

Summary

Crescent Lake National Wildlife Refuge is located in Garden County on the eastern edge of the Nebraska Panhandle. It lies on the southwestern edge of the 19,300 square mile Nebraska Sandhills, the largest sand dune area in the Western Hemisphere and one of the largest grass-stabilized regions in the world. The Sandhills are characterized by rolling, vegetated hills and inter-dunal valleys which are oriented in a northwest to southeast direction. Many shallow lakes and marshes are interspersed in the lower valleys. Native grasses predominate. Wildlife diversity, except large ungulates and their predators, is relatively unchanged since early settlement.

There are 21 wetland complexes on the Refuge totaling approximately 8,251 acres or about 18 percent of the total area. These wetlands are a mixture of shallow lakes, marshes, seasonal wetlands, wet meadows and a small stream resulting from Refuge management activities.

The Sandhills are within a wide transitional zone called the Mixed Grass Prairie which lies between Tallgrass Prairie to the east and Short Grass Prairie to the west. Although precipitation is typical of the semi-arid Mixed Grass Prairie, the Sandhills are characterized by post-climax, tallgrass species typical of a greater moisture regime (Oosting 1948; Keeler, et al 1980).

The Nebraska Sandhills are one of the few large native prairie areas in the United States that have not been substantially converted to farmland or otherwise modified. Thus, most of the plant and animal species present when settlement began are still present today.

This is a 15-year Plan, but only the goals will remain static. Objectives and strategies are based on present knowledge and reflect known needs. They may change, as may specific management actions, as knowledge and needs change. Public involvement will be sought for any significant amendments.

It is also important to understand that individual objectives cannot be taken out of context. It is the mixture of objectives that will produce the desired results. Generally speaking, on Crescent Lake Refuge, where the legal mandate is to serve as a "refuge and breeding ground for birds and other wild animals," habitat is managed to support or produce birds and other wildlife. However, because it is the habitat over which wildlife managers have most control, a clear understanding must also occur of the kinds and amounts of habitat needed to support that wildlife. Public use and environmental education are also important functions of the Refuge. Thus, it is important to know what kinds and how much public use can be allowed and remain compatible with the wildlife purposes and objectives.

The main goals of the CCP are:

Endangered, Threatened, and Candidate Species

- *Goal: Contribute to the preservation and restoration of endangered flora and fauna that are or were endemic to the Crescent Lake Refuge area.*

Upland Habitat

- *Goal: Preserve, restore, and enhance the ecological diversity of indigenous flora and fauna of the physiographic region described as the Sandhills Prairie.*

Wilderness

- *Goal: Preserve, restore, and enhance the ecological diversity of indigenous flora and fauna of the physiographic region described as the Sandhills Prairie, while maintaining and enhancing the wilderness quality.*

Wetland Habitat

- *Goal: Maintain natural and artificially managed permanent and semipermanent wetlands to provide habitat for migratory waterfowl, shorebirds, wading birds, and associated wetland-dependent species.*

Fish and Wildlife

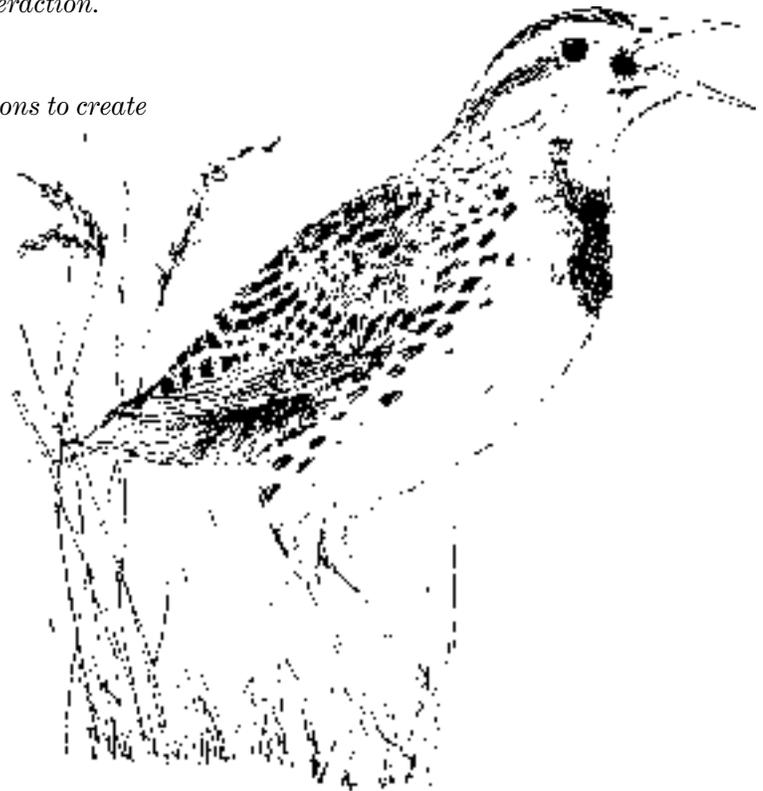
- *Goal: Preserve, restore, and enhance the ecological diversity and abundance of migratory birds and other indigenous fish and wildlife with emphasis on grassland-dependent species.*

Interpretation and Recreation

- *Goal: Provide visitors an opportunity to enjoy, learn about and utilize fish and wildlife in a setting that emphasizes an undisturbed natural environment and minimum human interaction.*

Community Involvement / Support Systems

- *Goal: Interact with communities and organizations to create mutually beneficial partnerships.*



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Purpose and Vision

Legal Purpose

Crescent Lake National Wildlife Refuge was established on March 16, 1931, by Executive Order 5597 which defined the legal purpose as an area “. . . reserved and set apart . . . as a refuge and breeding ground for birds and wild animals.”

It is important to understand this legal purpose, particularly because it includes all wild animals, not just migratory birds. It is the hub around which planning, management actions, and compatibility determinations revolve.

Vision

“I am the grass; I cover all . . .

“I am the grass

Let me work”

- Carl Sandberg (Grass)

A sea of grass in a sea of grass, Crescent Lake National Wildlife Refuge was established primarily for the concentration of native prairie and associated wetlands which, together, attract a wide variety of wildlife, particularly migratory birds. But, like all national wildlife refuges, Crescent Lake Refuge is not an island, independent of what goes on around it. It is part of larger and dynamic social, economic and biological communities, communities that also affect wildlife that use the Refuge. Unlike many Refuges, however, surrounding land use, principally cattle grazing, is relatively stable, public use is relatively low, and there are few threats from the outside.

Thus, we envision a Refuge about the same size it is now, the purpose of which is to maintain in perpetuity a representative sample of the native prairie and wildlife associated with this part of the Nebraska Sandhills. We see habitat in excellent condition, fewer exotic plants, and a healthy and growing population of blowout penstemon, an endangered plant. We see a visiting public which values the solitude and for which relatively few but high quality learning and recreational facilities are available. We see about half of the Refuge as a National Wilderness Area which supports bison, a species not present in the area in a wild state for over 100 years. We see the Refuge doing its part to support migratory birds enjoyed by people in States up and down the Central Flyway. We see active partnerships with surrounding landowners to help them maintain habitat on private lands while engaged in sustained, profitable agriculture. We see the Refuge as a contributing part of the Nebraska Sandhills.

I. Introduction /Background

Purpose of a Comprehensive Conservation Plan

The National Wildlife Refuge System Improvement Act of 1997 requires that Comprehensive Conservation Plans (CCP) be prepared for each unit of the National Wildlife Refuge System, and that the public be involved in preparing and revising these plans.

Comprehensive planning creates an opportunity to meet with neighbors, customers, and other agencies to identify and discuss natural resource issues and help ensure the plan meets the changing needs of wildlife and people. This Plan discusses history, goals and objectives, and the general direction refuge management will take over the next 15 years. For a complete discussion of the planning process, refer to the “Draft Planning Policy Pursuant to the National Wildlife Refuge System Improvement Act of 1997” (copies available at the Refuge Headquarters).

