containing compatible soil types (4,086 acres). The proposed minimum level of 300 acres is 7% of the total area containing compatible soil types. The prairie dog compatible zone (1,787 acres) identified on the map below is 11% of the total refuge acreage and 44% of the total area containing compatible soil types.

A minimum acreage of 300 acres was determined based on the speculation of historically occupied acres by Flath and Clark. Research and staff observations also indicates that this level would support a sustainable population that could also support associated species such as burrowing owls and ferruginous hawks. This level will allow for control measures to be implemented addressing the existing conflicts with adjacent landowners. It will also allow for planned prairie restoration to move forward.

Existing and newly established towns outside of the prairie dog compatible zones could be considered for active control methods using one or more of the tools described below. The need for direct control measures would be considered on a case by case basis. Considerations would include conflicts with planned prairie seedings and management, location relative to occupied residences and private rangeland, or other conflicts with management. A unit by unit listing of towns to be controlled and what method(s) to be used has not been given due to the evolving nature of our prairie restoration program, experience to be gained with control techniques, and the dynamic establishment of towns on the refuge. This will allow more flexibility where, when, and how control measures are taken and will allow us to adjust when conditions warrant. These details will be addressed in our annual habitat work plans.

Existing and newly established towns inside of the prairie dog compatible zone would be allowed to expand and contract without the use of direct control measures. Changes in agricultural practices on adjacent private lands within the compatible zone, such as the planting of alfalfa or other tame grasses for a hay crop on fields that had been farmed annually, may require control measures adjacent to these fields.

MANAGEMENT OPTIONS FOR BLACK-TAILED PRAIRIE DOGS

Many strategies and techniques were considered for the management of black-tailed prairie dogs. They were evaluated based on a review of available literature, staff experience and knowledge, adjacent neighbor's and partner's experience, available budget, and compliance with laws, regulations, and policies related to refuge management. We will strive to maintain a minimum of 300 acres of occupied black-tailed prairie dog towns on the refuge; however actual acreages may far exceed that within the compatible zone.

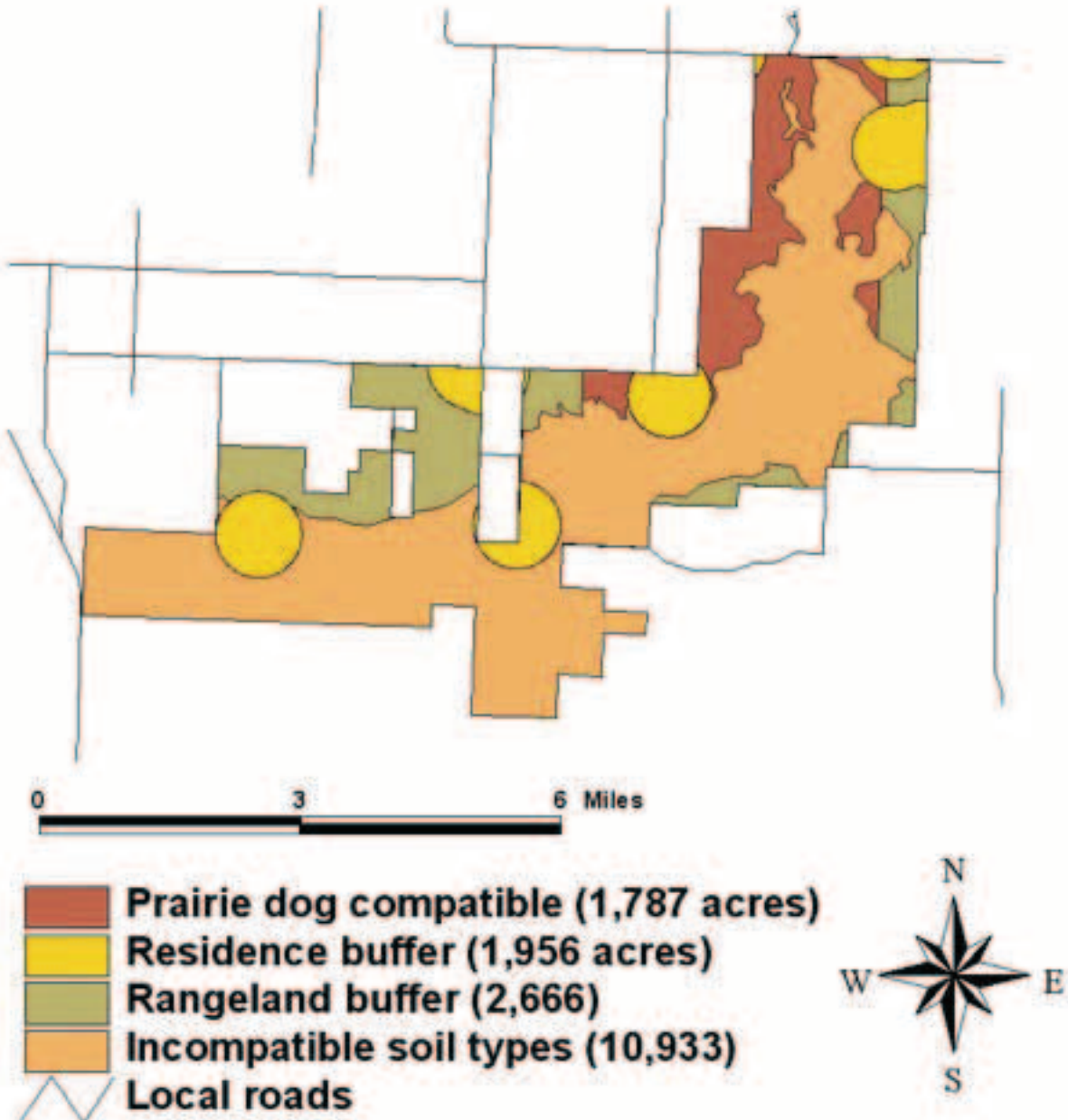
Toxicants

The use of toxicants has been shown to be one of the most effective methods of control for prairie dogs. Staff does not believe that prairie dog management can be effectively completed without the availability of toxicants as a tool in the toolbox. Several toxicants are currently labeled for uses which have no secondary poisoning effects when label instructions are followed, and typically provide up to 90% control with the 1st treatment. One or more follow-up treatments may be needed for 100% control. Timing of the application is critical to reduce impacts to nontarget species (Tom Beck, personal communication).

Zinc-phosphide coated oats were developed and approved by the U.S. Fish and Wildlife Service as a control agent for prairie dogs (Tietjen 1976). They have been used successfully on Lacreek NWR prior to the moratorium. Proper pre-baiting and timing are critical to ensure that treated grain is consumed by prairie dogs and does not remain available to non-target animals. All label instructions will be followed by certified applicators. Prairie dogs eating zinc phosphide treated oats typically die slowly enough that they retreat into burrow systems and are not left on the surface. Zinc phosphide is extremely toxic to waterfowl and granivorous birds (Knowles 1994). It rapidly decomposes in the environment when exposed to moisture. The most likely non-target species to be affected on Lacreek NWR would be granivorous birds commonly observed on prairie dog towns such as western meadowlarks, red-winged blackbirds, and horned larks. Late fall and early winter are considered ideal times for control due to the fact that most granivorous birds, burrowing owls, and other sensitive species are not present. Also, prairie dogs more readily take the treated grain, as little to no green forage is available (Tom Beck, personal communication).

PhosFume is another toxicant labeled for use in prairie dog control. It is widely used to fumigate grain bins and is also labeled for use on burrowing rodents, including prairie dogs. It comes in a tablet form that is dispensed into holes and then the holes are covered. A chemical reaction is initiated by exposure to atmospheric moisture and phosphine gas is released throughout the burrow system. This phosphine gas is highly toxic to insects, birds, and mammals. Timing again is critical, as any non-target animals in the burrows will also be killed. The best time to treat with PhosFume is from fall to late winter, after all burrowing owls have departed. The state of South Dakota has treated adjacent prairie dog towns with PhosFume and report >90% control with the first treatment (Tom Beck, personal communication). A certified contractor will be hired to make application of this toxicant. Current refuge policy will be followed by completion of an approved Pesticide Use Proposal for both.

Proposed Prairie Dog Management Scenario



Shooting

Recreational shooting of black-tailed prairie dogs is not allowed on Lacreek NWR, and we propose to leave this closure in place. This decision was made based upon the fact that a significant amount of opportunity for this activity occurs on adjacent state and private lands. Most of the Refuges dog towns also are used for wildlife observation. Control through selective shooting by Refuge staff was considered. Experience has shown that this is a very labor intensive and relatively ineffective method of control. Therefore, this method will not be considered for use.

Trapping

The use of cage traps, leg hold traps, snares, and connibear traps were considered. The publication Prevention and Control of Wildlife Damage produced by the University of Nebraska Wildlife Extension Service discusses the merits of each. In general, cage traps and snares have been shown to be labor intensive, relatively ineffective, and expensive on a large scale. Small leg hold traps and #120 Connibear or equivalent traps have been shown to be quite effective for control in very small towns. We plan to use leg hold and/or Connibear traps placed in burrow entrances to control small towns less than 5 acres in size. Upon removal of animals, the burrows will be filled in to discourage re-colonization.

We are considering the use of live trapping to support the recovery efforts for black-footed ferrets. Long term management of established towns may require periodic repeated control to limit population size within a town and prevent expansion (Knowles 1986). One option we are considering is to live trap a portion of these towns and provide as a food source for black footed ferrets. This would reduce or eliminate the need for long term toxicant use on remaining prairie dog towns. This would depend on the demand for live prairie dogs, ability to secure clearances for transport, support received for supplies and labor to capture, quarantine, and transport, etc.

Visual Barriers/Deterrents

The placement of hay bales, fences, and perches have been reported in the literature as control techniques (Hyngstrom 1988). The theory is that visual barriers and perches placed to encourage raptor and mammalian predator use will discourage the use of an area by prairie dogs. Although, all three methods have been tried on and adjacent to Lacreek NWR in recent years, no noticeable affect has been observed. This control technique may be more effective on newly established towns containing only a small number of animals.

Some success has been reported with the use of visual fence barriers at other locations. Any material that withstands deterioration by sunlight and precipitation can be used. Reef Industries is the manufacturer of Griffolyn, which is promoted as a barrier for prairie dogs <<http://www.reefindustries.com>>.

Information on the design and installation of this barrier material is available at the following website <http://www.ci.boulder.co.us/openspace/nature/pdogs_management.htm#fencing>. We will purchase and install this visual barrier on at least one site at the time other control methods are completed. The effectiveness of this visual barrier will be evaluated and if effective, will be used for other similar situations.

Physical Barriers

Placement of physical barriers has been used with varying success. The South Dakota Game, Fish, and Parks recently installed a single strand of electric fence placed 2” to 5” above the ground surface in an attempt to prevent damage to a windbreak planted adjacent to a dog town. Kocia and other annual weeds grew on the opposite side of the fence. These tall weeds caused the prairie dogs to cease attempts at expansion of the town, at least on the side with the electric fence, for one year. By the second year, some prairie dogs had moved past the electric fence (Tom Beck, personal communication).

Snow fence and fences made of other materials have been placed to make a physical barrier to dog town expansion. Some have reported good success, while others report that prairie dogs dig under the fence or climb over without problems. There may be some situations, where installation of a temporary electric fence or snow fence may be warranted to prevent prairie dogs from moving. An example of a situation where this could be useful would be on a newly seeded prairie restoration adjacent to an established dog town. A temporary fence may allow annual weeds to grow, preventing prairie dogs from re-occupying the site. We will install a physical barrier fence on at least one site in coordination with other control activities and evaluate its effectiveness. If this technique proves effective, we will increase its use on other sites.

Farming/leveling holes

To prevent re-establishment, holes and mounds may be bladed, disked, or otherwise smoothed. If the field will be farmed after treatment, disking and other farming operations will level and smooth the mounds. Small towns may be smoothed with a small tractor mounted blade.

Seeding

Nearly all prairie dog towns on the refuge established in fields that had a cropping history, and therefore the native plant community was lost. Currently, many of these towns are dominated by annual weeds such as kocia (*Kocia scoparia*) and Russian thistle (*Salsola iberica*), both of which are commonly referred to as tumbleweeds. After the growing season, bare ground is present and severe wind erosion may occur. The native plant community to be expected on a well established dog town in the mid grass prairie would be more representative of the short grass prairie. This would include species such as blue grama, buffalo grass, elk sedge, sideoats grama, western wheatgrass and other low growing and drought tolerant species. In order to establish a plant community tolerant of repeated prairie dog grazing and burrowing, established dog towns that remain will be over seeded with blue grama, buffalo grass, western wheatgrass, elk sedge and other locally collected native species. This will help with both the long term viability of the town and reduce wind erosion that occurs with the increased amount of bare soil.

Disease Monitoring

Staff will be informed of the potential for plague and other infectious diseases associated with prairie dogs through periodic safety meetings, e-mails, and memos. Any individual animals that appear to be sick or injured will be monitored. If appropriate, one or more animals will be collected by qualified staff member using appropriate personal protective equipment and sent to the disease lab for analysis. The regional biologist will be contacted along with the Center for Disease

Control for consultation prior to any animal or flea collection. Upon confirmation that plaque has been confirmed on Lacreek NWR, regional external affairs will be contacted to formulate a response plan.

Translocating

The only likely scenario to cause the long term loss of most/all prairie dogs on Lacreek NWR would be an outbreak of plague. In the event that a total loss of prairie dogs occurs on Lacreek NWR, monitoring will continue for at least 3 years. If after 3 years prairie dogs have not begun to re-establish on their own, consideration will be given to translocating black tailed prairie dogs into an existing town within the compatible zone. Other measures could also be attempted, such as increasing the frequency and duration of livestock grazing on previously occupied towns in the compatible zone.

Population Monitoring

The reintroduction of black-footed ferrets into South Dakota prompted the need to estimate population densities of black-tailed prairie dogs with some certainty because they are an essential food source for ferrets. Several techniques were developed that include: 1) counting active burrows using transects (Biggins et al. 1993), 2) visual counts in a defined area, 3) and using aerial photographs (Severson and Plumb 1998). All these techniques were tested during a mark/recapture study by Severson and Plumb and it was determined that using visual counts in a defined area correlated more closely to the actual numbers than other methods.

The number and size of prairie dog towns on Lacreek NWR has remained relatively small with the exception of the past few years (1999 – 2005). Because of this, monitoring has been a low priority for the Refuge and was not part of the wildlife inventory plan. With the recent expansion, estimating densities has become important. The Refuge currently maps the number of acres on Lacreek NWR and identifies newly formed or recolonized areas, but no density estimates have been completed. Prairie dog surveys will be incorporated into the Refuges wildlife inventory plan with the first survey completed in 2005 and results available in early 2006.

The Refuge will use the protocol outlined by Severson and Plumb (1998). This technique consists of counting individuals three times in 4-hec plots for 3 consecutive days using the maximum number counted as the final estimate. Visual counts will be conducted from an elevated area e.g., a blind or hill, early morning using binoculars. The surveys will be conducted from mid to late June after the young-of-the-year has emerged and yearlings are dispersing. Additionally, the refuge will continue to map complex boundaries using GPS and identify any newly formed or recolonized areas.

REFERENCES

- Allen, T. and D. H. Johnson. Breeding Birds of Lacreek National Wildlife Refuge. 2003. Unpublished report. USGS- Northern Prairie Wildlife Research Center, Jamestown, North Dakota. 28pp.
- Agnew, W., D.W. Uresk, and R.M. Hansen. 1987. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. *J. Range Management*. 39:135-139.
- Bakker, K.K. 2003. A compilation and synthesis of avian research completed in South Dakota. Report to South Dakota Department of Game, Fish and Parks. South Dakota Department of Game, Fish and Parks, Wildlife Division Report No.2003-09,72 pp.
- Biggins, D.E., B.J. Miller, L.R. Hanebury, B. Oakleaf, A.H. Farmer, R. Crete, and A. Dood. 1993. A technique for evaluating black-footed ferret habitat. Pages 73-88 in J.L. Oldemeyer, D.E. Biggins, and B.J. Miller, editors. Proceedings of the symposium on the management of prairie dog complexes for the reintroduction of the black-footed ferret. Biological Report 13. U.S. Fish and Wildlife Service, Washington, D.C.
- Boddicker, Major L. Prevention and Control of Wildlife Damage. B-75 to B-84 Prairie Dogs.
- Campbell, T.M. III. And T.W. Clark. 1981. Colony characteristics and vertebrate associates of white-tailed and black-tailed prairie dogs.
- Center For Disease Control Website:<www.cdc.gov>.
- Cid, M.S., J. K. Detling, A.D. Whicker., and M. A. Brizuela. 1991. Vegetational responses of a mixed-grass prairie site following exclusion of prairie dogs and bison. *Journal of Range Management* 44(2), March 1991.
- Cincotta, R.P. 1985. Habitat and dispersal of black-tailed prairie dogs in Badlands National Park. Ph.D. Dissertation. Colorado State University, Fort Collins, CO. 52pp.
- Clark, T.W. 1989. Conservation biology of the black-footed ferret. Wildlife Preservation Trust, Special Scientific Rpt. No. 3. Philadelphia, PA 175 pp.
- Clark, T. W., T.M. Campbell III, D.G. Socha, and D.E. Casey. 1982. Prairie dog colony attributes and associated vertebrate species. *Great Basin Nat.* 42:572-582.

- Coppock, David Layne. 1981. Impacts of Black-tailed Prairie Dogs on Vegetation in Wind Cave National Park. MS Thesis. Colorado State University, Ft. Collins. Co. 86p.
- Cully, J.F. 1989. Plague in prairie dog ecosystems: Importance for black-footed ferret management. Montana BLM Wildlife Technical Bulletin No. 2 pp. 47-55.
- Finkbeiner, S.L., and D.H. Johnson. 2002. Breeding Birds of Lacreek National Wildlife Refuge. U.S. Geological Survey. Northern Prairie Wildlife Research Center. Jamestown, ND.
- Flath, D.L., and T.W. Clark. 1986. Historic status of black-footed ferret habitat in Montana. Great Basin Nat. Mem. 8:63-71.
- Foster, Nancy S. and Scott E. Hyngstrom. Prairie Dogs and their Ecosystem. Multi-agency brochure.
- Hyngstrom, Scott E., and Dallas R. Virchow. Prairie Dogs and the Prairie Ecosystem.
- Hyngstrom, S.E., and D.D. Fisher. 1988. Prairie Dogs and Their Control. NebGuide G80-519. Coop. Extension Service. University of Nebraska, Lincoln. 4pp.
- Kantrud, H.A. and K.F. Higgins. 1992. Nest and nest site characteristics of some ground-nesting, non-passerine birds of northern grasslands. Prairie Naturalist 24(2).
- Knowles, C.J. 1986. Population Recovery of Black-tailed Prairie Dogs Following Control with Zinc Phosphide. Journal of Range Management 39(3), pp 249-251.
- Knowles C.J. and P.R. Knowles. 1994. A Review of Black-tailed Prairie Dog Literature in Relation to Rangelands Administered by the Custer National Forest.
- Koford, C. B. 1958. Prairie dogs, whitefaces, and blue grama. Wildlife Monographs. 3. 78 pp.
- Kolbe, J.J., B.E. Smith, and D. M. Browning. Burrow Use by Tiger Salamanders (*Ambystoma tigrinum*) at a Black-tailed Prairie Dog (*Cynomys ludovicianus*) Town in Southwestern South Dakota. Herpetological Review 33(2). 2002.
- Kraft, Rolf H. 1997. Draft Environmental Assessment for Prairie Dog Management at Lacreek NWR, Martin, SD.

Lacreek National Wildlife Refuge. Black-tailed Prairie Dog Surveys for 2002, 2003, and 2004. Unpublished report.

Lamb B.L., and K. Cline. 2003. Public Knowledge and Perceptions of Black-tailed Prairie Dogs. *Human Dimensions of Wildlife* 8:127-143.

Luce, Bob, et. al. 2002. A Multi-State Conservation Plan for the Black-tailed Prairie Dog, *Cynomys ludovicianus*, in the United States.

Nebraska Game and Parks Commission Website:<http://www.ngpc.state.ne.us/wildlife/pdogs.html>

Reading, R.P., S.R. Beissinger, J.J. Grentsen, and T.W. Clark. 1989. Attributes of black-tailed prairie dog colonies in northcentral Montana, with management recommendations for conservation of biodiversity. Pp 13-45. *The prairie dog ecosystem: Managing for biological diversity*. Montana BLM Wildlife Technical Bulletin No. 2. 55pp.

Renken, R.B. and J.J. Dinsmore. 1987. Nongame bird communities on managed grasslands in North Dakota. *The Canadian Field-Naturalist* Vol. 101.

Ryan, M.R. 1986. Nongame management in grassland and agricultural ecosystems. *Management of Nongame Wildlife in the Midwest: A Developing Art*. Proceedings of a Symposium held at the 47th Midwest Fish and Wildlife Conference. Grand Rapids Michigan. p. 116-136.

Sharps, J.C. and D.W. Uresk. 1991. Ecological review of black-tailed prairie dogs and associated species in Western South Dakota. *Great Basin Nat.* 50:339-345.

Skinner, R.M. 1975. Grassland use patterns and prairie bird populations on Missouri. *Prairie: A Multiple View*. University of North Dakota Press. Grand Forks, ND. p. 171-180.

South Dakota Game, Fish, and Parks Website: <http://www.sdgfp.info/pdplan.pdf>

South Dakota Black-tailed Prairie Dog Management Plan. Draft 4 – May 2004.

Smith, R.E. 1967. Natural History of prairie dogs in Kansas. *Kans. Univ. Nat. Hist. Misc. Publ.* 49. 39 pp.

Tietjen, H.P. 1976. Zinc phosphide – its development as a control agent for black-tailed prairie dogs. USDI, Fish and Wildlife Service Spec. Sci. Rep – Wildl. 195.

U.S. Fish and Wildlife Service, Region 6. November 24, 2003. Management of Black-tailed Prairie Dogs on Fish and Wildlife Service Lands.

U.S. Fish and Wildlife Service, Regional Directors, Region 2 and 6. Memorandum dated 1/21/2001. Black-tailed Prairie Dog Management on Service Lands.

Van Pelt, William E. The Black-tailed Prairie Dog Conservation Assessment and Strategy.

Volkert, W. K. 1992. Response of Grassland birds to large-scale prairie planting project. The Passenger Pigeon, Vol, 54 (3).

Wilhelm, Robert B., Jerry R. Choate, and J. Knox Jones, Jr. 1981. Mammals of Lacreek National Wildlife Refuge, South Dakota. Texas Tech Press, Lubbock, Texas. Special Publications No. 17, 39 pp.

Fire: A Critical Natural Process

Fire, whether set or caused by lightning, has been a part of the prairie for thousands of years. Fire provides one or more benefits to a prairie. It can remove dead vegetation that hinders new growth; it can release nutrients to enrich the soil; it can reduce invader plants and encourage native species; and, it can create habitats attractive to wildlife. The significance of fire in natural grasslands has been well established. Frequent, light fires on bluestem grasslands, for example, result in an increase in biomass and may also stimulate flower production. When fire is suppressed from these grasslands, native species may lose their competitive edge. . In addition, accumulations of fuels often change fire regime characteristics and have created the potential in some areas for uncharacteristically severe wildfires. These catastrophic wildfires often pose risks to public and firefighter safety, as well as threaten property and resource values such as wildlife habitat.

Historically, grasslands in the northern Great Plains coevolved with various disturbance regimes such as fire and large-scale grazing. The use of prescribed fire in most ecosystems is essential for healthy vegetation and for maintaining or improving wildlife habitat. When integrated back into an ecosystem, fire can help restore and maintain healthy systems and help reduce the risk of wildfires. To facilitate fire's natural role in the environment, fire must be integrated into land and resource management plans and activities on a broad scale. Prescribed fire can:

- Improve wetlands by reducing the density of vegetation and accumulated plant litter, thereby increasing the amount of surface water available to wildlife
- Sustain biological diversity by reducing invader species and encouraging native species
- Add to the effectiveness of an Integrated Pest Management Program
- Improve soil fertility
- Improve quality and amount of livestock forage
- Reduce the susceptibility of plants to insects and disease caused by moisture and nutrient stress

Wildland Fire Management Policy and Guidance

The 2001 Federal Wildland Fire Management Policy directs federal agencies to balance suppression to protect life, property, and resources with fire use to regulate fuels and maintain healthy ecosystems. The policy directs agencies to utilize the appropriate management response for all wildland fires regardless of the ignition source. In addition, the policy provides eight guiding principles that are fundamental to the success of the fire management program:

- Firefighter and public safety is the first priority in every fire management activity
- The role of wildland fires as an essential ecological process and natural change agent will be incorporated into the planning process
- Fire management plans, programs, and activities support land and resource management plans and their implementation
- Sound risk management is a foundation for all fire management activities
- Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives
- Fire management plans and activities are based upon the best available science
- Fire management plans and activities incorporate public health and environmental quality consideration, federal, state, tribal, local, interagency, and international coordination and cooperation are essential
- Standardization of policies and procedures among federal agencies is an ongoing objective

Based on this guidance, it is essential to include fire management into land use resource plans such as the CCP. The fire management plan for Lacreek NWR is a stepdown plan from the CCP and habitat management plan. The fire management plan contains significantly more detail on fire suppression, fire use, and fire management activities, while incorporating the above policy and guidance.

Fire Program Management Goal

All wildfires on Lacreek NWR will be safely suppressed in order to protect life, property, and other resources. Prescribed fire will be utilized within the context of ecosystem management for habitat management purposes, and to protect public and private property through fuel reduction activities, especially in areas with a high proportion of adjacent residences. All fire management activities will be conducted in a manner consistent with applicable laws, policies, and regulations. A fire management plan will be maintained and updated as needed or at least every 10 years.

Fire Management Objectives and Strategies:

Fire Management Objective #1

Use prescribed fire in a safe and professional manner to accomplish habitat management strategies in uplands, wet meadows, and developed wetlands.

Upland Habitat Strategy: Conduct 200 to 1,500 acres of prescribed burning in upland habitats each year to encourage/promote increased plant structure.

Wet Meadow Habitat Strategy: Conduct 200 to 1,500 acres of prescribed burning in wet meadow habitats each year to encourage/promote increased and plant structure.

Integrate prescribed burning and prescribed grazing management techniques.

Developed Wetland Habitat Strategy: Conduct 200 to 1,500 acres of prescribed burning each year in developed wetland to: reduce plant litter depths; encourage germination and growth of desirable species; injure root systems of aggressive perennial wetland plants; and improve effectiveness of grazing and IPM in these habitats.

Fire Management Objective #2

All wildfires occurring on or threatening Lacreek NWR will be suppressed in: a safe and professional manner; coordination with all cooperating agencies; and accordance with all applicable laws, regulations, and policies.

Strategy: Use the Lacreek Fire Management Plan for specific details on the use of prescribed fire as a management tool, and the suppression of wildfires on or threatening Lacreek NWR.

Appendix G

Species List

The following plant list was compiled from species collected on Lacreek NWR and located in herbariums at Lacreek NWR, South Dakota State University, University of South Dakota, and University of Nebraska at Chadron. Additional species were added by staff members at Lacreek NWR from specimens that had been keyed but were not included in herbarium collections. A “D” following the common name indicates this is a desirable species for consideration in Developed Wetland Objectives A, B, and C. I = Introduced, N = Native

Plants

<i>Scientific Name</i>	<i>Common Name</i>	<i>Origin</i>
<i>Acer negundo</i>	Box elder	N
<i>Achillea millefolium</i> ssp. <i>lanulosa</i>	Yarrow	N
<i>Agropyron caninum</i>	Slender wheatgrass D	N
<i>Agropyron cristatum</i>	Crested wheatgrass	I
<i>Agropyron intermedium</i>	Intermediate wheatgrass	I
<i>Agropyron repens</i>	Quackgrass	I
<i>Agropyron smithii</i>	Western wheatgrass D	N
<i>Agrostis hyemalis</i>	Ticklegrass D	N
<i>Agrostis stolonifera</i>	Redtop	I
<i>Alisma plantago-aquatica</i>	Water plantain D	N
<i>Alisma subcordatum</i>	Water plantain D	N
<i>Allium textile</i>	Wild onion	N
<i>Alopecurus arundinacea</i>	Creeping foxtail	I
<i>Amaranthus retroflexus</i>	Pigweed	N
<i>Amaranthus tuberculatus</i>	Tall water hemp D	N
<i>Ambrosia artemesifolia</i>	Common ragweed D	N
<i>Ambrosia psilostachya</i>	Western ragweed D	N
<i>Ammannia robusta</i>	Ammannia D	N
<i>Amorpha canescens</i>	Leadplant	N
<i>Amorpha fruticosa</i>	False indigo D	N
<i>Andropogon gerardii</i>	Big bluestem D	N
<i>Andropogon hallii</i>	Sand bluestem	N
<i>Andropogon scoparius</i>	Little bluestem	N
<i>Antennaria neglecta</i>	Pussytoes	N
<i>Apocynum sibiricum</i>	Prairie dogbane D	N
<i>Arctium lappa</i>	Great burdock	I
<i>Argemone polyanthemus</i>	Pricklypoppy	N
<i>Aristida purpurea</i>	Red three-awn	N
<i>Artemesia biennis</i>	Biennial wormwood	I
<i>Artemesia campestris</i>	Green sagewort	N
<i>Artemesia frigida</i>	Fringed sage	N
<i>Artemesia ludoviciana</i>	White sage	N
<i>Asclepias arenaria</i>	Sand milkweed	N
<i>Asclepias incarnata</i>	Swamp milkweed	N
<i>Asclepias pumila</i>	Dwarf milkweed	N
<i>Asclepias speciosa</i>	Showy milkweed	N
<i>Asclepias syriaca</i>	Common milkweed D	N
<i>Asclepias veridiflora</i>	Green milkweed	N
<i>Asclepias verticillata</i>	Whorled milkweed	N
<i>Asparagus officianalis</i>	Asparagus	I
<i>Aster ericoides</i>	Heath aster D	N