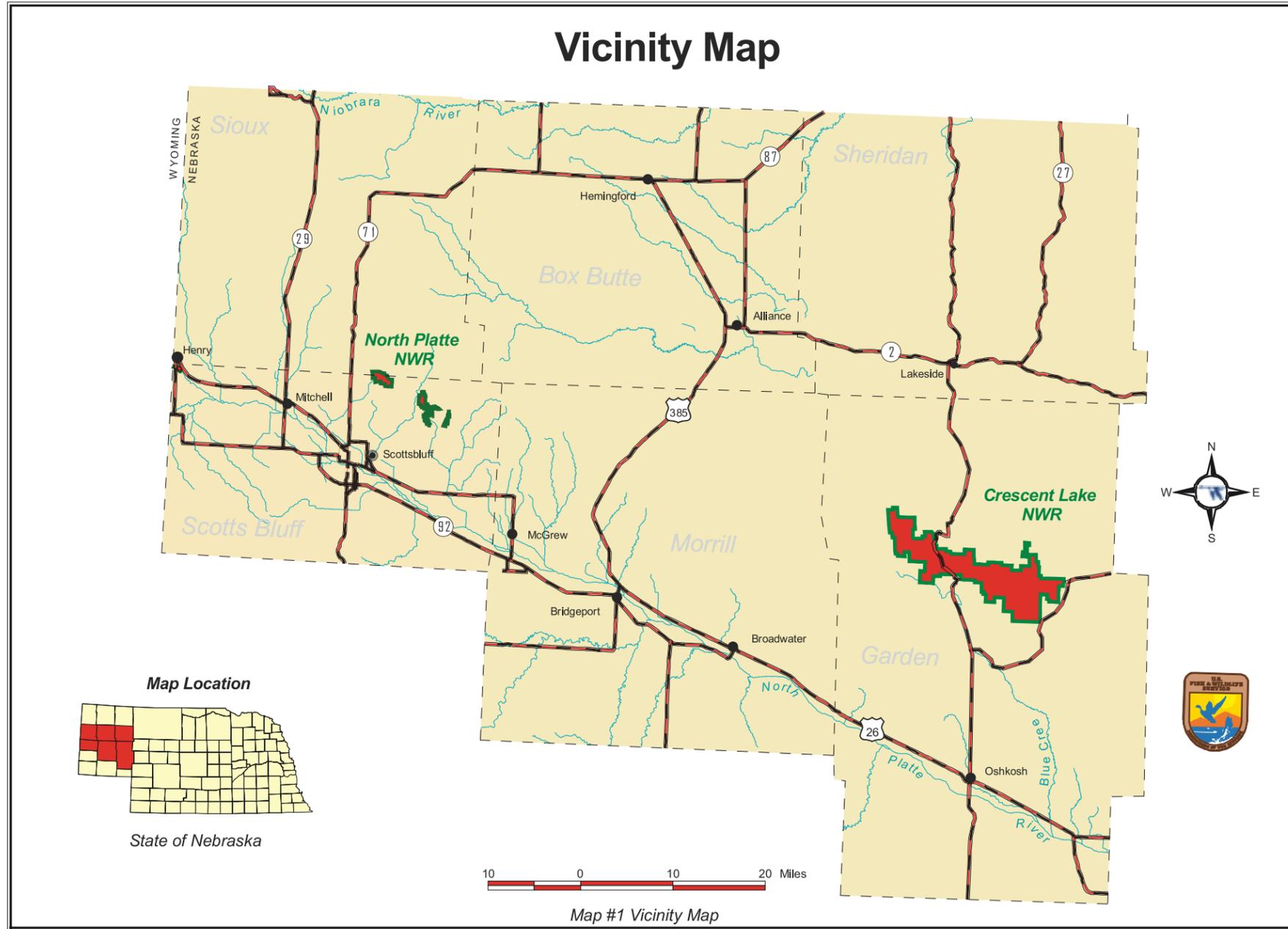
Refuge History - an Overview

Establishment and Administration

The 45,849-acre Crescent Lake National Wildlife Refuge (Refuge), established in 1931, is located 28 miles north of Oshkosh, Nebraska in Garden County at the southwestern end of the Nebraska Sandhills (Map 1). It is administered by the U.S. Fish & Wildlife Service (Service) as part of the Crescent Lake/North Platte National Wildlife Refuge Complex, and is within the Central Flyway. The Complex headquarters is 100 miles to the west in the City of Scottsbluff.

The initial Refuge was 36,920 acres, acquired primarily from one large ranch. Additional lands were acquired between 1932 and 1937. Most lands were acquired or exchanged under the authority of the Migratory Bird Conservation Act (45 Stat. 1222). About 2,566 acres were acquired under the Resettlement Administration (Executive Order 7027, April 30, 1935), a drought and depression relief program.

The Nebraska Sandhills were settled largely as a result of the Kincaid Act of 1904, a modification of the Homestead Act to allow settlers 640 acres in “less productive” areas. As a result, a homestead existed in almost every meadow. However, 640 acres was not a viable farm/ranch unit in the Sandhills, and land was soon consolidated into larger units. Today, the Sandhills are home to some of the largest ranches in the country. Because of the large acreage required to support economically viable units, Garden County is among the least densely populated areas in the continental United States. Most of the Refuge location names originated from the early homesteaders.



The earliest government actions on the Refuge were tree plantings and small construction projects by the Civilian Conservation Corps (CCC) and the Works Projects Administration (WPA). The CCC built several buildings still in use today at the Refuge headquarters. The WPA built roads, fences, and other facilities, such as the fire tower and buildings, at the headquarters site.

Initially, the staff at Crescent Lake Refuge was also responsible for the 2,909-acre North Platte Refuge, 100 miles to the west. The latter was not staffed until 1990 when the Crescent Lake/North Platte National Wildlife Refuge Complex was officially formed. The Complex headquarters was moved to Scottsbluff in 1993.

All lands around the Refuge are in private ownership except for a small ranch on the west boundary, purchased in 1984 by The Nature Conservancy for preservation of the blowout penstemon (an endangered plant). The only other public land in Garden County is Ash Hollow State Historical Park, 50 miles to the southeast. In March 2000, media entrepreneur Ted Turner purchased a large ranch adjacent to the east boundary of the Refuge; plans for this area are not yet known, although Mr. Turner has placed bison on holdings in Nebraska, Montana, and other states.

Because of its remote location, the Refuge must provide housing for employees. Currently, housing is available for five permanent and four temporary employees. Four service and equipment storage buildings, together with the residences, are clustered in a compact headquarters area (Map 2). Additional equipment storage and two buildings are located across the county road about one-half mile to the east.

Wildlife and Habitat Management

Special Places In 1972, a 24,502-acre area was proposed for inclusion in the National Wilderness Preservation System (Map 2). Although Congress has not acted on the proposal, no development has occurred in the area since 1972.

Two Research Natural Areas were established in 1955 by a Director's Order and included on the National List of Research Areas (Map 2). The Goose Lake RNA (940 acres) has not been grazed, hayed, or intentionally burned since 1948. The Hackberry Lake RNA (172 acres) has not been disturbed since 1951, except for a 60-acre spring burn in 1983 and a short duration spring graze in 1988.

Populations Management Direct populations management consisted primarily of providing sanctuary and controlling predators. Predator control was a significant management activity until 1994, when it was suspended due to staffing limitations and modest results. Public trapping has occurred sporadically. It ended in 1954 when it became economically unfeasible, was revived in the 1980s, but again faded out with low fur prices.

Wetland Management The Refuge has about 8,250 acres of wetlands; there are no permanent natural streams. Manipulation of water levels is possible only on nine lakes and has been used to control shoreline vegetation and create open shoreline for migratory birds. Pothole blasting occurred in the late 1960s to create additional waterfowl breeding habitat; results were limited and the effort was discontinued after a few years. Natural filling of wetlands and invasion of phragmites, an exotic plant, are emerging problems.

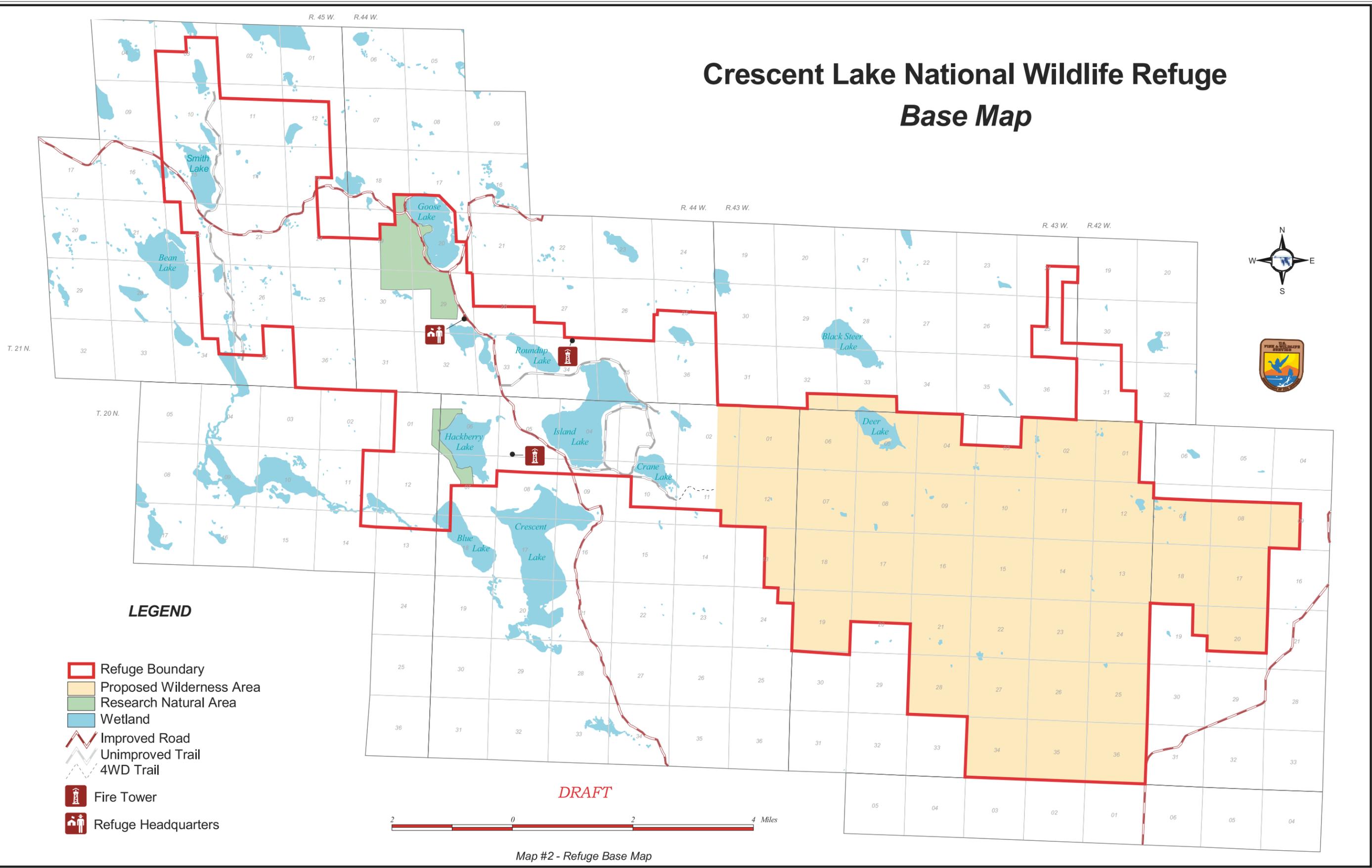
Upland Management The agreement for purchase of the original 36,920 acres allowed previous owners to continue to graze at no cost for 10 years. The only restriction was that no more than 4,000 cattle could be on the Refuge at any one time. By the end of the 10 years, most of the Refuge was seriously overgrazed. During World War II, the Refuge was leased to surrounding ranches for cattle grazing to help meet wartime needs. Although the stocking rate then was half that on surrounding commercial lands, Refuge grasslands made little recovery. After the War, grazing gradually declined.

Although the Refuge has largely recovered from overgrazing in the past, grazing remains an important tool. Today, native prairie management consists of a combination of rest, grazing, and prescribed burning. Prescribed burning was first used as a management tool in 1984 and has obvious limitations in this sea of grass; about 500 acres are planned for burning annually.

Noxious weeds are a ubiquitous problem, and the Refuge is no exception. Fortunately, surrounding private lands are well-managed and the problem is limited to Canada thistle. Leafy spurge was eradicated from the Refuge in 1994.

There are about 80 acres of trees on the Refuge, most of which were planted by the CCC in the 1930s. Trees add diversity; however, with the exception of cottonwoods and willows, they are not a normal part of the Sandhills Prairie. There is no active management and the acreage is steadily declining through natural mortality.

Crescent Lake National Wildlife Refuge Base Map



Map #2 - Refuge Base Map

Cultural Resources

Historic, archaeological, and paleontological resources are protected by Federal laws. No formal, systematic cultural resource surveys have been conducted on the Refuge. The buildings constructed by the CCC or WPA are more than 50 years old and qualify for preservation.

Public Use

Recreation and Education Portions of the Refuge have always been open for hunting, fishing, wildlife observation, and general nature-oriented activities. A Special Use Permits can be used to allow the public to trap. The Refuge is isolated (Oshkosh, population 1,100, is the nearest town and 28 miles away) and accessible by few and relatively rough roads. This isolation limits the number of visitors but is an important and desirable quality for most who do come. Public use averages about 8,000 visitors per year.

Facilities were always minimal and, even today, are limited to one auto tour route, two graveled boat ramps, two fishing piers, a public rest room, modest interpretive displays at the headquarters, and kiosks at the entrances.

Originally, Refuge lakes did not contain sport fish. Today, three lakes support sport fisheries which are used by over 5,000 anglers annually. The Nebraska Game and Parks Commission (NGPC) manages sport fisheries with concurrence of the refuge manager.

Hunting has always occurred on the Refuge and has grown to about 600 visits per year.

Economic Use As mentioned above, the Refuge was heavily grazed until the mid-1940s. Since about 1970, grazing has been considered a tool for wildlife management and the amount of grazing declined as grassland improved and native prairie conditions were restored. The current practice of grazing the meadows 1 year out of 6 and the uplands 1 year out of 20 was initiated in 1993. In the past, as many as 20 permittees grazed cattle on the Refuge annually and the amount of grazing exceeded 24,000 animal unit months (AUMs). Today, only 3 to 5 permittees use the Refuge in any given year and grazing is limited to about 2,500 AUMs. Grazing fees are established through competitive bidding and are lower than those in much of the Sandhills because Refuge grazing areas are difficult to access.

The National Wildlife Refuge System

Mission and Goals and Guiding Principles

The National Wildlife Refuge System (Refuge System) is the world's largest collection of lands set aside specifically for wildlife. The first unit of the System, a 3-acre pelican and heron rookery in Florida, was created in 1903 by President Theodore Roosevelt. Today, the System includes nearly 540 national wildlife refuges, thousands of small wetlands and other special management areas encompassing more than 95 million acres and located in all 50 States and a number of U.S. Territories.

The Refuge System provides habitat for endangered species, migratory birds, species of management concern (see Glossary and Appendix H) and other "trust resources" for which the Federal government is ultimately responsible. It also provides habitat for resident wildlife and offers wildlife-dependent recreation for over 34 million visitors annually.

Fish and Wildlife Service Mission

"To work with others to conserve, protect, and enhance fish and wildlife and plants and their habitats for the continuing benefit of the American people."

To fulfill this mission, Congress has charged the Service with conserving and managing migratory birds, endangered species, anadromous and interjurisdictional fish, and certain marine mammals. The Service carries out these responsibilities through several functional entities, one of which is the National Wildlife Refuge System.

National Wildlife Refuge System Mission

"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Improvement Act of 1997, Public Law 105-57).

National Wildlife Refuge System Goals

1. *To fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.*
2. *Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.*
3. *Perpetuate migratory bird, interjurisdictional fish, and marine mammal populations.*
4. *Conserve a diversity of fish, wildlife, and plants.*
5. *Conserve and restore, where appropriate, representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.*
6. *To foster understanding and instill appreciation of fish, wildlife, and plants, and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.*

While individual refuges are important in and of themselves, they are even more important for their collective benefits as a network. Together, national wildlife refuges form a network of lands spanning the entire continent - supporting birds migrating from Alaska and Canada to the southern States and points south, preserving trust resources, and providing enjoyment for people throughout the United States and neighboring countries. Together, they help prevent species from becoming threatened or endangered by securing habitat in all or portions of a species range. Thus, the network is critical - a deficiency in one location may affect wildlife in other locations.

Legal and Policy Guidance

National wildlife refuges are guided by: The mission and goals of the National Wildlife Refuge System; the legal purpose of the specific refuge unit as described in the establishing legislation or executive orders; International Treaties; Federal laws and regulations; and Service policies. Key concepts and guidance for the System are included in the National Wildlife Refuge System Administration Act of 1966, The Refuge Recreation Act of 1962, Title 50 of the Code of Federal Regulations, the Fish and Wildlife Service Manual, Executive Order 12996 (March 23, 1996) and, most recently, the National Wildlife Refuge System Improvement Act of 1997. Appendix C contains a partial list of Federal laws governing administration of the System.

Crescent Lake Refuge is also guided by a number of agreements with other agencies and by the conditions presented in the Environmental Assessment (following Draft CCP) and Compatibility Determinations (Appendix E).

Important Concepts for Management of National Wildlife Refuges

Compatibility. “Compatibility” is an important legal concept. The National Wildlife Refuge System Administration Act of 1966 allowed public use of any area within the System, provided that such use was “compatible” with the major purposes for which such areas were established. The concept was further defined and strengthened by the National Wildlife Refuge System Act of 1997. Thus, by law, all uses of national wildlife refuges, including land management activities and wildlife-dependent recreation, must be formally determined to be “compatible.” A compatible use is defined as one that, in the professional judgement of the refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge. Professional judgement is further defined as a determination that is consistent with sound fish and wildlife management and administration practices, available science, available resources (including funding, personnel, facilities, and other infrastructure), and adherence with applicable laws. See Appendix E for a synopsis of compatibility determinations for the major uses allowed on Crescent Lake Refuge.