<i>Scientific Name</i>	<i>Common Name</i>	<i>Origin</i>
<i>Aster falcatus</i>	White prairie aster D	N
<i>Aster simplex</i>	Panicled aster D	N
<i>Astragalus ceramicus</i>	Bird's-egg milkvetch	N
<i>Astragalus crassicaarpus</i>	Groundplum milkvetch	N
<i>Astragalus racemosus</i>	Racemed poisonvetch	N
<i>Beckmania syzigachne</i>	American sloughgrass D	N
<i>Berteroa incana</i>	Hoary alyssum	I
<i>Berula erecta</i>	Water parsnip	N
<i>Bidens cernua</i>	Nodding beggar-ticks D	N
<i>Bidens comosa</i>	Beggar-ticks D	N
<i>Bidens coronata</i>	Tickseed sunflower D	N
<i>Bidens frondosa</i>	Beggar-ticks D	N
<i>Bidens vulgate</i>	Beggar-ticks D	N
<i>Bouteloua curtipendula</i>	Side-oats grama	N
<i>Bouteloua gracillis</i>	Blue-grama	N
<i>Bouteloua hirsuta</i>	Hairy grama	N
<i>Brassica kaber</i>	Wild mustard	I
<i>Bromis inermis</i>	Smooth brome grass	I
<i>Bromus japonicus</i>	Japanese brome grass	I
<i>Bromus porteri</i>	Nodding brome grass	N
<i>Bromus tectorum</i>	Cheatgrass	I
<i>Buchloe dactyloides</i>	Buffalo grass	N
<i>Calamagrostis canadensis</i>	Canada bluejoint D	N
<i>Calamagrostis stricta</i>	Northern reedgrass D	N
<i>Calamovilfa longifolia</i>	Prairie sandreed	N
<i>Calylophus serrulatus</i>	Yellow evening primrose	N
<i>Camelina microcarpa</i>	Smallseed falseflax	I
<i>Carduus acanthoides</i>	Plumeless thistle	I noxious
<i>Carduus nutans</i>	Musk thistle	I noxious
<i>Carex atherodes</i>	Slough sedge D	N
<i>Carex brevoir</i>	Fescue sedge D	N
<i>Carex comosa</i>	Sedge D	N
<i>Carex eleocharis</i>	Needleleaf sedge	N
<i>Carex filifolia</i>	Threadleaf sedge	N
<i>Carex hystericina</i>	Bottlebrush sedge D	N
<i>Carex lanuginosa</i>	Wooly sedge D	N
<i>Carex nebraskensis</i>	Nebraska sedge D	N
<i>Carex preagracilis</i>	Clustered field sedge D	N
<i>Carex stipata</i>	Saw-beak sedge D	N
<i>Carex vulpinoidea</i>	Fox sedge D	N
<i>Celtis occidentalis</i>	Hackberry	N
<i>Cenchrus longispinus</i>	Sandbur	N
<i>Ceratophyllum demersum</i>	Coontail D	N
<i>Chenopodium rubrum</i>	Red goosefoot D	N
<i>Chrysopsis villosa</i>	Hairy goldaster	N
<i>Cicuta maculata</i>	Water hemlock	N
<i>Cirsium arvense</i>	Canada thistle	I noxious
<i>Cirsium undulatum</i>	Wavyleaf thistle	N
<i>Cirsium vulgare</i>	Bull thistle	I
<i>Cleome serrulata</i>	Rocky mountain beeplant	N
<i>Convolvulus arvensis</i>	Creeping jenny	I
<i>Conyza canadensis</i>	Horseweed	I
<i>Coreopsis tinctoria</i>	Plains coreopsis	N
<i>Cornus stolonifera</i>	Red osier dogwood D	N
<i>Coryphantha vivipara</i>	Purple pincushion	N
<i>Cyperus esculentus</i>	Yellow nutsedge D	N
<i>Dactylis glomerata</i>	Orchardgrass	I
<i>Dalea candida</i>	White prairie clover	N
<i>Dalea purpurea</i>	Purple prairie clover	N

<i>Scientific Name</i>	<i>Common Name</i>	<i>Origin</i>
<i>Dalea villosa</i>	Silky prairie clover	N
<i>Delphinium virescens</i>	Prairie larkspur	N
<i>Descurainia pinnata</i>	Tansymustard	I
<i>Desmodium canadense</i>	Canada tickclover	N
<i>Desmodium canadense</i>	Canada tickclover	N
<i>Dicanthelium oligosanthes</i> var. <i>scribnerianum</i>	Scribner's panicum	N
<i>Distichlis spicata</i>	Inland saltgrass D	N
<i>Dyssodia papposa</i>	Fetid marigold	N
<i>Echinacea angustifolia</i>	Purple coneflower	N
<i>Echinochloa crusgalli</i>	Barnyard grass D	I
<i>Echinochloa muricata</i>	Rough barnyardgrass D	N
<i>Eleagnus angustifolia</i>	Russian olive	I
<i>Eleocharis aciculais</i>	Spikerush D	N
<i>Eleocharis compressa</i>	Spikerush D	N
<i>Eleocharis palustris</i>	Creeping spikerush D	N
<i>Elodea canadensis</i>	Elodea D	N
<i>Elymus canadensis</i>	Canada wildrye D	N
<i>Epilobium ciliatum</i>	Willow herb D	N
<i>Epilobium leptophyllum</i>	Narrow-leaved willow herb D	N
<i>Equisetum leavigatum</i>	Smooth scouring rush	N
<i>Eragrostis cilianensis</i>	Stinkgrass	I
<i>Eragrostis trichoides</i>	Sand lovegrass	N
<i>Erigeron bellidiastrum</i>	Western fleabane	N
<i>Erigeron strigosus</i>	Daisy fleabane	N
<i>Eriogonum annuum</i>	Annual wild buckwheat	N
<i>Eriophorum gracile</i>	Slender cottongrass D	N
<i>Erysium asperum</i>	Western wallflower	N
<i>Eupatorium maculatum</i>	Spotted joe-pye weed D	N
<i>Euphorbia esula</i>	Leafy spurge	I noxious
<i>Euphorbia marginata</i>	Snow-on-the-mountain	I
<i>Euthamia graminifolia</i>	Grass-leaved goldenrod	I
<i>Fraxinus pennsylvanica</i>	Green ash D	I
<i>Froelichia gracilis</i>	Cottonweed D	I
<i>Galium aparine</i>	Catchweed bedstraw D	I
<i>Galium trifidum</i>	Small bedstraw D	I
<i>Gaura coccinea</i>	Scarlet gaura	I
<i>Gaura parviflora</i>	Velvet gaura	I
<i>Gentiana andrewsii</i>	Bottle gentian D	N
<i>Geum aleppicum</i>	Yellow avens	N
<i>Gleditsia triacanthos</i>	Honey locust	N
<i>Glyceria grandis</i>	Tall managrass D	N
<i>Glyceria striata</i>	Fowl managrass D	N
<i>Glycyrrhiza lepidota</i>	Wild licorice D	N
<i>Grindelia squarrosa</i>	Curlycup gumweed	N
<i>Gutierrezia sarothrae</i>	Broom snakeweed	N
<i>Haplopappus spinulosus</i>	Cutleaf ironplant	N
<i>Helianthus annuus</i>	Annual sunflower D	N
<i>Helianthus grosseratus</i>	Sawtooth sunflower D	N
<i>Helianthus maximiliani</i>	Maximilian sunflower D	N
<i>Helianthus nuttallii</i>	Nuttall's sunflower D	N
<i>Helianthus petiolaris</i>	Plains sunflower	N
<i>Helianthus rigidus</i>	Stiff sunflower	N
<i>Helianthus tuberosus</i>	Jerusalem artichoke D	N
<i>Heliopsis helianthoides</i>	False sunflower D	N
<i>Hesperis matronalis</i>	Damesrocket	I
<i>Hordeum jubatum</i>	Foxtail barley D	N
<i>Hordeum pusillum</i>	Little barley D	N
<i>Hymenopappus tenuifolius</i>	Slimleaf hymenopappus	N

<i>Scientific Name</i>	<i>Common Name</i>	<i>Origin</i>
<i>Impatiens capensis</i>	Spotted touch-me-not D	N
<i>Ipomoea leptophylla</i>	Bush morning glory	N
<i>Ipomopsis longiflora</i>	White trumpet flower	N
<i>Iva xanthifolia</i>	Marshelder	N
<i>Juncus balticus</i>	Baltic rush D	N
<i>Juncus bufonis</i>	Toad rush D	N
<i>Juncus dudleyi</i>	Dudley rush D	N
<i>Juncus interior</i>	Inland rush D	N
<i>Juncus marginatus</i>	Grassleaf rush D	N
<i>Juncus nodosus</i>	Knotted rush D	N
<i>Juncus torreyi</i>	Torrey's rush D	N
<i>Juniperis virginiana</i>	Red cedar	N
<i>Kocia scoparia</i>	Kocia	I
<i>Koeleria macrantha</i>	Prairie junegrass	N
<i>Kuhnia eupatorioides</i>	False boneset	N
<i>Lactuca oblongifolia</i>	Blue lettuce	N
<i>Lathyrus polymorphus</i>	Hoary vetchling	N
<i>Leersia oryzoides</i>	Rice cutgrass D	N
<i>Lemna minor</i>	Duckweed D	N
<i>Lemna trisulca</i>	Star duckweed	N
<i>Lespedeza capitata</i>	Round headed bushclover	N
<i>Leucocrinum montanum</i>	Starlily	N
<i>Liatris punctata</i>	Dotted gayfeather	N
<i>Liatris squarrosa</i>	Scaly blazingstar	N
<i>Lithospermum canescens</i>	Hoary puccoon	N
<i>Lithospermum incisum</i>	Wavyleaf puccoon	N
<i>Lonicera tatarica</i>	Tartarian honeysuckle	I
<i>Lotus corniculatus</i>	Birdsfoot trefoil	I
<i>Lotus purshianus</i>	American deervetch	N
<i>Lycopus americanus</i>	American bugleweed	N
<i>Lygodesmia juncea</i>	Rush skeleton weed	N
<i>Lysimachia ciliate</i>	Fringed loosestrife D	N
<i>Maianthemum stellatum</i>	False solomon' seal	N
<i>Medicago sativa/falcata</i>	Alfalfa	I
<i>Melilotus alba</i>	White sweetclover	I
<i>Melilotus officinalis</i>	Yellow sweetclover	I
<i>Mentha arvensis</i>	Mint D	N
<i>Mentzelia decapatala</i>	Ten petaled mentzelia	N
<i>Mirabilis hirsute</i>	Hairy four-o'clock	N
<i>Mirabilis nyctaginea</i>	Wild four-o'clock	N
<i>Monarda fistulosa</i>	Bee balm	N
<i>Muhlenbergia pungens</i>	Sand muhly	N
<i>Muhlenbergia racemosa</i>	Marsh muhly	N
<i>Nepeta cataria</i>	Catnip	I
<i>Oenothera biennis</i>	Common evening primrose	N
<i>Oenothera nutallii</i>	White stemmed evening primrose	N
<i>Oenothera rhombipetala</i>	Fourpoint evening primrose	N
<i>Onoclea sensibilis</i>	Sensitive fern D	N
<i>Onosmodium molle</i>	False gromwell	N
<i>Opuntia fragilis</i>	Fragile prickly pear	N
<i>Opuntia polycantha</i>	Prickly pear	N
<i>Oryzopsis hymenoides</i>	Indian ricegrass	N
<i>Oxalis dilleni</i>	Gray-green woodsorrel	N
<i>Oxytropis lambertii</i>	Lambert's crazyweed	N
<i>Panicum cappillare</i>	Witchgrass	N
<i>Panicum dichotomiflorum</i>	Fall panicum D	N
<i>Panicum virgatum</i>	Switchgrass D	N
<i>Paspalum setaceum</i>	Knot grass	I

<i>Scientific Name</i>	<i>Common Name</i>	<i>Origin</i>
<i>Penstemon albidus</i>	White beardtongue	N
<i>Penstemon angustifolius</i>	Narrowleaf beardtongue	N
<i>Penstemon glaber</i>	Smooth beardtongue	N
<i>Penstemon gracilis</i>	Slender beardtongue	N
<i>Penstemon grandiflorus</i>	Shell-leaf penstemon	N
<i>Phalaris arundinacea</i>	Reed canarygrass	I/N
<i>Phleum pretense</i>	Timothy	I
<i>Phlox andicola</i>	Plains phlox	N
<i>Phlox hoodii</i>	Hood's phlox	N
<i>Phragmites australis</i>	Phragmites	N/I
<i>Physalis pumila</i>	Prairie ground cherry	N
<i>Physalis virginiana</i>	Ground cherry	N
<i>Physostegia parviflora</i>	Obedient plant	N
<i>Pilea fontana</i>	Clearweed	N
<i>Plantago patagonica</i>	Indianwheat	N
<i>Poa compressa</i>	Canada bluegrass	I
<i>Poa pratensis</i>	Kentucky bluegrass	I
<i>Polanisia jamesii</i>	James clammyweed	N
<i>Polygala alba</i>	Milkwort	N
<i>Polygonum amphibium</i>	Water smartweed D	N
<i>Polygonum coccineum</i>	Swamp smartweed D	N
<i>Polygonum convolvulus</i>	Black bindweed	I
<i>Polygonum lapathifolium</i>	Annual smartweed D	N
<i>Polygonum pennsylvanicum</i>	Pennsylvania smartweed D	N
<i>Polygonum persicaria</i>	Lady's-thumb D	N
<i>Polygonum punctatum</i>	Water smartweed D	N
<i>Polygonum sagittatum</i>	Arrow smartweed D	N
<i>Populus deltoids</i>	Plains cottonwood	N
<i>Potamogeton foliosus</i>	Leafy pondweed D	N
<i>Potamogeton nodosus</i>	Longleaf pondweed D	N
<i>Potamogeton pectinatus</i>	Sago pondweed D	N
<i>Potamogeton pusillus</i>	Small pondweed D	N
<i>Potamogeton richardsonii</i>	Claspingleaf pondweed D	N
<i>Prunella vulgaris</i>	Healall D	N
<i>Prunus americana</i>	Wild plum	N
<i>Prunus pumila</i>	Sandcherry	N
<i>Prunus virginiana</i>	Chokecherry	N
<i>Psoralea argophylla</i>	Silverleaf scurfpea	N
<i>Psoralea digitata</i>	Palmleaf scurfpea	N
<i>Psoralea tenuiflora</i>	Slimflower scurfpea	N
<i>Ranunculus longistris</i>	White water-crowfoot D	N
<i>Ratibida columnifera</i>	Upright prairie coneflower	N
<i>Redfieldia flexuosa</i>	Blowout grass	N
<i>Ribes odoratum</i>	Buffalo currant	N
<i>Rorippa palustris</i>	Bog yellow cress D	N
<i>Rosa acicularis</i>	Prickly rose	N
<i>Rosa arkansana</i>	Prairie rose	N
<i>Rudbeckia hirta</i>	Black-eyed susan	N
<i>Rumex crispus</i>	Curly dock D	I
<i>Rumex maritimus</i>	Golden dock D	N
<i>Rumex occidentalis</i>	Western dock D	N
<i>Rumex stenophyllus</i>	Dock D	I
<i>Rumex venosus</i>	Wild begonia	N
<i>Sagittaria cuneata</i>	Arrowhead D	N
<i>Sagittaria latifolia</i>	Arrowhead D	N
<i>Salix amygdaloides</i>	Peach-leaved willow	N
<i>Salix exigua</i>	Sandbar willow D	N
<i>Salix petiolaris</i>	Meadow willow D	N
<i>Salsola iberica</i>	Russian thistle	I