Wildlife as Priority. The National Wildlife Refuge System Improvement Act of 1997 states that wildlife conservation is the priority of the System. It amends the Refuge System Administration Act by including a unifying mission for the System, a formal process for determining compatible uses, and a requirement that each refuge will be managed under a Comprehensive Conservation Plan. Further, the Act defines wildlife-dependent recreational uses as: hunting and fishing, wildlife observation and photography, environmental education and interpretation. (Specific details regarding these and other amendments are available through the Refuge or Regional Office.)

Partnerships and Public Involvement. Executive Order 12996 (March 23, 1996) also provides important guidance. Among other things it: stresses the importance of partnerships with Federal and State agencies, Tribes, organizations, industry, and the general public; and, mandates public involvement in decisions on acquisition and management of refuges.

Existing Partnerships

Partnerships with local, State and Federal Agencies, private conservation organizations, and landowners are important not only for achieving and sustaining Refuge objectives but to assure the Refuge is an active member of the community and contributes to the broader objectives of that community. Existing partnerships include:

- Nebraska Game and Parks Commission - Fisheries and wildlife management/Law enforcement
- University of Nebraska - Blowout penstemon recovery
- Earlham University - Reptile and amphibian research
- Central Panhandle Mutual Aid Association - Fire suppression and other emergencies
- The Nature Conservancy - Blowout penstemon recovery
- North Platte Valley Sportmans Association - National Fishing Day activities
- Natural Resource Conservation Service - Wetland Reserve Program
- National Weather Service - Weather station data
- Nebraska and Pine Ridge National Forests - Interagency Fire Agreement
- U.S. Geological Survey - Water resources management
- Local landowners - FWS Partners for Fish and Wildlife Program

II. Planning Process

Description

The project leader for the Crescent Lake/North Platte National Wildlife Refuge Complex and the manager of the Crescent Lake Refuge were assigned primary responsibility for planning in May 1998. An open house/scoping session was held in Oshkosh on July 16, 1998, to inform the public of the planning process and to seek ideas on Refuge programs and issues. About 150 invitations were mailed to local and national stakeholders (educators, permittees, neighbors, other agencies and non-profit organizations). The general public was also invited through widely published/broadcast news releases. Information could also be obtained by contacting the Refuge Manager and comments could be submitted in writing.

Refuge staff also met personally with the Alliance Office of the Nebraska Game and Parks Commission (NGPC), Wildcat Audubon Society, the North Platte Valley Sportsmans Association, the Alliance Rotary Club and the Scottsbluff Lions Club to discuss the CCP process.

In November 1998, the Project Leader formed an interdisciplinary team to provide input and critical review (Appendix K).

The final CCP will guide management of the Crescent Lake Refuge for the next 15 years. It will be used to prepare and revise step-down management plans, performance plans, and budget requests. The Plan will be reviewed during routine Refuge inspections and programmatic evaluations. When changes are needed, the level of public involvement and associated NEPA documentation will be determined by the Project Leader. The entire plan will be formally reviewed and revised at least every 15 years.

Planning Assumptions / Limitations

Proposed Wilderness Area

The 24,502-acre proposed Wilderness Area, until accepted or rejected by Congress, must be managed as if it was wilderness; only “minimum tools” can be used (see Section IV and Appendix G).

Research Natural Areas

The two officially designated RNAs (1,076 acres) are to remain free of human disturbance, including habitat management and public use.

Planning Issues

The following issues were identified during the public scoping process and/or discussions with review team members. Some additional information is available in the Environmental Assessment.

Wilderness Proposal and Research Natural Areas (see previous page)

Endangered Species. The Refuge is within the range of the blowout penstemon, a federally-listed endangered plant, and plays an important role in its survival.

Public Access. The Refuge is accessible only by relatively narrow, rough roads; most interior roads are passable only with four-wheel-drive vehicles.

Hunting and Fishing. The Refuge is open to deer and upland bird hunting but not waterfowl.

Invasive Species. Canada thistle exists in varying densities throughout the Refuge, including the proposed Wilderness Area and Research Natural Areas. Phragmites is an aggressive wetland invader.

Bison Reintroduction. Bison were once part of the Sandhills Prairie ecosystem and should be considered for reintroduction into the proposed Wilderness Area.

Lands of Interest. Several adjacent areas are potentially important for the endangered blowout penstemon, wetland values, and migratory birds and are candidates for additional protection.

Staffing and Funding. Several people expressed concern that funds would never be available to staff the Refuges and implement the Plan.

III. Refuge and Resource Descriptions

Socio-economic Environment

Crescent Lake Refuge is located in Garden County on the eastern edge of the Nebraska Panhandle, an 11-county, 14,000-square-mile region with a population of about 90,000 people. Basic economic activities in Garden County include irrigated and dryland farming, cattle feeding, and ranching.

According to the Nebraska Panhandle Economic Development Report (Panhandle Area Dev. Dist., undated ca. 1998), the population of Garden County decreased from 2,460 in 1990 to 2,224 in 1997, a decrease of about 10 percent. The population in the year 2010 is projected at 1,707, a decrease of more than 20 percent from 1997; similar trends are projected for much of the surrounding rural area. Only the major population centers, such as Scottsbluff/Gering (100 miles to the west), project growth of any significance.

Geographic / Ecosystem Setting

Crescent Lake Refuge lies on the southwestern edge of the 19,300 square mile Nebraska Sandhills, the largest sand dune area in the Western Hemisphere and one of the largest grass-stabilized regions in the world. The Sandhills are characterized by rolling, vegetated hills and inter-dunal valleys which are oriented in a northwest to southeast direction. Many shallow lakes and marshes are interspersed in the lower valleys. Native grasses predominate. Wildlife diversity, except large ungulates and their predators, is relatively unchanged since early settlement.

About 177,000 acres of open water lakes, shallow marshes and fens, and nearly 1,130,000 acres of wet meadows remain in the Sandhills. Most wetlands are freshwater; about 10 percent are alkaline. They range in size from 1 to 2,300 acres, but 80 percent are less than 10 acres (LaGrange 1997). Many wetlands have been drained in attempts to increase hay production. Estimates of the amount drained range from 15 percent (McMurtrey and Craig 1969) to 46 percent (USFWS 1986). Wetland drainage continues to this day (Bleed and Flowerday 1989).

The Fish and Wildlife Service operates under an “ecosystem approach to resource management” and, for organizational purposes, has identified watershed-based ecosystems. The Crescent Lake Refuge is within the Platte-Kansas Rivers Ecosystem (Map 3).

Climate

Climate of the Sandhills is characteristic of the central Great Plains - cold winters, hot summers, and frequent thunderstorms from spring to late summer. Annual precipitation ranges from 17 to 23 inches (Wilhite and Hubbard 1989), and is coupled with high evapo-transpiration rates. The Refuge has operated an official weather station since 1935. Precipitation on the Refuge averages 16.8 inches and temperatures have ranged from minus 46 to 109 degrees Fahrenheit. Since 1976, relatively high precipitation has resulted in positive net moisture balances (annual precipitation minus open pan evaporation) in most years.

Soils

Most soils are wind-laden sands that have not been held in place long by vegetation. They are light colored and have little organic matter. Soils in basins, valleys, and wet meadows have thicker and darker surface layers and more organic matter than soils found in the hills. The main soil types are dune sand, Valentine sands, Valentine-loamy sands, and Gannett loamy sands. Rainfall is quickly absorbed and causes little erosion; soil evaporation rates are low. Native grasses grow well under these conditions, but soil exposed by overgrazing or plowing is subject to wind erosion (Layton, et al 1956).

Geology

During the Cretaceous era, a shallow sea covered the area of the Sandhills. When the sea receded, large valleys were formed which today are covered with sand. The geological processes are not well understood because of that sand cover. The exact time is debated, but somewhere between 21,000 and 8,000 years ago, water deposited sand which later began shifting as a result of climatic changes. This blowing sorted the alluvial deposits; fine material was carried out of the area and coarse material was left behind, resulting in the uniform particle size typical of wind deposited dunes (Bleed and Flowerday 1989).

Refuge Resources

Water and Wetlands

The Nebraska Sandhills overlay the High Plains Aquifer, commonly referred to as the Ogallala Aquifer. This groundwater is the source of wetlands in low areas and valleys and is the driving force supporting the ecological diversity and integrity of the Sandhills.

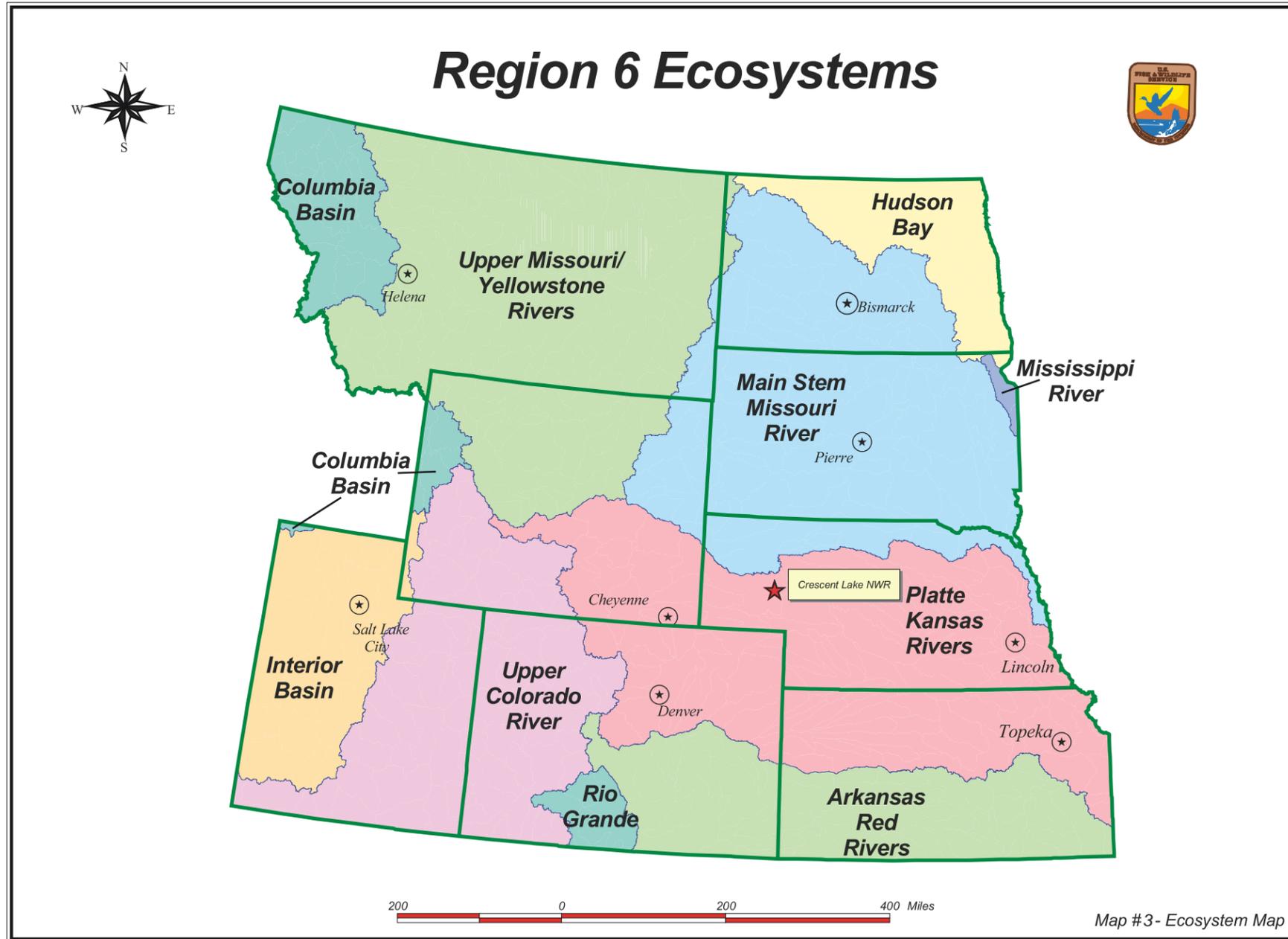
There are 21 wetland complexes on the Refuge totaling approximately 8,251 acres or about 18 percent of the total area (Map 4). These wetlands are a mixture of shallow lakes, marshes, seasonal wetlands, wet meadows and a small stream resulting from Refuge management activities. They were classified as follows by the Fish and Wildlife Service (USFWS, Sandhills Wetlands 1986):

Type II, Fresh Meadows	4,755 acres
Type III, Shallow Fresh Marshes	1,154 acres
Type IV, Fresh Marshes	309 acres
Type V, Open Fresh Water	2,033 acres

A few, small alkaline wetlands also exist. These were not specifically identified as such by the inventory and total about 413 acres.

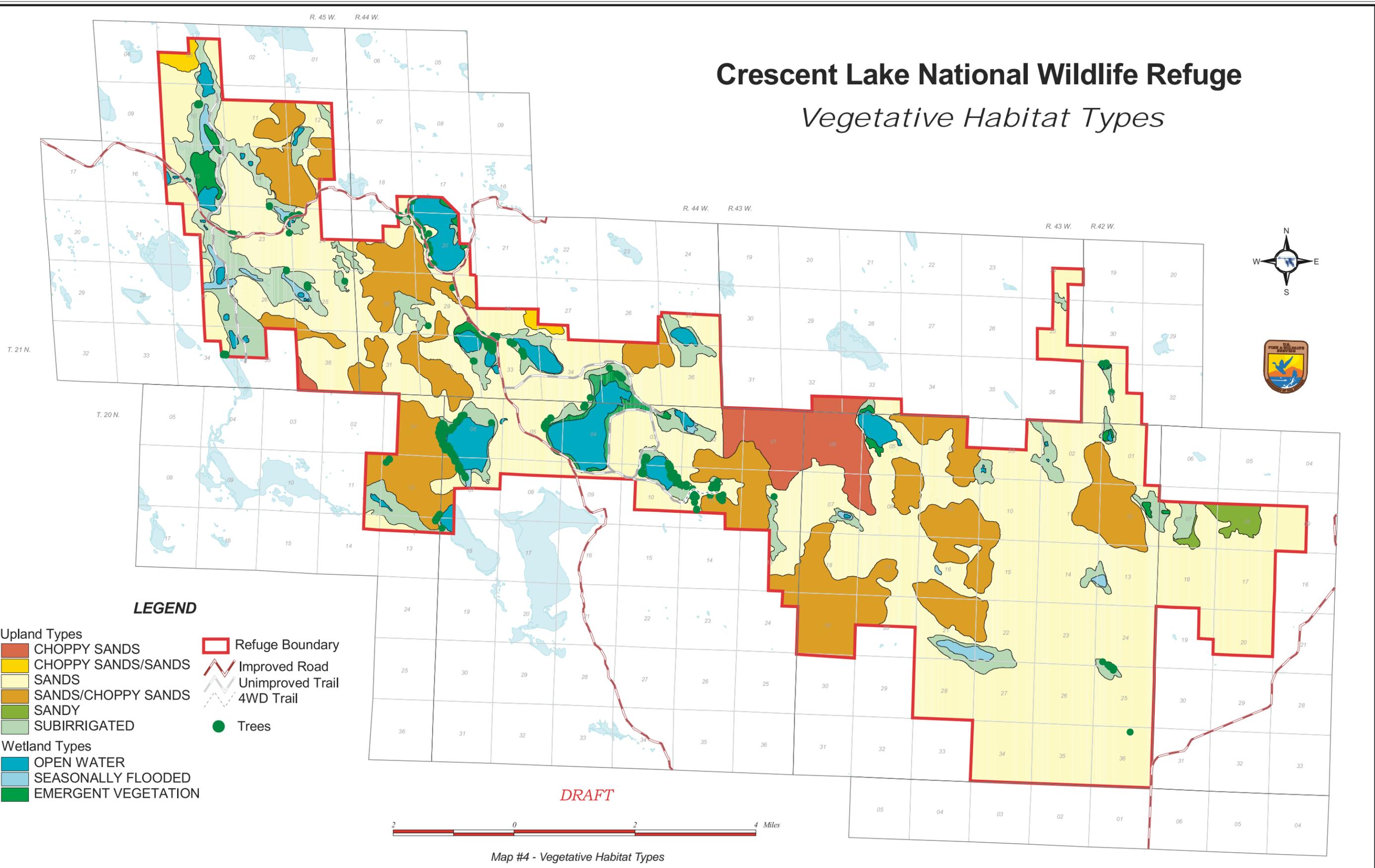
Submergent and emergent wetland vegetation ranges from sparse to dense depending on soils and alkalinity. Emergent vegetation includes cattail, bulrush, and phragmites. Vegetation bordering wetlands is primarily grasses and sedges. A few lakes have associated groves of cottonwood and willow trees, usually on the north shores.

Most Refuge wetlands rise and fall with precipitation and groundwater levels. Since 1981, precipitation has been above average resulting in record water levels. Control structures and elevation gauges have been installed on nine lakes, but water levels can be increased significantly on only five that are connected to a ditch which drains a private marsh north of the Refuge. Gauges on Island Lake record natural fluctuations. The U.S. Geological Survey has many groundwater survey wells on the Refuge which are used to study the complex groundwater hydrology of the area; the Refuge staff monitors about 25 of these.