<i>Scientific Name</i>	<i>Common Name</i>	<i>Origin</i>
<i>Schizachyrium scoparium</i>	Little bluestem	N
<i>Scirpus acutus</i>	Hard-stem bulrush D	N
<i>Scirpus fluviatilis</i>	River bulrush D	N
<i>Scirpus maritimus</i>	Prairie bulrush D	N
<i>Scirpus pallidus</i>	Pale bulrush D	N
<i>Scirpus pungens</i>	Chairmakers rush D	N
<i>Senecio integerrimus</i>	Lambstonge groundsel	N
<i>Senecio riddellii</i>	Riddell's ragwort	N
<i>Seteria glauca</i>	Yellow foxtail	I
<i>Seteria verticillata</i>	Bristly foxtail	I
<i>Seteria viridus</i>	Green foxtail	I
<i>Shepherdia argentea</i>	Buffaloberry	N
<i>Solanum rostratum</i>	Buffalo bur	N
<i>Solidago canadensis</i>	Canada goldenrod	N
<i>Solidago gigantea</i>	Giant goldenrod	N
<i>Solidago missouriensis</i>	Missouri goldenrod	N
<i>Solidago mollis</i>	Soft goldenrod	N
<i>Solidago rigida</i>	Stiff goldenrod	N
<i>Sonchus arvensis</i>	Perennial sowthistle	I
<i>Sorghastrum nutans</i>	Indiangrass D	N
<i>Sparganium eurycarpum</i>	Burreed D	N
<i>Spartina pectinata</i>	Prairie cordgrass D	N
<i>Sphaeralcea coccinea</i>	Scarlet globemallow	N
<i>Sporobolus airoides</i>	Alkali sacaton	N
<i>Sporobolus asper</i>	Tall dropseed	N
<i>Sporobolus cryptandrus</i>	Sand dropseed	N
<i>Stachys palustris</i>	Marsh hedgenettle D	N
<i>Stipa comata</i>	Needle-and-thread	N
<i>Stipa viridula</i>	Green needlegrass	N
<i>Symphoricarpos occidentalis</i>	Western snowberry	N
<i>Sysymbrium altissimum</i>	Tumble mustard	I
<i>Sysymbrium loeselli</i>	Tallhedge mustard	I
<i>Taraxicum officinale</i>	Dandelion	I
<i>Teucrium canadense</i>	American germander D	N
<i>Thelypteris palustris</i>	Marsh fern D	N
<i>Thlaspi arvense</i>	Field pennycress	I
<i>Toxicodendron rydbergii</i>	Poison ivy	N
<i>Tradescantia bracteata</i>	Bracted spiderwort	N
<i>Tradescantia occidentalis</i>	Prairie spiderwort	N
<i>Tragopogon dubius</i>	Goatsbeard	I
<i>Trifolium pretense</i>	Red clover	I
<i>Triodana leptocarpa</i>	Lookingglass	N
<i>Triodanus perfoliata</i>	Venus lookingglass	N
<i>Typha angustifolia</i>	Narrowleaf cattail	N
<i>Typha latifolia</i>	Common cattail	N
<i>Ulmus americana</i>	American elm	N
<i>Ulmus pumila</i>	Siberian elm	I
<i>Urtica dioica</i>	Stinging nettle D	N
<i>Verbascum thapsus</i>	Common mullein	I
<i>Verbena hastata</i>	Blue vervain D	N
<i>Verbena stricta</i>	Woolly verbena	N
<i>Vernonia fasciculata</i>	Ironweed D	N
<i>Veronica americana</i>	Brooklime speedwell D	N
<i>Veronica anagallis-aquatica</i>	Water speedwell D	N
<i>Veronica peregrine</i>	Purslane speedwell D	N
<i>Vicia Americana</i>	American vetch	N
<i>Viola nuttallii</i>	Nuttall's violet	N
<i>Viola pratinocola</i>	Meadow violet	N
<i>Vulpia octoflora</i>	Six weeks fescue	N

<i>Scientific Name</i>	<i>Common Name</i>	<i>Origin</i>
<i>Xanthium strumarium</i>	Cocklebur	N
<i>Yucca glauca</i>	Yucca	N
<i>Zannichellia palustris</i>	Horned pondweed D	N
<i>Zizania aquatica</i>	Wild rice D	N

*Plant list was compiled from species collected on Lacreek NWR and located in herbariums at Lacreek NWR, South Dakota State University, University of South Dakota, and University of Nebraska at Chadron. Additional species were added by staff members at Lacreek NWR from specimens that had been keyed but were not included in herbarium collections.

A “D” following the common name indicates this is a Desirable species for consideration in Developed Wetland Objectives A, B, and C. I = Introduced, N = Native

Herpetofauna

<i>Scientific Name</i>	<i>Common Name</i>
Salamanders	
<i>Ambystoma tigrinum</i>	Blotched tiger salamander
Frogs	
<i>Bufo woodhousei</i>	Woodhouse’s toad
<i>Pseudacris triseriata</i>	Western chorus frog
<i>Rana catebeiana</i>	Bullfrog
<i>Rana pipiens</i>	Leopard frog
<i>Scaphiopus bombifrons</i>	Plains spadefoot toad
Turtles	
<i>Chelydra serpentina</i>	Common snapping turtle
<i>Chrysemys picta</i>	Western painted turtle
<i>Terrapene ornate</i>	Western box turtle
Lizards	
<i>Cnemidophorus sexlineatus</i>	Prairie racerunner
<i>Eumeces multivirgatus</i>	Many-lined skink
<i>Holbrookia maculata</i>	Northern earless lizard
<i>Sceloporus undulates</i>	Northern prairie lizard
Snakes	
<i>Coluber constrictor</i>	Eastern yellow-bellied racer
<i>Crotalus viridus</i>	Prairie rattlesnake
<i>Heterodon nasicus</i>	Western hognose snake
<i>Pituophis melanoleucus</i>	Bull snake
<i>Thamnophis radix</i>	Plains garter snake
<i>Thamnophis sirtalis</i>	Red-sided garter snake

*Contents of this table taken from The Herpetofauna of Lacreek National Wildlife Refuge, Luis Maralet, 1975.

Mammals

<i>Scientific Name</i>	<i>Common Name</i>
<i>Antilocarpa americana</i>	Pronghorn
<i>Canis latrans</i>	Coyote
<i>Castor canadensis</i>	Beaver
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog
<i>Dipodomys ordii</i>	Ord’s kangaroo rat
<i>Erethizon dorsatum</i>	Porcupine
<i>Felis rufus</i>	Bobcat
<i>Geomys bursarius</i>	Plains pocket gopher
<i>Lepus californicus</i>	Black-tailed jackrabbit
<i>Lepus townsendii</i>	White-tailed jackrabbit
<i>Mephitis mephitis</i>	Striped skunk
<i>Microtus ochrogaster</i>	Prairie vole
<i>Microtus pennsylvanicus</i>	Meadow vole
<i>Mus musculus</i>	House mouse

<i>Scientific Name</i>	<i>Common Name</i>
<i>Mustela frenata</i>	Long-tailed weasel
<i>Mustela nivalis</i>	Least weasel
<i>Mustela vison</i>	Mink
<i>Odocoileus hemionus</i>	Mule deer
<i>Odocoileus virginianus</i>	White-tailed deer
<i>Ondatra zibethicus</i>	Muskrat
<i>Onychomys leucogaster</i>	Northern grasshopper mouse
<i>Perognathus fasciatus</i>	Olive-backed pocket mouse
<i>Perognathus flavescens</i>	Plains pocket mouse
<i>Perognathus hispidus</i>	Hispid pocket mouse
<i>Peromyscus leucopus</i>	White-footed mouse
<i>Peromyscus maniculatus</i>	Deer mouse
<i>Procyon lotor</i>	Raccoon
<i>Reithrodontomys megalotis</i>	Western harvest mouse
<i>Reithrodontomys montanus</i>	Plains harvest mouse
<i>Sorex cinerius</i>	Masked shrew
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined ground squirrel
<i>Spermophilus franklinii</i>	Franklin's ground squirrel
<i>Spilogale putorius</i>	Eastern spotted skunk
<i>Sylvilagus audubonii</i>	Desert cottontail
<i>Sylvilagus floridanus</i>	Eastern cottontail
<i>Taxidea taxus</i>	Badger
<i>Vulpes velox</i>	Swift fox
<i>Vulpes vulpes</i>	Red fox
<i>Zapus hudsonius</i>	Meadow jumping mouse

*Table lists mammals documented as occurring on Lacreek NWR (Wilhelm et al. 1981)

Birds

<i>Scientific Name</i>	<i>Common Name</i>
<i>Accipiter cooperii</i>	Cooper's hawk
<i>Accipiter gentiles</i>	Northern goshawk
<i>Accipiter striatus</i>	Sharp-shinned hawk
<i>Actitis macularia</i>	Spotted sandpiper
<i>Aechmophorus occidentalis</i>	Western grebe
<i>Agelaius phoeniceus</i>	Red-winged blackbird
<i>Aix sponsa</i>	Wood duck
<i>Ammodramus leconteii</i>	LeConte's sparrow
<i>Ammodramus savannarum</i>	Grasshopper sparrow
<i>Anas acuta</i>	Northern pintail
<i>Anas americana</i>	American widgeon
<i>Anas clypeata</i>	Northern shoveler
<i>Anas creca</i>	Green-winged teal
<i>Anas cyanoptera</i>	Cinnamon teal
<i>Anas discors</i>	Blue-winged teal
<i>Anas platyrhynchos</i>	Mallard
<i>Anas rubripes</i>	American black duck
<i>Anas strepera</i>	Gadwall
<i>Anser albifrons</i>	Greater white-fronted goose
<i>Anthus rubescens</i>	American pipit
<i>Anthus spragueii</i>	Sprague's pipit
<i>Aquila chrysaetos</i>	Golden eagle
<i>Archilochus colubris</i>	Ruby-throated hummingbird
<i>Ardea alba</i>	Great egret
<i>Ardea herodias</i>	Great blue heron
<i>Arenaria interpres</i>	Ruddy turnstone
<i>Asio flammeus</i>	Short-eared owl
<i>Asio otus</i>	Long-eared owl

<i>Scientific Name</i>	<i>Common Name</i>
<i>Athene cunicularia</i>	Burrowing owl
<i>Aythya affinis</i>	Lesser scaup
<i>Aythya americana</i>	Redhead
<i>Aythya collaris</i>	Ring-necked duck
<i>Aythya marila</i>	Greater scaup
<i>Aythya valisineria</i>	Canvasback
<i>Bartramia longicauda</i>	Upland sandpiper
<i>Bombycilla cedrorum</i>	Cedar waxwing
<i>Bombycilla garrulus</i>	Bohemian waxwing
<i>Botaurus lentiginosus</i>	American bittern
<i>Branta Canadensis</i>	Canada goose
<i>Bubo virginianus</i>	Great horned owl
<i>Bubulcus ibis</i>	Cattle egret
<i>Bucephala albeola</i>	Bufflehead
<i>Bucephala clangula</i>	Common goldeneye
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Buteo lagopus</i>	Rough-legged hawk
<i>Buteo lineatus</i>	Red-shouldered hawk
<i>Buteo platypterus</i>	Broad-winged hawk
<i>Buteo regalis</i>	Ferruginous hawk
<i>Buteo swainsoni</i>	Swainson's hawk
<i>Butorides virescens</i>	Green heron
<i>Calamospiza melanocorys</i>	Lark bunting
<i>Calcarius lapponicus</i>	Lampan longspur
<i>Calcarius mccownii</i>	McCown's longspur
<i>Calcarius ornatus</i>	Chestnut-collared longspur
<i>Calidris alba</i>	Sanderling
<i>Calidris bairdii</i>	Baird's sandpiper
<i>Calidris himantopus</i>	Stilt sandpiper
<i>Calidris mauri</i>	Western sandpiper
<i>Calidris melanotos</i>	Pectoral sandpiper
<i>Calidris minutilla</i>	Least sandpiper
<i>Calidris pusilla</i>	Semipalmated sandpiper
<i>Callidris fuscicollis</i>	White-rumped sandpiper
<i>Cardinalis cardinalis</i>	Northern cardinal
<i>Carduelis flammea</i>	Common redpoll
<i>Carduelis pinus</i>	Pine siskin
<i>Carduelis tristis</i>	American goldfinch
<i>Carpodacus purpureus</i>	Purple finch
<i>Cathartes aura</i>	Turkey vulture
<i>Catharus fuscescens</i>	Veery
<i>Catharus guttatus</i>	Hermit thrush
<i>Catharus minimus</i>	Gray-cheeked thrush
<i>Catharus ustulatus</i>	Swainson's thrush
<i>Catoptrophorus semipalmatus</i>	Willet
<i>Ceryle alcyon</i>	Belted kingfisher
<i>Charadrius melodus</i>	Piping plover
<i>Charadrius semipalmatus</i>	Semipalmated plover
<i>Charadrius vociferous</i>	Killdeer
<i>Chen caerulescens</i>	Snow goose
<i>Chen rossii</i>	Ross's goose
<i>Chilidonias niger</i>	Black tern
<i>Chondestes grammacus</i>	Lark sparrow
<i>Chordeiles minor</i>	Common nighthawk
<i>Circus cyaneus</i>	Northern harrier
<i>Cistothorus palustris</i>	Marsh wren
<i>Cistothorus platensis</i>	Sedge wren
<i>Coccythraustes vesperinus</i>	Evening grosbeak
<i>Coccyzus americanus</i>	Yellow-billed cuckoo
<i>Coccyzus erythrophthalmus</i>	Black-billed cuckoo