Crescent Lake National Wildlife Refuge

Vegetative Habitat Types



LEGEND

Upland Types

- CHOPPY SANDS
- CHOPPY SANDS/SANDS
- SANDS
- SANDS/CHOPPY SANDS
- SANDY
- SUBIRRIGATED

- Refuge Boundary
- Improved Road
- Unimproved Trail
- 4WD Trail
- Trees

Wetland Types

- OPEN WATER
- SEASONALLY FLOODED
- EMERGENT VEGETATION

DRAFT



Map #4 - Vegetative Habitat Types

Vegetation

The Sandhills are within a wide transitional zone called the Mixed Grass Prairie which lies between Tallgrass Prairie to the east and Short Grass Prairie to the west. Although precipitation is typical of the semi-arid Mixed Grass Prairie, the Sandhills are characterized by post-climax, tallgrass species typical of a greater moisture regime (Oosting 1948; Keeler, et al 1980). This is due primarily to the moisture penetration and holding capacities of the soil, root structures, and photosynthetic strategies of cool and warm season plants (Tolstead 1942; Barnes 1984).

The Refuge plant herbarium contains 223 species; however, the collection is incomplete (Appendix F).

Vegetative Types

Four basic vegetative types or range sites are on the Refuge (NRCS 1995). (see Map 4)

Wetland Range Sites. These low meadow sites make up only 1 percent of the Refuge and are dominated by species that thrive in a moisture-saturated soil profile, such as prairie cordgrass, blue-joint reed grass, sedge species, and non-grass species such as golden rod, dock, and willows.

Sub-irrigated Range Sites. These are meadows close to the groundwater level where soil moisture can support deep-rooted, warm season native grasses even during drought. They make up about 9 percent of the Refuge and are dominated by tallgrass species such as switchgrass and sand bluestem. They are also prone to invasion by exotic species, such as Kentucky bluegrass and smooth brome, and noxious weeds, such as Canada thistle.

Sand Range Sites. These include the dry meadows (the edge between wet meadows and the sandhills) and the gently undulating sandhills. They make up about 76 percent of the Refuge. Predominate grasses include both cool season species such as needle-and-thread and western wheatgrass, and warm season species such as prairie sandreed, sand bluestem, sand love grass, and sand dropseed. Common non-grass species include prairie sunflower, yucca, lead plant, and prairie rose. Exotic species, such as cheatgrass, will invade these sites.

Choppy Sand Range Sites. These are the characteristic dunes for which the Nebraska Sandhills are named and make up about 11 percent of the Refuge. They support a wide variety of vegetation but also contain many, relatively small, unvegetated areas, commonly called “blowouts,” that are subject to wind erosion. The number of blowouts vary with terrain but, overall, these open sand areas make up about 3 percent of the choppy sand range sites. Blowout penstemon (*Penstemon haydenii*), a federally-listed endangered species, is endemic to the Sandhills and its characteristic habitat includes the blowouts and open sand areas. Predominate grasses include blue grama, sand bluestem, sand dropseed, blowout grass, sand love grass, little bluestem, and sandhills muhly. Non-grass species include yucca, sand cherry, prairie rose, and prairie sunflower.

Perennial and annual flowering forbs are an important component of true native prairie and are more abundant on the Refuge than on the surrounding private lands which are managed for livestock production. Although formal surveys are not conducted, refuge managers have observed an increase in non-grass species since grazing was reduced starting in 1993.

There are about 45 species of native and introduced trees and shrubs in the Sandhills, 30 of which occur on the Refuge. Some, such as sand sage, choke cherry, sandbar willow, and cottonwood, are characteristic of native prairie. Many are not. The Civilian Conservation Corps planted native and nonnative trees and shrubs during the 1930s, most of which have disappeared. Mature trees succumb to prairie fires and porcupines, and seedlings rarely survive deer and rodent browsing. The only tree species that has become successfully established without human assistance is the green ash which reproduces well but only in the shade canopy of mature willows or cottonwoods. There are about 80 acres of trees on the Refuge.

Endangered Plants

Hayden's, or blowout, penstemon is Nebraska's rarest plant (Farrar 1990) and the only endangered plant on the Refuge. It was placed on the Federal list of endangered species in 1987. This plant is somewhat unique in that it depends on non-vegetated sand surfaces, or blowouts, for its existence (Fritz, et al 1992). Good management of private grazing lands has reduced the amount of blowouts in the Sandhills; only in the drier western fringes are blowouts still common. In 1984, The Nature Conservancy purchased an 840-acre area adjacent to the Refuge specifically for perpetuation of blowout penstemon.

Blowout penstemon surveys began on the Refuge in 1987 when 2,058 plants were found. In 1998, only 415 remained (see Figure 1). Although shrinking habitat is part of the problem, plant populations are declining even in areas with what appears to be good habitat. So, other factors are at work. Perhaps genetic viability is failing as plants become increasingly isolated from each other. Since 1997, the University of Nebraska has supplied seedlings grown at a facility in Lincoln. About 9,500 plants have been planted on the Refuge through 2000; about 15 percent of the 1997 planting and 20 percent of the 1998 planting survived.

Figure 1. Penstemon Populations

Year	Native	Surviving Transplants	Total
1987	2,058	--	2,058
1988	1,652	--	1,652
1989	1,264	--	1,264
1990	1,545	--	1,545
1991	765	--	765
1992	1,055	--	1,055
1993	985	--	985
1994	956	--	956
1995	624	--	624
1996	608	--	608
1997	533	332	865
1998	415	831*	1,246
1999	407	777**	1,184
2000	486	546***	1,032

* Includes 1998 transplants

** Does not include the 1999 transplants

*** Does not include the 2000 transplants

Plant Species of Management Concern.

Plant Species of Management Concern listed by the U.S. Fish & Wildlife Service or the State of Nebraska are presented in Appendix H. In addition, there are several other plant species which will receive special management emphasis on Crescent Lake Refuge for the reasons listed below:

Canada thistle	Widespread noxious weed
Cheatgrass brome	Exotic, expanding range
Common reed	Exotic, expanding range
Eastern cottonwood	High wildlife values, native plant, decreasing range
Blowout penstemon	Federally-listed endangered species, decreasing range

Wildlife

The Nebraska Sandhills are one of the few large native prairie areas in the United States that have not been substantially converted to farmland or otherwise modified. Thus, most of the plant and animal species present when settlement began are still present today.

Surveys and census activities are limited by staffing and funding. Most are broad-scale sampling, which works well for large numbers of highly visible species but yields erratic and questionable results for species which are less visible or occur in smaller numbers. Some intensive, more sophisticated surveys have been discontinued because of insufficient staff and questionable data. As a result, high quality, refuge-specific information is not available for many species.

Endangered and Threatened Species

There are no federally-listed endangered wildlife which depend on the Refuge in any significant way. Prairie falcons, least terns, and piping plovers are occasionally seen during migrations but are considered casual visitors. The ferruginous hawk is considered a sensitive species but is an uncommon migrant. Black terns and loggerhead shrikes are also sensitive species which nest on the Refuge. Recent informal surveys revealed about 100 tern nests and 20 shrike nests.

The swift fox, an infrequent visitor, is a State-listed species for which little information is available. One siting was made on the Refuge in 2000 and an increasing number of sightings are occurring north of the Refuge, but no official data is available.

The yellow mud turtle is another Refuge species of special interest and will be treated as a listed species for planning purposes. The Refuge population is centered at Gimlet Lake and is estimated at 4,000 to 5,000. A study by Earlham College, which includes the Refuge, provides good information on the biology of the turtle (Iverson, Annual Study Reports).

Birds

Nebraska includes 413 species on its official bird list, 279 of which occur on Crescent Lake Refuge (Appendix F).

Species of Special Interest. For the purposes of this plan, Wildlife Species of Management Concern are those listed by the U.S. Fish & Wildlife Service, the State of Nebraska, or Partners in Flight as declining and in need of special attention. Comparing these lists with the Refuge bird list indicates 25 such species occur on the Refuge sometime during the year (Appendix H). Little is known about the status and trends of most of these birds or how they are affected, positively or negatively, by present habitat management.

Waterfowl. Thirty-two species use the Refuge during some portion of the year and 15 species nest on the Refuge. Peak numbers during the fall migration occur in October and averaged 13,100 over the last 10 years. Peak numbers during the spring migration occur in April and averaged 12,600 over the same period. Table 1 shows average peak numbers by species.

Figure 2. Average Peak Waterfowl Populations by Species During Fall Migration, 1985-95 (*Nests on the Refuge)

Species	Average Peak No.
* Trumpeter swan	29
* Canada goose	1,050
* Mallard	4,860
* Gadwall	4,960
* Pintail	1,370
* Green-winged teal	1,400
* Blue-winged teal	730
* Cinnamon teal	30
* Wigeon	3,075
* Shoveler	4,140
* Redhead	4,232
Ring-necked duck	4,950
* Canvasback	3,660
* Lesser scaup	3,840
Common goldeneye	3,000
* Bufflehead	5,520
* Ruddy duck	3,420
Common merganser	600

Although the Sandhills, as a whole, are the most important waterfowl production area in the State, Crescent Lake is not considered a waterfowl production refuge per se. Duck breeding pairs ranged from 548 to 1,450 since 1987, a period which included very dry and very wet years on both the Refuge and on portions of the major breeding grounds to the north. The number of ducklings hatched ranged from 1,000 to 3,500. Among dabbling ducks, blue-winged teal are the most common nesters (62 percent), followed by mallards (33 percent), gadwalls (3 percent), pintails (1 percent), and shovelers (1 percent). For diving ducks, ruddy ducks are the most common nesters (48 percent), followed by redheads (43 percent) and canvasbacks (9 percent).

Predation on duck nests is a limiting factor. Bullsnares, weasels, raccoons, and skunks are the major predators. Without predator control, nest success rates hover around 16 percent, the bottom end of the rate needed for population maintenance. An intensive bullsnake removal program during the 1980s resulted in nest success rates up to 50 percent on a small sample area. However, because nest densities are relatively low, the resulting small increase in numbers of ducks produced to flight stage could not be justified, and the program was discontinued in 1994. Extensive predator control has not occurred on the Refuge since then.

There are 98 Canada goose nesting tubs on the Refuge, about 60 percent of which are used annually. Hatching success is around 80 percent and between 200 and 250 goslings are raised to flight stage. Few geese nest off the artificial structures.

Marsh and Water Birds. Eared grebes nest on Goose and Deer Lakes. Numbers vary considerably from year-to-year, and during the last 10 years ranged from 446 adults and 290 nests to 1,194 adults and 656 nests.

There is a long-standing double-crested cormorant rookery on Goose Lake, and cormorants pioneered onto Crane Lake in 1997. The number of nests over the last 10 years averaged about 60.

Great blue herons nest in the Crane Lake rookery. The number of nests in the last 4 years ranged from 43 to 127; production estimates range from 94 to 125 young hatched.

Black-crowned night-herons have traditionally nested at Smith Lake but, for unknown reasons, the colony moved to Goose Lake in 1997. The number of nests in the last 10 years ranged from 3 to 11.

American bitterns were first surveyed in 1996 (a breeding male song survey on Smith, Goose, Gimlet and Island Lakes). From 1996 to 1999, the number of males ranged from 24 to 35.

A rail call survey was initiated in 1997 and yields only trend information. Virginia rail calls went from 36 to 20 and sora rail calls from 6 to zero in the period 1997 to 1999.

Shorebirds, Gulls, Terns, and Allied Species. Thirty-one shorebird species, 7 gull species, and 5 tern species occur on the Refuge. Of these, 11 species nest on the Refuge (Appendix F). No formal surveys are conducted. Peak numbers of all species seldom exceed 2,500 in spring and 1,000 in fall.

Raptors. The open grasslands of the Sandhills, interspersed with small areas of trees, provide excellent habitat and food sources for raptors. Twenty-seven species have been recorded on the Refuge. Figure 3 presents 1997 breeding survey results, an average year.

Figure 3. 1997-1999 Raptor Breeding Survey Results

Species	Average Breeding Pairs	Average No. Young
Red-tailed hawk	2	4 (est.)
Swainson's hawk	5	8
Bald eagle	1	2
Great horned owl	2	3
Northern harrier	8	Unknown
American kestrel	4	15
Barn owl (in nest structures)	8	24

Non-migratory Birds. Prairie grouse, a significant component of the Nebraska Sandhills, are declining throughout their range (Proceedings Prairie Grouse Technical Conference 1998). Crescent Lake Refuge is also seeing declines. Sharp-tailed grouse lek surveys from 1986 to 1997 show active dancing grounds decreasing from 45 to 15 and dancing males decreasing from 413 to 109. Refuge populations seemed to rebound in 1998 and 1999 when the number of dancing grounds averaged 32 and the number of dancing males averaged 226. The causes for the decline and the significance of the recent increases are not clear.

The Refuge is on the western edge of the range of the greater prairie chicken. This species has not been present with regularity since the 1950s, and then numbers seldom exceeded 100. Reintroduction projects in the 1970s and 1980s were unsuccessful. A single male was seen on the Refuge in the spring of 2000, and five were heard during the lek counts.

Ring-necked pheasants, exotic but popular game birds, occur in relatively small numbers. The average breeding population from 1987 to 1999 was 361.

Mammals

The Sandhills provide habitat for a variety mammals (Appendix F). Pre-settlement mammalian fauna included 59 species. Ten carnivores and ungulates were probably extirpated by 1900, including the bison, elk, and bighorn sheep. Ten mammals have been introduced or their natural ranges extended, including the fox squirrel, black-tailed jackrabbit, and raccoon (Jones 1964).

White-tailed deer and mule deer are both present. The best populations estimates are from the period 1979 to 1991 when aerial surveys were conducted. Estimated average populations during that period were 110 mule deer and 152 white-tailed deer. Populations have not significantly changed since that period, although aerial surveys are cost-prohibitive and were replaced with less accurate ground surveys. The largest harvests since the hunter check station was initiated in 1981 occurred in 1998 and 1999 when 66 and 47 deer were checked respectively. The average harvest since 1981 is 32.

Because of their economic importance and because they can alter wetland habitat, muskrats have been surveyed by counting houses in the winter since the Refuge was established. Population peaks occurred in 1950 (934 houses), 1989 (1,929 houses), and 1996 (742 houses). During the last peak, considerable opening of cattail marshes was noted.

Coyote scat counts were initiated in 1997 and supply population trends which have been stable during the survey period. Estimates of population numbers are not available.

There is no data for population trends of other mammal species.

Amphibians and Reptiles

The most common reptiles and amphibians are the box turtle, bullsnake, tiger salamander, and garter snake (Appendix F). The yellow mud turtle is considered a Refuge species of special interest and is discussed under endangered species.

Fish

Fisheries have been managed by the NGPC under an agreement with the Refuge since 1991, when FWS fisheries capabilities were reduced. Island Lake has been open to sport fishing since 1931. Carp were eliminated in 1978, and the lake now supports warm water species including largemouth bass, bluegill, crappie, yellow perch, walleye, and sauger. However, a few carp of even-age class were discovered in the spring of 2000 and the problem may reemerge.

Carp were reduced, but not eliminated, in Smith Lake in 1996. That lake now supports a perch/panfish fishery but may develop a serious carp problem in the future. Crane Lake is the only other lake with sport fishery potential and was stocked with yellow perch in 2000. The fathead minnow, the only other fish species on the Refuge, was introduced into several lakes in the late 1970s. The minnow provides a food source for a variety of birds but also creates turbid water, an undesirable result.

Cultural Resources

Little formal archaeological work has been conducted within the Nebraska Sandhills. Collections by avocational archaeologists indicate the area has a long prehistoric record and that artifacts are widely distributed; however, because of the unique nature of the Sandhills, settlement and subsistence patterns are difficult to predict (Burgett and Nickel 1999). No systematic surveys have been conducted on the Refuge, and no known Native American sites exist.

Historic use of the Sandhills is better documented. Only a few fur trade and ranching operations existed prior to the Federal government's decision to survey the region and make it available for homesteading in 1904. Nearly all early attempts at farming failed and homesteads were aggregated into efficient and successful ranching operations. No farm or ranch buildings remain on the Refuge but old dump sites are still scattered across the area. Two Refuge buildings and two fire towers built by the CCC and WPA in the 1930s are subject to conditions of Federal laws protecting historic resources.

Public Use

Crescent Lake offers a variety of public use opportunities including hunting, fishing, wildlife viewing, photography, hiking, and environmental education (Map 5). Public trapping has been allowed on a permit basis. About 7,000 to 9,000 people visited Crescent Lake in recent years, a drop of over 30 percent from the 13,000 recorded in 1987. Counting methods varied somewhat throughout the period and may be the reason for this drop.