<i>Scientific Name</i>	<i>Common Name</i>
<i>Colaptes auratus</i>	Northern flicker
<i>Columba livia</i>	Rock dove
<i>Contopus virens</i>	Eastern wood-pewee
<i>Corvus brachyrhynchos</i>	American crow
<i>Coturnicops noveboracensis</i>	Yellow rail
<i>Cyanocitta cristata</i>	Blue jay
<i>Cygnus buccinator</i>	Trumpeter swan
<i>Cygnus columbianus</i>	Turndra swan
<i>Dendroica coronata</i>	Yellow-rumped warbler
<i>Dendroica magnolia</i>	Magnolia warbler
<i>Dendroica palmarum</i>	Palm warbler
<i>Dendroica pensylvanica</i>	Chestnut sided warbler
<i>Dendroica petechia</i>	Yellow warbler
<i>Dendroica striata</i>	Blackpoll warbler
<i>Dolichonyx oryzivorus</i>	Boblink
<i>Drumetella carolinensis</i>	Gray catbird
<i>Egretta caerulea</i>	Little blue heron
<i>Egretta thula</i>	Snowy egret
<i>Empidonax minimus</i>	Least flycatcher
<i>Empidonax traillii</i>	Willow flycatcher
<i>Eremophila alpestris</i>	Horned lark
<i>Euphagus carolinus</i>	Rusty blackbird
<i>Euphagus cyanocephalus</i>	Brewer's blackbird
<i>Falco columbarius</i>	Merlin
<i>Falco mexicanus</i>	Prairie falcon
<i>Falco peregrinus</i>	Peregrine falcon
<i>Falco rusticolus</i>	Gyr Falcon
<i>Falco sparverius</i>	American kestrel
<i>Fulica americana</i>	American coot
<i>Gallinago gallinago</i>	Common snipe
<i>Geothlypis trichas</i>	Common yellowthroat
<i>Grus americana</i>	Whooping crane
<i>Grus canadensis</i>	Sandhill crane
<i>Guiraca caerulea</i>	Blue grosbeak
<i>Haliaeetus leucocephalus</i>	Bald eagle
<i>Himantopus mexicanus</i>	Black-necked stilt
<i>Hirundo rustica</i>	Barn swallow
<i>Icteria virens</i>	Yellow-breasted chat
<i>Icterus galbula</i>	Baltimore oriole
<i>Icterus spurius</i>	Orchard oriole
<i>Ixobrychus exilis</i>	Least bittern
<i>Junco hyemalis</i>	Dark-eyed junco
<i>Lanius excubitor</i>	Northern shrike
<i>Lanius ludovicianus</i>	Loggerhead shrike
<i>Larus delawarensis</i>	Ring-billed gull
<i>Larus glaucescens</i>	Glaucous-winged gull
<i>Larus Philadelphia</i>	Bonaparte's gull
<i>Larus pipixcan</i>	Franklin's gull
<i>Leucosticte atrata</i>	Black rosy-finch
<i>Limnodromus griseus</i>	Short-billed dowitcher
<i>Limnodromus scolopaceus</i>	Long-billed dowitcher
<i>Limosa fedoa</i>	Marbled godwit
<i>Limosa haemastica</i>	Hudsonian godwit
<i>Llarus argentatus</i>	Herring gull
<i>Lophodytes cucullatus</i>	Hooded merganser
<i>Melanerpes erythrocephalus</i>	Red-headed woodpecker
<i>Melanitta fusca</i>	White-winged scoter
<i>Meleagris gallopavo</i>	Wild turkey
<i>Melospiza Georgiana</i>	Swamp sparrow

<i>Scientific Name</i>	<i>Common Name</i>
<i>Melospiza lincolni</i>	Lincoln's sparrow
<i>Melospiza melodia</i>	Song sparrow
<i>Mergus merganser</i>	Common merganser
<i>Mergus serrator</i>	Red-breasted merganser
<i>Mimus polyglottos</i>	Northern mockingbird
<i>Mniotilta varia</i>	Black-and-white warbler
<i>Molothrus ater</i>	Brown-headed cowbird
<i>Myadestes townsendi</i>	Townsend's solitaire
<i>Myiarchus crinitus</i>	Great crested flycatcher
<i>Numenius americanus</i>	Long-billed curlew
<i>Nyctanassa violacea</i>	Yellow-crowned night-heron
<i>Nyctea scandiaca</i>	Snowy owl
<i>Nycticorax nycticorax</i>	Black-crowned night-heron
<i>Otus asio</i>	Eastern screech owl
<i>Oxyura jamaicensis</i>	Ruddy duck
<i>Pandion haliaetus</i>	Osprey
<i>Parula Americana</i>	Northern parula
<i>Passer domesticus</i>	House sparrow
<i>Passerculus sandwichensis</i>	Savannah sparrow
<i>Passerella iliaca</i>	Fox sparrow
<i>Passerine amoena</i>	Lazuli bunting
<i>Passerine cyanea</i>	Indigo bunting
<i>Pelecanus erythrorhynchos</i>	American white pelican
<i>Perdix perdix</i>	Gray partridge
<i>Petrochelidon pyrrhonota</i>	Cliff swallow
<i>Phalacrocorax auritus</i>	Double-crested cormorant
<i>Phalaropus lobatus</i>	Red-necked phalarope
<i>Phalaropus tricolor</i>	Wilson's phalarope
<i>Phasianus colchicus</i>	Ring-necked pheasant
<i>Pheucticus ludovicianus</i>	Rose-breasted grosbeak
<i>Pheucticus melanocephalus</i>	Black-headed grosbeak
<i>Pica pica</i>	Black-billed magpie
<i>Picoides pubescens</i>	Downy woodpecker
<i>Picoides villosus</i>	Hairy woodpecker
<i>Pipilo maculatus</i>	Spotted towhee
<i>Piranga olivacea</i>	Scalet tanager
<i>Plectrophenax nivalis</i>	Snow bunting
<i>Plegadis chihi</i>	White-faced ibis
<i>Pluvialis dominica</i>	American golden plover
<i>Pluvialis squatarola</i>	Black-bellied plover
<i>Podiceps nigricollis</i>	Eared grebe
<i>Podilymbus podiceps</i>	Pied-billed grebe
<i>Poecile atricapillus</i>	Black-capped chickadee
<i>Poecetes gramineus</i>	Vesper sparrow
<i>Porzana carolina</i>	Sora
<i>Progne subis</i>	Purple martin
<i>Quiscalus quiscula</i>	Common grackle
<i>Rallus Limicola</i>	Virginia rail
<i>Recurvirostra Americana</i>	American avocet
<i>Regulus calendula</i>	Ruby-crowned kinglet
<i>Regulus satrapa</i>	Golden-crowned kinglet
<i>Riparia riparia</i>	Bank swallow
<i>Salpinctes obsoletus</i>	Rock wren
<i>Sayornis phoebe</i>	Eastern phoebe
<i>Sayornis saya</i>	Say's phoebe
<i>Seiurus aurocapillus</i>	Ovenbird
<i>Seiurus noveboracensis</i>	Northern waterthrush
<i>Setophaga ruticilla</i>	American redstart
<i>Sialia currucoides</i>	Mountain bluebird
<i>Sialia sialis</i>	Eastern bluebird

<i>Scientific Name</i>	<i>Common Name</i>
<i>Sitta canadensis</i>	Red-breasted nuthatch
<i>Sitta carolinensis</i>	White-breasted nuthatch
<i>Sphyrapicus varius</i>	Yellow-bellied sapsucker
<i>Spiza Americana</i>	Dickcissel
<i>Spizella arborea</i>	American tree sparrow
<i>Spizella pallida</i>	Clay-colored sparrow
<i>Spizella passerine</i>	Chipping sparrow
<i>Spizella pusilla</i>	Field sparrow
<i>Stelgidopteryx serripennis</i>	Northern rough-winged swallow
<i>Sterna forsteri</i>	Forster's tern
<i>Sterna hirundo</i>	Common tern
<i>Sturnella magna</i>	Eastern meadowlark
<i>Sturnella neglecta</i>	Western meadowlark
<i>Sturnus vulgaris</i>	European starling
<i>Tachycineta bicolor</i>	Tree swallow
<i>Tachycineta thalassina</i>	Violet-green swallow
<i>Toxostoma rufum</i>	Brown thrasher
<i>Tringa flavipes</i>	Lesser yellowlegs
<i>Tringa melanoleuca</i>	Greater yellowlegs
<i>Tringa solitaria</i>	Solitary sandpiper
<i>Troglodytes aedon</i>	House wren
<i>Turdus migratorus</i>	American robin
<i>Tympanuchus cupido</i>	Greater prairie-chicken
<i>Tympanuchus phasianellus</i>	Sharp-tailed grouse
<i>Tyrannus forficatus</i>	Scissor-tailed flycatcher
<i>Tyrannus tyrannus</i>	Eastern kingbird
<i>Tyrannus verticalis</i>	Western kingbird
<i>Tyto alba</i>	Barn owl
<i>Vermivora celata</i>	Orange-crowned warbler
<i>Vermivora peregrine</i>	Tennessee warbler
<i>Vireo olivaceus</i>	Red-eyed vireo
<i>Vireo bellii</i>	Bell's vireo
<i>Vireo gilvus</i>	Warbling vireo
<i>Wilsonia pusilla</i>	Wilson's warbler
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed blackbird
<i>Zenaida macroura</i>	Mourning dove
<i>Zonotrichia albicollis</i>	White-throated sparrow
<i>Zonotrichia leucophrys</i>	White-crowned sparrow
<i>Zonotrichia querula</i>	Harris's sparrow

*List compiled from refuge records. An additional 32 species have been observed on the refuge, but were excluded from this list as they were considered to be accidental.

Appendix H

Refuge Operating Needs System

<i>Project Number</i>	<i>Project Description</i>	<i>First Year Need (\$1,000)</i>	<i>Recurring Base Need (\$1,000)</i>	<i>Personnel FTE</i>
00002	Complete high diversity seedlings to restore native mixed grass and wet meadow habitat.	\$152	0	0
00003	Create migratory bird habitat	\$156	0	2

Appendix I

Maintenance Management System

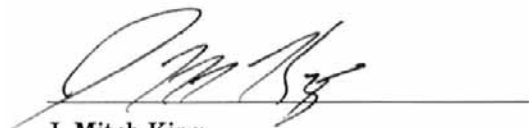
<i>MMS Number</i>	<i>Description</i>	<i>Cost (\$1,000)</i>
Deferred Maintenance		
04005	Replace Quarters #14	262
93002	Rehabilitate water control structure on trout pond #2	96
Large Construction		
04004	Replace Quarters #2	262
SAMMS # 01117103	Little White River Dam Rehabilitation Phase III	4,142
Heavy Equipment		
94004	Replace loader/backhoe	93
01018	Replace Case 2090 Tractor	69
01019	Replace 1983 Case Articulating Loader	105
01003	Replace 1981 D6 Bulldozer	131
01008	Replace 1981 Road Grader	148
01017	Replace 1968 Lorain Dragline	137
01009	Replace 2000 F-450 Fire Truck	37
01012	Replace 1988 GMC Stakebody Truck	44
01015	Replace John Deere 6400 Tractor	66
01020	Replace John Deer 7410 Tractor	74
05001	Replace 2004 Freightliner Dump truck	91
Small Equipment		
01004	Replace Dodge Minivan	25
00005	Replace 1991 Chevy Pickup	31
01002	Replace 1997 Ford Pickup	33
01005	Replace 1999 Chevrolet Pickup	31
01006	Replace 2000 Chevrolet Pickup	31
01007	Replace 2001 Ford Super duty Pickup	31
01016	Replace John Deere 750 Tractor/mower	13
02002	Replace 2001 B & B Herbicide Sprayer	18
02003	Replace 2002 Honda ATV	6
02005	Replace 2002 Dodge Pickup	34
02006	Replace 2001 Panther Airboat	26
02007	Replace Model 52 Fire Engine	16
03001	Replace 2003 Chevrolet Pickup	31
04008	Replace 2002 Honda Rancher ATV	6
04009	Replace 2002 Honda Rancher ATV	6
04010	Replace 1997 Honda ATV	6
04012	Replace John Deere 425 Riding Mower	8
04014	Replace Grolsz Seed Stripper	7
04015	Replace 2002 Dodge Extended Cab Pickup	30
04017	Replace John Deere Batwing Mower	14
04018	Replace 2004 Polaris Ranger 6X6	9
04019	Replace John Deere 485 Riding Mower	9
04020	Replace John Deere Batwing Mower	13
04021	Replace 2004 Warne Chemical Herbicide Sprayer	6
04022	Replace 2003 Chevy Pickup	22
05002	Replace 2005 Polaris Ranger	10
Road Rehabilitation		
88022B	Preliminary Engineering (Routes 10 & 11, 6.73 miles & parking lots 900, 903-06)	712
88021	Construction Route 10 & 11, 6.73 miles & parking lots 900, 903-06)	1,180
00007	Preliminary Engineering (Route 12, 4.08 miles)	123
91008	Construction Route 12, 4.08 miles	1,180

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 implementing 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 Lacreek National Wildlife Refuge and Wetland Management District* 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

2/23/06
Date



David Wiseman
Refuge Program Supervisor
U.S. Fish and Wildlife Service, Region 6
Lakewood, CO

FEB 23 2006
Date



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

FEB 23 2006
Date



Tom Koerner
Refuge Manager
Lacreek National Wildlife Refuge and
Wetland Management District
Columbia, SD

FEB 23 2006
Date

Finding of No Significant Impact

U.S. Fish and Wildlife Service

Region 6

Denver, Colorado

Three management alternatives for the Lacreek National Wildlife Refuge and Wetland Management District Comprehensive Conservation Plan were assessed as to their effectiveness in achieving the Refuge purposes and their impact on the human environment. Alternative A, the No Action Alternative, would continue current management of the Refuge. Alternative B, Integrated Restoration, the Proposed Action would strive to restore ecological processes and achieve habitat conditions that require reduced management over time recognizing the place of the refuge in the overall landscape and community. Alternative C, Comprehensive Grassland Restoration would focus management on restoration of grassland habitat and its associated species. Based on this assessment and comments received, I have selected Alternative B for implementation.


The preferred alternative (alternative B) was selected because it best meets the purposes for which the Lacreek National Wildlife Refuge and Wetland Management District 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.

As part of this plan black tailed prairie dog management plan for Lacreek National Wildlife Refuge was developed. Management would include any activity conducted to control the size of prairie dogs towns, maintain habitat suitability for black tailed prairie dogs, and/or ensure the long term viability of black tailed prairie dogs at Lacreek NWR within a biologically and socially compatible zone over the next 15 years.

I find that the preferred alternative and black tailed prairie dog management plan are not major Federal actions 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 implementation of 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 of South Dakota has been notified and given the opportunity to review the Comprehensive Conservation Plan and associated environmental assessment.


J. Mitch King
Regional Director
Region 6, U.S. Fish & Wildlife Service
Denver, Colorado

2/23/06
Date



Bibliography

Bibliography

- Abraham, C.L., and R.M. Evans. 1999. The development of endothermy in American white pelicans. *The Condor*. 101:832–41.
- Ad hoc Drafting Committee for the Interior Population of Trumpeter Swans, 1998. Mississippi and Central Flyway Management Plan for the Interior Population of Trumpeter Swans. Mississippi and Central Flyway Councils. (c/o USFWS, Migratory Bird Coordinator) Twin Cities, MN. Unpub. Rpt.
- Adamcik, R.S., E.S. Bellantoni, D.C. DeLong Jr., J.H. Schomaker, D.B. Hamilton, M.K. Laubhan, and R.L. Schroeder. 1997. Writing Refuge Management Goals and Objectives: A Handbook. U.S. Department of the Interior, U.S. Fish and Wildlife Service, National Wildlife Refuge System. 30.
- Adolphson, D.G., and M. Adolphson. 1968 March. Size, distribution, and population of three colony nesting species in South Dakota. *South Dakota Bird Notes*.
- Agnew, W., D.W. Uresk and R.M. Hansen. 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. *J. Range Manage.* 39:135–38.
- Andelt, W.F. and S.N. Hopper. 2003. Managing prairie dogs. Colorado State University Cooperative Extension-Natural Resources. No. 6.506. [not cited in text]
- Aschwanden, C. 2001. Learning to live with prairie dogs. *Natural Wildlife Mag.* 39:2. [not cited in text]
- Austin, J.E., and M.R. Miller. 1995. Northern Pintail (*Anas acuta*). In A. Poole and F. Gill (eds). *The Birds of North America*, No. 163. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C. doi:10.2173/bna.163.
- Bakker, K.K. 2003a. A compilation and synthesis of avian research completed in South Dakota. College of Arts and Sciences, Dakota State University, Madison, South Dakota. <http://www.homepages.dsu.edu/bakker/birds/grassland.htm>.
- Bakker, K.K. 2003b. A synthesis of the effect of woody vegetation on grassland nesting birds. *Proceedings of the South Dakota Academy of Science*. 82:119–40. [not cited in text]
- Bandas, S.J. and K.F. Higgins. 2004. Field Guide to South Dakota Turtles. SDCES EC 919. Brookings: South Dakota State University.
- Banko, W.E. 1960. The Trumpeter Swan. U.S. Fish and Wildlife Service, North American Fauna. 63.
- Barko, V.A., J.H. Shaw and D.M. Leslie. 1999. Birds associated with black-tailed prairie dog colonies in southern shortgrass prairie. *Southwestern Naturalist*. 44(4):484–89.
- Benedict, R.A., P.W. Freeman, and H.H. Genoways. 1996. Prairie legacies—mammals. In F.B. Samson, and F.L. Knopf (eds). *Prairie conservation: preserving America's most endangered ecosystem*. Covelo, Calif.: Island Press.
- Berenthal, T.W. 2003. Development of a floristic quality assessment methodology for Wisconsin. Wisconsin Department of Natural Resources. Madison, WI.
- Birkenholz, D.E. 1972. Habitat relationships of grassland birds at Goose Lake Prairie Nature Preserve. Kansas State University, Manhattan: 63–66.
- Bleed, A. and C. Flowerday (eds). 1990. An Atlas of the sand hills. Resource Atlas No. 5a. Conservation and Survey Division, Institute of Agriculture and Natural Resources. University of Nebraska–Lincoln.
- Bock, C. E., Webb, B. 1984. Birds as grazing indicator species in southeastern Arizona. *J. Wildl. Manage.* 48:1045–49.
- Bouffard, S.H. and M.A. Hanson. 1997. Fish in waterfowl marshes: waterfowl managers' perspective. *Wildlife Society Bulletin*, 25(1):146–57.
- Bowen, B.S., and A.D. Kruse. 1993. Effects of grazing on nesting by upland sandpipers in southcentral North Dakota. *J. Wildl. Manage.* 57:291–301.
- Brinson, M.M., A.E. Lugo and S. Brown. 1981. Primary productivity, decomposition and consumer activity in freshwater wetlands. *Annual Review of Ecology and Systematics* 12:123–61.
- Brisbin, Jr., I.L., H.D. Pratt and T.B. Mowbray. 2002. American Coot (*Fulica americana*) Hawaiian Coot (*Fulica alai*). In A. Poole and F. Gill (eds). *The Birds of North America*. 697. The Birds of North America, Inc. Philadelphia, PA. doi:10.2173/bna.697a.

- Brown, B.T. 1993. Bell's Vireo. In A. Poole, P. Stettenheim, and F. Gill (eds). The Birds of North America, No. 35 Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union, Washington, D.C. doi: 10.2173/bna.35.
- Brown, D.G. and D. Duvall. 1993. Habitat associations of prairie rattlesnakes (*Crotalus viridis*) in Wyoming. *Herpetological Natural History*. 1(1):5–12.
- Brown, J.K. and J.K. Smith (eds). 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Brown, S., C. Hickey, and B. Harrington. 2000. United States Shorebird Conservation Plan. Manomet Center For Conservation Sciences. August.
- Bunnell, F.L., D. Dunbar, L. Koza, and G. Ryder. 1981. Effects of disturbance on the productivity and numbers of White pelicans in British Columbia-observations and models. *Colonial Waterbirds*. 4:2–11.
- Bureau of Reclamation. 2002. 2000–2001 Vegetation Mapping Project Final Report, Lacreek National Wildlife Refuge. Technical Memorandum 8260–02-02. Remote Sensing and GIS Group, Technical Service Center, Bureau of Reclamation. February.
- Burgett, G.R. and R.K. Nickel. 1994. Archeological Overview and Assessment for Lacreek, Fort Niobrara and Valentine National Wildlife Refuges, Midwest Archeological Center, National Park Service.
- Campbell, T.M. and T.W. Clark. 1981. Colony characteristics and vertebrate associates of white-tailed and black-tailed prairie dogs in Wyoming. *American Midland Naturalist*. 105(2):269–76.
- Carter, J. M. 1998. Water resources of Mellette and Todd Counties, South Dakota. U.S. Geological Survey Water Resources Investigations Report 98-4146.
- Clark, R.J. 1975. A field study of the short-eared owl, *Asio flammeus* (Pontoppidan), in North America. *Wildlife Monographs* 47:1-67.
- Clayton, K.M. and J.K. Schmutz. 1999. Is the decline of burrowing owls *Speotyto cunicularia* in prairie Canada linked to changes in Great Plains ecosystems? *Bird Conservation International* 9:163–85.
- Connelly, J.W., M.W. Gratson, and K.P. Reese. 1998. Sharp-tailed Grouse (*Tympanuchus phasianellus*). In A. Poole and F. Gill (eds). The Birds of North America, No. 354. The Birds of North America, Inc., Philadelphia, PA. doi:10.2173/bna.354.
- Converse, S.J. and J.A. Savidge. 2003. Ambient temperature, activity, and microhabitat use by ornate box turtles (*Terrapene ornata ornata*). *J. of Herpetology*. 37(4):665–70.
- Conway, C.J. 1995. Virginia Rail (*Rallus limicola*). In A. Poole and F. Gill (eds). The Birds of North America, No. 173. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C. doi:10.2173/bna.173.
- Coppock, D.L., J.E. Ellis, J.K. Detling, and M.I. Dyer. 1983. Plant-herbivore interactions in a North American mixed-grass prairie. II. Responses of bison to modification of vegetation by prairie dogs. *Oecologia* (Berlin). 56:10–15.
- Cowardin, L.M., P.J. Pietz, J.T. Lokemoen, H.T. Sklebar, and G.A. Sargeant. 1998. Response of nesting ducks to predator exclosures and water conditions during drought. *J. of Wildlife Management*. 62(1):152–63.
- Cully, J.F. and E.S. Williams. 2001. Interspecific comparisons of sylvatic plague in prairie dogs. *J. of Mammalogy*. 82(4):894–905.
- D'Antonio, C.M. and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. *Annual Review of Ecology and Systematics*. 23:63–87.
- Danley, R.F., R.K. Murphy, and E.M. Madden. 2004. Species diversity and habitat of grassland passerines during grazing of a prescribe-burned, mixed-grass prairie. *Western North American Naturalist* 64(1):72–77.
- Davis, S.K. 2004. Area Sensitivity in grassland passerines: Effects of patch size, patch shape, and vegetation structure on bird abundance and occurrence in southern Saskatchewan. *The Auk*. 121(4):1130–45.
- Dechant, J.A., D.H. Johnson, L.D. Igl, C.M. Goldade, A.L. Zimmerman, and B.R. Euliss. 1999 (revised 2002b). Effects of management practices on grassland birds: Wilson's Phalarope. Northern Prairie Wildlife Research Center, Jamestown, ND.
- Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, M.P. Nenneman, and B.R. Euliss. 1998 (revised 2001). Effects of management practices on grassland birds: Marbled Godwit. Northern Prairie Wildlife Research Center, Jamestown, ND.

- Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, P.A. Rabie, and B.R. Euliss. 1999 (revised 2002a). Effects of management practices on grassland birds: Long-billed Curlew. Northern Prairie Wildlife Research Center, Jamestown, ND.
- Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, B.D. Parkin, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Willet. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. <<http://www.npwrc.usgs.gov/resource/literatr/grasbird/will/will.htm>>
- Dechant, J.A., Sondreal, M.L., Johnson, D.H., Igl, L.D., Goldade, C.M., Zimmerman, A.L., and Euliss, B.R. 2002. Effects of management practices on grassland birds: American Bittern. Northern Prairie Wildlife Research Center:1–14.
- DeJong, J.R. 2001. Landscape fragmentation and grassland patch size effects on non-game grassland birds in xeric mixed-grass prairies of western South Dakota. South Dakota State University, Brookings, SD.
- Doran, P.J., M. Whalen, K. Riener, and L. Fitzner. 2004. American white pelican (*Pelecanus erythrorhynchos*). In E.M. Larsen, J.M. Azerrad, and N. Nordstrom (eds). Management Recommendations for Washington's Priority Species, Volume IV: Birds (Online). Available <http://wdfw.wa.gov/hab/phs/vol4/amwpelic.htm>.
- Drilling, N., R. Titman, and F. McKinney, F. 2002. Mallard (*Anas platyrhynchos*). In A. Poole and F. Gill (eds). The Birds of North America. 658. The Birds of North America, Inc., Philadelphia, PA. doi:10.2173/bna.658.
- Duebbert, H.F. and J.T. Lokemoen. 1977. Upland nesting of American bitterns, marsh hawks, and short-eared owls. The Prairie Naturalist. 9 (3–4):33–40.
- Duebbert, H.F., E.T. Jacobson, K.F. Higgins, and E.B. Podoll. 1981. Establishment of seeded grasslands for wildlife habitat in the Prairie Pothole Region. U.S. Fish and Wildlife Service, Special Scientific Report, Wildlife No. 234.
- Duebbert, H.F., J.T. Lokemoen, and D.E. Sharp. 1986. Nest Sites of Ducks in Grazed Mixed-Grass Prairie in North Dakota. Prairie Nat. 18(2):99–108.
- Dugger, B.D. and K.M. Dugger. 2002. Long-billed Curlew (*Numenius americanus*). In A. Poole and F. Gill, eds. The Birds of North America, No. 628. The Birds of North America, Inc., Philadelphia, PA. doi:10.2173/bna.628.
- Eggers, S.D. and D.M. Reed. 1997. Wetland plants and communities of Minnesota and Wisconsin. U.S. Army Corps of Engineers, St. Paul District. Northern Prairie Wildlife Research Center Online. <<http://www.npwrc.usgs/resource/1998/mnplant/mnplant.htm>> (Version 03SEP98).
- Ellis, J.W. and J.B. Monnie. 1969. Some observations of the trumpeter swan flock Lacreek National Wildlife Refuge. First Trumpeter Swan Conference. McGregor, MN.
- Evans, R.M. 1972. Some effects of water level on the reproductive success of the White Pelican at East Shole Lake, Manitoba. The Canadian Field-Naturalist. 86:151–53.
- Evans, R.M. and X.X. McMahon. 1987. Within-brood variation in growth and condition in relation to brood reduction in the American white pelican. Wilson Bull. 99(2):190–201.
- Faanes, C.A. and G.R. Lingle. 1995. Breeding birds of the Platte River Valley of Nebraska. Jamestown, ND: Northern Prairie Wildlife Research Center home page. <http://www.npwrc.usgs.gov/resource/distr/birds/platte/platte.htm> (Version 16JUL97).
- Farrar, J. 1984. Trumpeter. Nebraskaland. 62(2):22–29.
- Farrar, J. 1994. The Merganser Club, Afield with Charlie Metz. Nebraskaland. 72(8):14–25.
- Findholt, S.L. and S.H. Anderson. 1995b. Foraging areas and feeding habitat selection of American white pelicans (*Pelecanus erythrorhynchos*) nesting at Pathfinder Reservoir, Wyoming. Colonial Waterbirds 18(1):47–57.
- Finkbeiner, S.L. and D.H. Johnson. 2002. Breeding birds of Lacreek NWR:2002. USGS, Northern Prairie Wildlife Resource Center– Jamestown, ND.
- Fjetland, C.A. 1974. Trumpeter Swan Management in the National Wildlife System. Transactions of the Thirty–Ninth North American Wildlife and Natural Resources Conference:136–141.
- Forsberg, M. 1995. Angels of the Hills. Nebraskaland. 73(10):20–26.
- Frawley, B.J. 1989. The dynamics of nongame bird breeding ecology in Iowa alfalfa fields. Iowa State University, Ames, IA.
- Fredrickson, L.H. and F.A. Reid. 1988. Invertebrate response to wetland management. Waterfowl Management Handbook. U.S. Fish and Wildlife Service. Washington, DC.
- Fredrickson, L.H. and T.S. Taylor. 1982. Management of seasonally flooded impoundments for wildlife. U.S. Fish and Wildlife Service Resource Publication 148.

- Fritcher, S.C., M.A. Rumble, and L.D. Flake. 2004. Grassland bird densities in several stages of mixed-grass prairie. *J. Range Manage.* 57:351–57.
- Fritz, M., J. Stubbendieck and W. Jobman. 1992. Blowout Penstemon Recovery Plan. <http://ecos.fws.gov/species_profile/servlet/gov.doi.species_profile.servlets.SpeciesProfile?spcode=Q2EX#status>
- Gale, R.S., E.O. Garton and I.J. Ball. 1987. The history, ecology, and management of the Rocky Mountain Population of Trumpeter Swans. U.S. Fish & Wildl. Service, Montana Cooperative Wildl. Research Unit, Missoula, MT.
- Gannon, V.P.J. 1978. Factors limiting the distribution of the prairie rattlesnake. *Blue Jay.* 36(3):142–44.
- Gannon, V.P.J. and Secoy, D.M. 1985. Seasonal and daily activity patterns in a Canadian population of the prairie rattlesnake, *Crotalus viridis viridis*. *Canadian J. of Zoology.* 63:86–91.
- Gibbs, J.P., S. Melvin, and F.A. Reid. 1992. American Bittern (*Botaurus lentiginosus*). In A. Poole, P. Stettenheim, and F. Gill (eds). *The Birds of North America*, No. 18. Philadelphia: The Academy of Natural Sciences, Washington, DC: The American Ornithologists' Union. doi:10.2173/bna.18.
- Gillette, L.N. 1973. Hand Rearing Trumpeter Swans at the Hennepin County Park Reserve District.:1–4.
- Gorenzel. W.P., R.A. Ryder and C.E. Braun. 1982. Reproduction and nest site characteristics of American Coots at different altitudes in Colorado. *The Cooper Ornithological Society.* 84:59–65.
- Grant, R.A. 1965. The burrowing owl in minnesota. *The Loon* (3):2–17.
- Grant, T.A., E. Madden and G.B. Berkey. 2004. Tree and shrub invasion in northern mixed-grass prairie: implications for breeding grassland birds. *Wildlife Society Bulletin.* 32(3):807–18.
- Graves, B.M. and D. Duvall. 1990. Spring emergence patterns of wandering garter snakes and prairie rattlesnakes in Wyoming. *J. of Herpetology.* 24(4):351–56.
- Graves, B.M., D.Duvall, M.B. King, S.L. Linstedt and W.A. Gern. 1986. Initial den location by neonatal prairie rattlesnakes: functions, causes, and natural history in chemical ecology. City, State: Plenum Press. 285–304.
- Gregg, L. 1987. Recommendations for a program of sharptail habitat preservation in Wisconsin. Research Report 141. Department of Natural Resources, Madison, WI.
- Griebel, R.L., S.L. Winter and A.A. Steuter. 1998. Grassland birds and habitat structure in sandhills prairie managed using cattle or bison plus fire. *Great Plains Research* 8:255–68.
- Hale, J.B., L.B. Best and R.L. Clawson. 1985. Management of nongame wildlife in the midwest: a developing art. Proceedings of a Symposium, 47th Midwest Fish and Wildlife Conference, Grand Rapids, MI:116–33.
- Hammer, D.A. 1969. Parameters of a marsh snapping turtle population, Lacreek Refuge, South Dakota. *J. Wildl. Manage.* 33(4):995–1005.
- Hammer, D.A. 1972. Ecological relations of waterfowl and snapping turtle populations. Logan, UT. Ph.D., dissertation, Utah State University.
- Hanowski, J.M., D.P. Christian, D.P. G.J. and Niemi. 2000: Landscape requirements of prairie sharp-tailed grouse *Tympanuchus phasianellus campestris* in Minnesota, USA. - *Wildl. Biol.* 6:257–63.
- Haug, E.A. and L.W. Oliphant. 1990. Movements, activity patterns, and habitat use of burrowing owls in Saskatchewan. *J. Wildl. Manage.* 54(1):27–35.
- Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing Owl (*Speotyto cuniculari*) In A. Poole and F. Gill (eds). *The Birds of North America*, No. 61. Philadelphia: The Academy of Natural Sciences, Washington, D.C.: The American Ornithologists' Union. doi:10.2173/bna.61.
- Hellmers, N. 1970 March. Return of the Trumpeter. *Nebraskaland*:30–55.
- Helzer, C.J. 1996. The effects of wet meadow fragmentation on grassland birds. M.S. thesis. University of Nebraska, Lincoln, NE.
- Helzer C.J. and D.E. Jelinski. 1999. The Relative Importance of Patch Area and Perimeter-Area Ratio to Grassland Breeding Birds. *Ecological Applications.* 9(4):1448–58.
- Henson, P. and T.A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin.* 19(3):248–57.
- Herkert, J.R., D.L. Reinking, D.A. Wiedenfeld, M. Winter, J.L. Zimmerman, W.E. Jensen, E.J. Finck, R.R. Koford, D.H. Wolfe, S.K. Sherrod, M.A. Jenkins, J. Faaborg, and S.K. Robinson. 2003. Effects of prairie fragmentation on the nest success of breeding birds in the midcontinental United States. *Conservation Biology.* 17(2):587–94.
- Herkert, J.R., R.E. Szafoni, V.M. Kleen, and J.E. Schwegman. 1993. Habitat establishment, enhancement and management for forest and grassland birds in Illinois. Illinois Department of Conservation, Division of Natural Heritage, Natural Heritage Technical Publication 1, Springfield, Illinois.

- Higgins, K.F., T.W. Arnold and R.B. Barta. 1984. Breeding bird community colonization of sown stands of native grasses in North Dakota. *Prairie Nat.* 16(4):177–82.
- Holton, G. 1982. Habitat use by Trumpeter Swans in the Grande Prairie region of Alberta. University of Calgary, Alberta, Canada.
- Holycross, A.T. and J.D. Fawcett. 2002. Observations on neoeatal aggregations and associated behaviors in the prairie rattlesnake, *Crotalus viridis viridis*. *The American Midland Naturalist*. 148(1):181–84.
- Houston, C.S. and D.E. Bowen, Jr. 2001. Upland Sandpiper (*Bartramia longicauda*). In A. Poole and F. Gill (eds). *The Birds of North America*, No. 580. The Birds of North America, Inc. Philadelphia, PA.
- Howard, W.E. 1994. Rattlesnakes. Great Plains Agriculture Council—Wildlife Committee, Prevention and Control of Wildlife Damage: f-21–f-26.
- Howe, R.W., D.M. Roosa, J.P. Schaufenbuel, and W.R. Silcock. 1985. Distribution and abundance of birds in the Loess Hills of Western Iowa. *Proc. Iowa Acad. Sci.* 92(5):164–75.
- Hughes, J.P. 1996. The effect of vegetative structure and landscape composition on avian abundance and reproductive success in CRP fields in northeastern Kansas. M.S. thesis. Kansas State University, Manhattan, KS.
- Hughlett, C.A., F.C. Bellrose, H.H. Burgess, A.S. Hawkins and J.A. Kadlec. 1984. Declining productivity of trumpeter swans at Red Rock Lakes National Wildlife Refuge, Lima, Montana. 9th Trumpeter Swan Society Conference, West Yellowstone, MT.
- Johnsgard, P.A. 1983. The grouse of the world. Ph.D. dissertation, University of Nebraska, Lincoln, NE.
- Johnson Jr., R.F. and N.F. Sloan, 1976. The effects of human disturbance on the white pelican colony at Chase Lake National Wildlife Refuge, North Dakota. *The Inland Bird Banding News*. 48(5):162–200.
- Johnson Jr., R.F. and N.F. Sloan. 1978. White pelican production and survival of young at Chase Lake National Wildlife Refuge, North Dakota. *The Wilson Bulletin*. 90(3):346–52.
- Johnson, R.G. and S.A. Temple. 1990. Nest predation and brood parasitism of tallgrass prairie birds. *J. Wildl. Manage.* 54:106–11.
- Kadlec, J.A. 1962. Effects of a drawdown on a waterfowl impoundment. *Ecology* 43:267–81.
- Kantrud, H.A. and K.F. Higgins. 1992. Nest and nest site characteristics of some ground-nesting, non-passerine birds of northern grasslands. *Prairie Naturalist* 24(2):67–84.
- Kantrud, H.A., G.L. Krapu and G.A. Swanson. 1989. Prairie basin wetlands of the Dakotas: a community profile. U.S. Fish Wildl. Serv. Biol. Rep. 85(7.28).
- Kaul, R. 1990. Plants. Pages 127-142 in A. Bleed and C. Flowerday, tech.ed. *An atlas of the sand hills*. University of Nebraska, Lincoln. Resource Atlas No. 5a.
- King, J.G., B. Conant, R.J. King and G. Bucaria. 1983. Trumpeter swan surveys on the Chugach National Forest. *The Trumpeter Swan Society Newsletter*. 11(4):1–10.
- King, M.B. and D. Duvall. 1990. Prairie rattlesnake seasonal migrations: episodes of movement, vernal foraging and sex differences. *Animal Behavior*. 39:924–35.
- Klein, M.L., S.R. Humphrey and H.F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology*. 9(6):1454–65.
- Klett, A. T., T. L. Shaffer, and D. H. Johnson. 1988. Duck nest success in the Prairie Pothole Region. *J. Wildl. Manage.* 52:431-440.
- Knopf, F. L. 1976. Spatial and temporal aspects of colonial nesting of the white pelican, (*Pelecanus erythrorhynchos*). Ph.D. dissertation, Utah State University, Logan, UT.
- Knopf, F.L. 2004. American White Pelican (*Pelecanus erythrorhynchos*). In A. Poole (ed). *The Birds of North America Online*. Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: <http://bna.birds.cornell.edu/BNA/account/American_White_Pelican/doi:10.2173/bna.57>
- Knopf, F.L. and J.L. Kennedy. 1980. Foraging sites of white pelicans nesting at Pyramid Lake, Nevada. *Western Birds*. 11:175–80.
- Knopf, F.L., J.A. Sedgwick and D.B. Inkley. 1990. Regional correspondence among shrubsteppe bird habitats. *Condor* 92:45–53.
- Knowles C.J. and P.R. Knowles. 1994. A Review of Black-tailed Prairie Dog Literature in Relation to Rangelands Administered by the Custer National Forest.
- Konrad, P.M. and D.S. Gilmer. 1984. Observations on the nesting ecology of burrowing owls in central North Dakota. *Prairie Nat.* 16:129–30.
- Kortright, F.H. 1953. The ducks, geese, and swans of North America. Stackpole Co. & Wildl. Mgmt. Vol. 69 and 77.

- Kraft, R. 2004. Refuge Manager, Retired. Personal communication with Tom Koerner, Refuge Manager, U.S. Fish and Wildlife Service.
- LaMontagne, J.M., L.J. Jackson and R.M. Barclay. 2003. Characteristics of ponds used by trumpeter swans in a spring migration stopover area. *Canadian J. of Zoology*. 81:1791–98.
- LaMontagne, J.M., L.J. Jackson and R.M. Barclay. 2003. Compensatory growth responses of *Potamogeton pectinatus* to foraging by migrating trumpeter swans in spring stopover areas. *Aquatic Botany*. 76:235–44.
- Larson, D.L., J.L. Larson and C. Reed. 2005. Alternative management practices for *Cirsium arvense*. Final Report for Lacreek National Wildlife Refuge, South Dakota and Lake Andes National Wildlife Refuge, South Dakota. USGS Northern Prairie Wildlife Research Center, St. Paul, MN.
- Laubhan, Murray K.; Tom. M. Koerner; Matt D. Sprenger; Shilo A. Comeau-Kingfisher; Rachel A. Laubhan; 2005. A Preliminary Biological Assessment of Lacreek National Wildlife Refuge, Martin, South Dakota, USA, U.S. Department of the Interior, U.S. Geological Survey: Jamestown, ND
- Leach, J.T. 1975. Lacreek area Trumpeter Swan behavior and migration study. University of South Dakota, Vermillion, SD.
- Lingle, G.R. and N.F. Sloan. 1980. General Notes. *Wilson Bulletin*. 92(1):123–25.
- Lockman, D., C.R. Wood, H. Burgess, R. Burgess and H. Smith. 1987. Rocky Mountain Trumpeter Swan population. Wyoming flock. 1982–1986. Wyoming Game and Fish Dept., Cheyenne, WY.
- Lusk, J.J., K.S. Wells, F.S. Guthery, and S.D. Fuhlendorf. 2003. Lark Sparrow (*Chondestes grammacus*) nest-site selection and success in a mixed-grass prairie. *The Auk* 120(1):120–29.
- Madden, E.M. 1996. Passerine communities and bird-habitat relationships on prescribe-burned, mixed-grass prairie in North Dakota. M.S. thesis. Montana State University, Bozeman, MT.
- Marlaret, L. 1974. The herpetofauna of Lacreek National Wildlife Refuge. *Transactions of the Kansas Academy of Science*.
- Marti, C.D. 1969. Some comparisons of the feeding ecology of four owls in north-central Colorado. *The Southwestern Naturalist* 14(2):163–70.
- Martin, J.S. 1996. Analysis of Bell's Vireo in southern South Dakota. University of South Dakota. Vermillion, SD.
- Martin, J.W. and J.R. Parrish. 2000. Lark Sparrow (*Chondestes grammacus*). In A. Poole and F. Gill (eds). *The Birds of North America*, No. 488. The Birds of North America, Inc., Philadelphia, PA. doi:10.2173/bna.488.
- Martin, S.G. and T.A. Gavin. 1995. Bobolink (*Dolichonyx oryzivorus*). In A. Poole and F. Gill (eds). *The Birds of North America*, No. 176. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C. doi:10.2173/bna.176.
- McCrary, J.W., W.A. Wentz and R.L. Linder. 1986. Plants and invertebrates in a prairie wetland during duck brood-rearing. *Prairie Nat.* 18(1):23–32.
- McCrow, V.P. 1974. Reproduction of white pelicans in South Dakota in 1973. *Proc. S.D. Acad. Sci.* 53:135–52.
- Mcenroe, M., A. Sapa, K. Keenlyne, J. Cooper, A. Hanley, S. Hubbard, G. Towns, K. Torkelson, and S. Ladd. 1994 July. U.S. Fish and Wildlife Service, Region 6 Prairie, Wetlands, and Missouri River Main Stem Ecosystem Team.
- McHale, L.A. 2000. Factors influencing wetland selection by high plains trumpeter swans. University of Montana, Missoula, MT.
- Melvin, S.M. and J.P. Gibbs. 1996. Sora (*Porzana Carolina*). In A. Poole and F. Gill (eds). *The Birds of North America*, No. 250. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C. doi:10.2173/bna.250.
- Messmer, T.A. 1990. Influence of grazing treatments on non-game birds and vegetation structure in south central Dorth Dakota. Ph.D. dissertation. North Dakota State University, Fargo, ND.
- Mitchell, C.D. 1994. Trumpeter Swan (*Cygnus buccinator*). In A. Poole and F. Gill, eds. *The Birds of North America*, No. 105.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union. doi:10.2173/bna.105.
- Monnie, J.B. 1964. A successful reintroduction of the trumpeter swan to its former prairie breeding range. Paper presented to the Midwest Wildlife Conference.
- Mowbray, T.B., J.S. Sedinger and R.E. Trost. 2005. Canada Goose (*Branta Canadensis*). In A. Poole and F. Gill (eds). *The Birds of North America*, No. 682. The Birds of North America, Inc., Philadelphia, PA. doi:10.2173/bna.682.
- Murkin, H.R., E.J. Murkin and J.P. Ball. 1997. Avian habitat selection and prairie wetland dynamics: a 10-year experiment. *Ecological Applications* 7:1144–59.

- Murphy, R.K. 1993. History, nesting biology, and predation ecology of raptors in the Missouri Coteau of northwestern North Dakota. Ph.D. dissertation. Montana State University, Bozeman, MT.
- Murphy, R. 2005. Conservation strategy and guidelines for Dakota skippers on service lands in the Dakotas. U.S. Fish and Wildlife Service.
- Naugle, D.E., K.F. Higgins and K.K. Bakker. 1999. Habitat area requirements of wetland birds in western South Dakota. Proceedings of the South Dakota Academy of Science. 78:129–38.
- Naugle, D.E., J.S. Gleason, J.A. Jenks and K.F. Higgins. 1997. Factors influencing wetland use by Canada geese. Wetlands 17(4):552–58.
- Overmire, T.G. 1963. The effects of grazing upon habitat utilization of the Dickcissel (*Spiza Americana*) and Bell's Vireo (*Vireo bellii*) in north central Oklahoma. City. Ph.D. dissertation, Oklahoma State University, Stillwater, OK.
- Pacific Flyway Trumpeter Swan Committee. 1993. Pacific Flyway Management Plan for the Pacific Coast Population of Trumpeter Swans. U.S. Fish and Wildlife Service, Office of Migratory Bird Management. Washington, D.C.
- Pacific, Central, Mississippi and Atlantic Flyway Trumpeter Swan Committees. 1984. Trumpeter Swans: North American Management Plan. U.S. Fish and Wildlife Service, Office of Migratory Bird Management. Washington, D.C.
- Page, R. 1973. The Ecology of the trumpeter swan on Red Rocks Refuge, Montana. Second Annual Report.
- Pampush, G.J. and R.G. Anthony. 1993. Nest success, habitat utilization and nest-site selection of long-billed curlews in the Columbia Basin, Oregon. Condor 95:957–67.
- Pashley, D.N., C.J. Beardmore, J.A. Fitzgerald, R.P. Ford, W.C. Hunter, M.S. Morrison, and K.V. Rosenberg. 2000. Partners In Flight, Conservation of the Land Birds of the United States. American Bird Conservancy.
- Paullin, D.G. 1973. The ecology of submerged aquatic macrophytes of Red Rock Lakes National Wildlife Refuge, Montana. Montana State University, Bozeman, MT.
- Pelizza, C.A. 2001. Winter ecology of Trumpeter Swan, *Cygnus buccinator* in the northern Great Plains. University of South Dakota, Vermillion, SD.
- Pelizza, C.A. and H.B. Britten. 2002. Isozyme analysis reveals genetic differences between three trumpeter swan populations. Waterbirds. 25(1):355–59.
- Perisho, E. C. 1912. A preliminary report upon the geography, geology and biology of Mellette, Washabaugh, Bennett and Todd Counties, south-central South Dakota. South Dakota Geological and Biological Survey Bulletin Number Five:1-60.
- Pietz, P.J. and D.A. Granfors. 2000. Identifying predators and fates of grassland passerine nests using miniature video cameras. J. of Wildlife Management. 64(1):71–87.
- Plumpton, D.L. and R.S. Lutz. 1993a. Prey selection and food habits of burrowing owls in Colorado. Great Basin Naturalist 53(3):299–304.
- Plumpton, D.L. and R.S. Lutz. 1993b. Prey selection and food habits of burrowing owls in Colorado. J. Raptor Res. 27(4):175–79.
- Pool, R.J. 1914. A study of vegetation of the sandhills of Nebraska: University of Minnesota Botanical Studies 4, p. 37–78.
- Pospichal, L.B., and W.H. Marshall. 1954. A field study of Sora Rail and Virginia rail in central Minnesota. Flicker 26:2–32.
- Prose, B.L. 1987. Habitat suitability index models: Plains sharp-tailed grouse. U.S. Fish Wildl. Serv. Biol. Rep. 82. Nat. Ecology Center, Washington, D.C.
- Reading, R.P., S.R. Beissinger, J.J. Grentsen, and T.W. Clark. 1989. Attributes of black-tailed prairie dog colonies in northcentral Montana, with management recommendations for conservation of biodiversity. Pp 13-45. The prairie dog ecosystem: Managing for biological diversity. Montana BLM Wildlife Technical Bulletin No. 2.
- Redmond, R.L., T.K. Bickel, and D.A. Jenni. 1981. An evaluation of breeding season census techniques for long-billed curlews (*Numenius americanus*). Studies in Avian Biology 6:197-201.
- Redmond, R.L. and D.A. Jenni. 1986. Population ecology of the Long-billed Curlew (*Numenius americanus*) in western Idaho. Auk 103:755–67.
- Renken, R.B. and J.J. Dinsmore. 1987. Nongame bird communities on managed grasslands in North Dakota. Canadian Field-Naturalist 101(4):551–57.
- Roberts, T.S. 1955. Manual for the identification of the birds of Minnesota and neighboring states. Univ. of Minn. Press, Mpls.:488–89.
- Rohwer, F.C., W.P. Johnson and E.R. Loos. 2002. Blue-winged Teal (*Anas discors*). In A. Poole and F. Gill (eds). The Birds of North America, No. 625. The Birds of North America, Inc., Philadelphia, PA. doi:10.2173/bna.625.
- Rose, B.J. 1971. The Swans Came Back! South Dakota Conservation Digest. 2(37):16–19.

- Rotenberry, J.T. and J.A. Wiens. 1980. Habitat structure, patchiness, and avian communities in North American steppe vegetation: a multivariate analysis. *Ecology* 61:1228–50.
- Ruwaldt, Jr., J.J., L.D. Flake and J.M. Gates. 1979. Waterfowl pair use of natural and man-made wetlands in South Dakota. *J. Wildl. Manage.* 43(2):375–83.
- Ryan, M.R. 1986. Nongame management in grassland and agricultural ecosystems. In J.B. Hale, L.B. Best, and R.L. Clawson (eds). *Management of nongame wildlife in the Midwest: a developing art.* p. 117–36. North Central Section of The Wildlife Society. BookCrafters. Chelsea, MI.
- Ryder, R.A. 1981. Movements and mortality of white pelicans fledged in Colorado. *Colonial Waterbirds.* 4:72–76.
- Sanders, T.A., and W.D. Edge. 1998. Breeding bird community composition in relation to riparian vegetation structure in the western United States. *Journal Of Wildlife Management* 62(2):461–73.
- Sargeant, A.B., M.A. Sovada and T.L. Shaffer. 1995. Seasonal predator removal relative to hatch rate of duck nests in waterfowl production areas. *Wildlife Society Bulletin.* 23(3):507–13.
- Saveraid, J.H. 1937. Vegetation type map and explanatory notes, Bennett County. U.S. Department of Agriculture, Bureau of Biological Survey.
- Schaller, G.B. 1964. Breeding behavior of the White Pelican at Yellowstone Lake, Wyoming. *The Condor.* 66(1):3–23.
- Schmidt, T.L. 1986. Forestland resources of the Nebraska Sandhills. T.D. Wardle (ed.):University of Nebraska-Lincoln, Department of Foristries, Fisheries, and Wildlife, Nebraska Forest Service.
- Schroeder, R.L., J. Holler and J.P. Taylor. 2004. Managing national wildlife refuges for historic or non-historic conditions: determining the role of the refuge in the ecosystem. *Natural Resources Journal.* 44(4).
- Sedgwick, J.A. and F.L. Knopf. 1992. Describing willow flycatcher habitats: scale perspectives and gender differences. *Condor* 94:720–33.
- Semlitsch, R.D. and J.R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. *Conservation Biology.* 17(5):1219–28.
- Sharps, J.C. and D.W. Uresk. 1991. Ecological review of black-tailed prairie dogs and associated species in Western South Dakota. *Great Basin Nat.* 50:339–345.
- Shea, R.E. 1979. The Ecology of trumpeter swan in Yellowstone National Park and vicinity. University of Montana, Missoula, MT.
- Silvia, C.M., J.K. Detling, A.D. Whicker and M.A. Brizuela. 1991. Vegetational responses of a mixed-grass prairie site following exclusion of prairie dogs and bison. *J. Range Manage.* 44(2):100–104.
- Simmons, R. and P.C. Smith. 1985. Do Northern Harriers (*Circus cyaneus*) choose nest sites adaptively? *Can. J. Zool.* 63:494–98.
- Skinner, R.M. 1974. Grassland use patterns and prairie bird populations in Missouri. *Grassland Management.*
- South Dakota Department of Agriculture. 2001. Prairie dog management in South Dakota. p. 8. <http://www.www.state.sd.us/doa/das/pd_mgt.htm>
- Squires, J.R. 1991. Trumpeter Swan food habits, forage processing, activities and habitat use. Ph.D. dissertation, University of Wyoming, Laramie, WY.
- Steinauer, G., B. Whitney, K. Adams, M. Bullerman, and C. Helzer. 2003. A guide to prairie and wetland restoration in eastern Nebraska. Prairie Plains Resource Institute and Nebraska Game and Parks Commission.
- Stepney, P.H.R. 1986. Management considerations for the American white pelican in Alberta. Occasional paper (Provincial Museum of Alberta, Natural History Section):9:155–71.
- Stubbendieck, J. 2005. Professor of Agronomy, Department of Agronomy and Horticulture, University of Nebraska-Lincoln. Personal communication with Tom Koerner, Refuge Manager, U.S. Fish and Wildlife Service.
- Sugden, L.G. 1979. Habitat use by nesting American coots in Saskatchewan parklands. *The Wilson Bulletin,* 91(4):599–607.
- Sutherland, J.M. and W.J. Maher. 1987. Nest-Site Selection of the American coot in the aspen parklands of Saskatchewan. *The Condor.* 89:804–10.
- Svedarsky, W.D., J.E. Toepfer, R.L. Westemeier, and R.J. Robel. 2003. Effects of management practices on grassland birds: greater prairie-chicken. Northern Prairie Wildlife Research Center, Jamestown, ND.
- Swanson, D.L. 1999. Avifauna of an early successional habitat along the middle Missouri River. *Prairie Naturalist.* 31(3):145–64.
- Swink, F. and G. Wilhelm. 1979. *Plants of the Chicago region.* 3rd, rev. and exp. ed. with keys. Morton Arboretum, Lisle, IL.

- Swink, F. and G. Wilhelm. 1994. Plants of the Chicago region. 4th ed. Indiana Academy of Science, Indianapolis, IN.
- Taft, J.B., G.S. Wilhelm, D.M. Ladd, and L.A. Masters. 1997. Floristic quality assessment for vegetation of Illinois, a method of assessing vegetation integrity. *Erigenia*, Number 15, November 1997.
- Taylor, D.M. 1986. Effects of cattle grazing on passerine birds nesting in riparian habitat. *J. Range. Manage.* 39:254–58.
- Temple, S.A. 2002. Dickcissel (*Spiza americana*). In A. Poole and F. Gill, eds. *The Birds of North America*, No. 703. *The Birds of North America, Inc.*, Philadelphia, PA. doi:10.2173/bna.703.
- Thompson, C.D. and S.H. Anderson. 1988. Foraging behavior and food habits of burrowing owls in Wyoming. *Prairie Nat.* 20(1):23–28.
- Tunnell, T.R. 2004. Guide to native grassland management in Nebraska. The Nature Conservancy.
- U.S. Census Bureau QuickFacts. 2002.
- Clark, T.W., T.M. Campbell, D.G. Socha and D.E. Casey. 1982. Prairie dog colony attributes and associated vertebrate species. *Great Basin Naturalist*.42(4):572–82.
- U.S. Fish and Wildlife Service. 1995. Results from the 1995 Fisheries Assessment Surveys Conducted on Lacreek National Wildlife Refuge.
- U.S. Fish and Wildlife Service. 2001. Mainstem Missouri River Ecosystem Team, Ecosystem Planning for the Mainstem Missouri. June.
- U.S. Fish and Wildlife Service. 2002. Birds of conservation concern. U.S. Fish and Wildlife Service, Division of Migratory Bird Management Arlington, Virginia. <<http://migratorybirds.fws.gov/reports/BCC2002.pdf>>
- USGS. 2001. Coefficients of conservatism for the vascular flora of the Dakotas and adjacent grasslands. Northern Prairie Wildlife Research Center. Jamestown, ND.
- Vickery, P.D., M.L. Hunter and J.V. Wells. 1992. Evidence of incidental nest predation and its effects on nests of threatened grassland birds. *OIKOS*. 63:281–88.
- Volkert, W.K. 1992. Response of grassland birds to a large-scale prairie planting project. *The Passenger Pigeon*. 54(3):191–96.
- Weaver D.K. 1973. Trumpeter Swans in Minnesota. A Progress Report for the Third Trumpeter Swan Society Conference.
- Weller, N.W. and L.H. Fredrickson. 1974. Avian ecology of a managed glacial marsh. *Living Bird* 12:269–91.
- Westmore, R.A. 2004. 90 Percent Submittal Technical Specifications For Modifications To Little White River Dam. Lacreek National Wildlife Refuge, South Dakota. GEI Consultants, Inc. 6950 S. Potomac St., Suite 300 Centennial, CO. 80112. Project # 04108.
- Whicker, A.D. and J.K. Detling. 1988. Modification of vegetation structure and ecosystem processes by North American mammals. *The Hague*. 301–16.
- Whitehead, R. L. 1996. Ground water atlas of the United States: Montana, North Dakota, South Dakota, Wyoming, HA 730-I. U.S. Geological Survey URL <http://capp.water.usgs.gov/gwa/ch_i/index.html>
- Whitmore, R.C. 1981. Structural characteristics of grasshopper sparrow habitat. *J. Wildl. Manage.* 45(3):811–14.
- Wiens J.A., and J.T. Rotenberry. 1981. Habitat associations and community structure of birds in shrubsteppe environments. *Ecological Monographs* 51:21–41.
- Wiens, J.A. 1973. Pattern and process in grassland bird communities. *Ecological Monographs* 43:236–70.
- Wilhelm, G. and D. Ladd. 1988. Natural areas assessment in the Chicago region. *Transactions of North American Wildlife and Natural Resources Conference*. 53:631–75.
- Wilhelm, R.B., J.R. Choate and J.K. Jones. 1981. Mammals of Lacreek National Wildlife Refuge, South Dakota. Special Publications of The Museum Texas Tech University. No. 17:1–39.
- Wilson, S.D. and J.W. Belcher. 1989. Plant and bird communities of native prairie and introduced Eurasian vegetation in Manitoba, Canada. *Conservation Biology* 3(1):39–44.
- Zimmerman, A.L., B.E. Jamison, J.A. Dechant, D.H. Johnson, C.M. Goldade, J.O. Church, and B.R. Euliss. 2003. Effects of management practices on wetland birds: Sora. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online <<http://www.npwrc.usgs.gov/resource/literatr/wetbird/sora/sora.htm>>