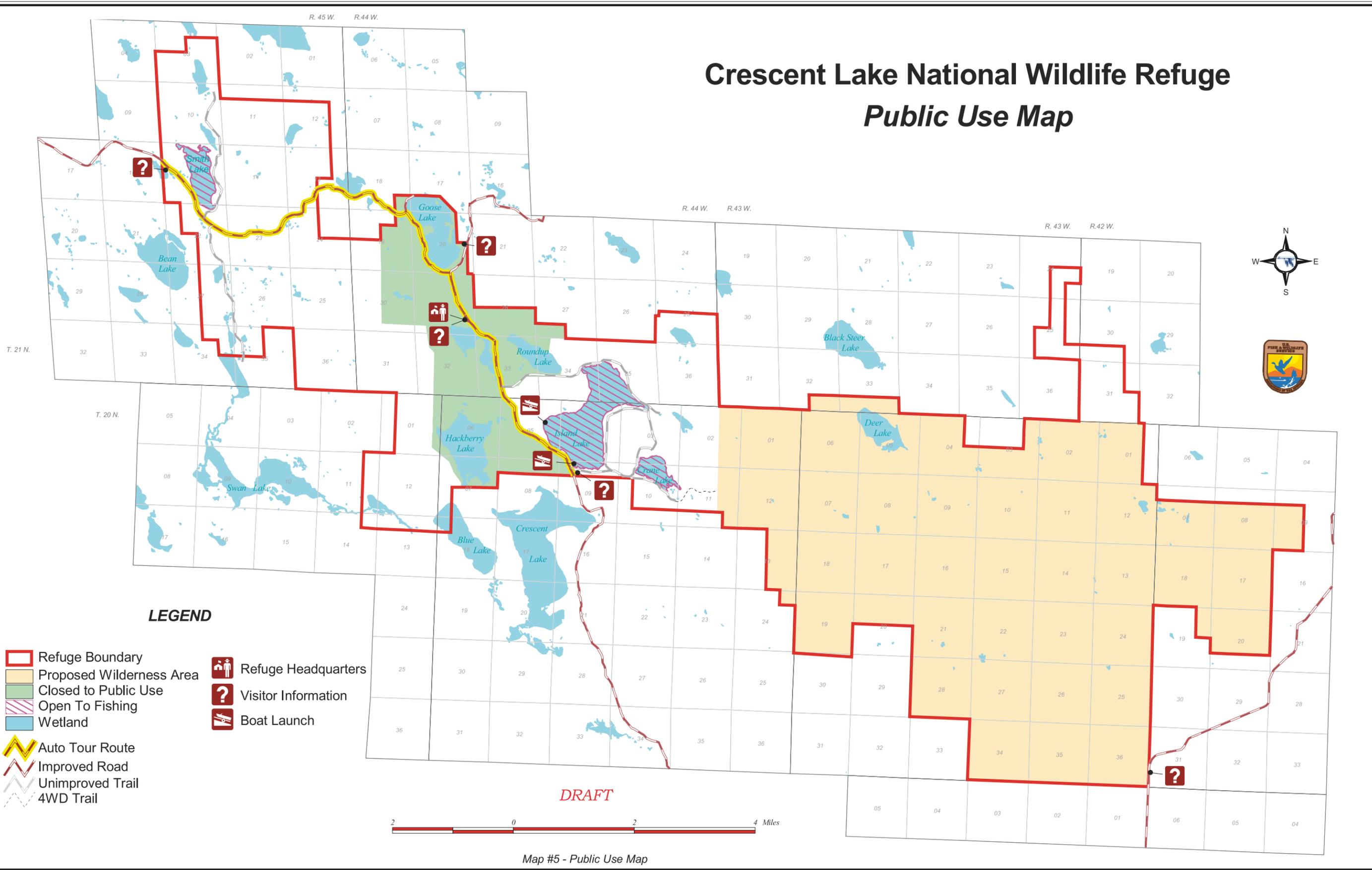
Most visitors engage in more than one activity but the primary reason for visits in recent years can be categorized as follows:

Hunting	3%
Fishing	67%
Wildlife viewing and photography	28%
Education/Interpretation	2%

The Refuge is open to hunting for mule and white-tailed deer, prairie grouse, and ring-necked pheasants. It is not open for waterfowl, other migratory birds, or predators, such as coyotes. The 5-year average for deer hunting is 200 visits; the average for upland game is 300 visits. Some hunters hunt for both deer and upland game during the same visit.

Fishing on Island and Smith Lakes is the most popular use of the Refuge. In recent years, fishing visits averaged about 5,000, of which 20 percent occurred during winter months. Supporting facilities are limited to two graveled boat ramps and two fishing piers on Island Lake. Boats are only allowed on Island Lake and gas powered engines are prohibited. Formal education/interpretation facilities are limited to one auto tour route along the County road and modest information kiosks and displays at the headquarters. The Refuge is available as an outdoor classroom; however, the isolated location, sparse local population, and distances to schools limits use to about 200 students per year.

Crescent Lake National Wildlife Refuge Public Use Map



LEGEND

-  Refuge Boundary
-  Proposed Wilderness Area
-  Closed to Public Use
-  Open To Fishing
-  Wetland
-  Auto Tour Route
-  Improved Road
-  Unimproved Trail
-  4WD Trail
-  Refuge Headquarters
-  Visitor Information
-  Boat Launch

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Map #5 - Public Use Map

IV. Refuge Goals, Objectives, and Strategies

Background

This is a 15-year plan, but only the goals will remain static. Objectives and strategies are based on present knowledge and reflect known needs. They may change, as may specific management actions, as knowledge and needs change. Public involvement will be sought for any significant amendments.

It is also important to understand that individual objectives cannot be taken out of context. It is the mixture of objectives that will produce the desired results. Generally speaking, on Crescent Lake Refuge, where the legal mandate is to serve as a “refuge and breeding ground for birds and other wild animals,” habitat is managed to support or produce birds and other wildlife. However, because it is the habitat over which wildlife managers have most control, a clear understanding must also occur of the kinds and amounts of habitat needed to support that wildlife. Public use and environmental education are also important functions of the Refuge. Thus, it is important to know what kinds and how much public use can be allowed and remain compatible with the wildlife purposes and objectives.

Although ecological diversity is part of the Refuge vision, the Refuge is limited in size and cannot be all things to all forms of wildlife. Therefore, in order to decide how much of specific habitats are needed and how to manage those habitats, it is necessary to define which animals or groups of animals will receive priority and where. For instance, if a conflict exists between providing for a species listed as “threatened” under the Endangered Species Act and providing for mallard ducks, the threatened species and its habitat may be given priority. Similarly, a species once part of, but now missing from, the “refuge ecosystem” may be given priority over a non-indigenous species or a species common on and off the refuge. Once such decisions are made, the types and management of habitat can be described.

The wildlife priorities for Crescent Lake Refuge are:

1. endangered or threatened species;
2. species considered candidates for listing as threatened or endangered, and Species of Management Concern (species which, based on scientific evidence, are or are becoming rare, or are steadily declining in numbers, and for which proper habitat occurs on the Refuge);
3. migratory birds;
4. species that are dependent upon some special quality of the habitat found on the Refuge;
5. fish and wildlife that people use consumptively; and
6. organisms that, because of a unique quality, are of special interest to people.

Endangered, Threatened, and Candidate Species

Plants and animals listed as endangered or threatened by either the Federal government or the State of Nebraska will receive priority in all Refuge management decisions. Only two are known to use the Refuge in any significant way (See Section III, Refuge and Resource Descriptions). The federally-listed blowout penstemon, a plant which grows only on sand soils in areas devoid of other vegetation; and the State-listed swift fox. The Refuge is in the heart of the remaining penstemon habitat. The swift fox is an infrequent and casual visitor but an increasing number of sightings are being recorded in the vicinity, primarily just off the Refuge to the north. A third species, the yellow mud turtle, is a sensitive species and, as such, will also receive priority consideration.

Goal 1: Contribute to the preservation and restoration of endangered flora and fauna that are or were endemic to the Crescent Lake Refuge area.

Objective: Maintain five population groups of blowout penstemon with at least 300 plants in each group (one half of the Recovery Plan goal).

Native plants declined from 2,050 in the first survey in 1987 to 608 in 1996 (see Figure 1). A transplant program was started in 1997 in cooperation with the University of Nebraska. The penstemon survey conducted in 2000 found 1,032 plants (not including plants transplanted that spring). Although the number of plants on the Refuge has increased, the survival rate of the transplants is low and the immediate future seems to include a continuous input of hand-grown plants. It also appears that habitat shrinkage is not the only reason for declining numbers. There are many blowouts with suitable habitat where the plants continue to decline. A large number of new blowouts were started in the winter of 1997 but none were colonized by 1999. Transplants appear more vigorous and it may be that native plants have become genetically deficient from many years of isolation. Transplantation may result in increased vigor over time.

Strategies:

- Continue the transplant program; monitor population status, survival rates, colonization, and other parameters to evaluate and adjust management.
- Prepare maps showing the past, present, and desired location of penstemon populations on and nearby the Refuge, and overlay information regarding numbers of plants, densities, transplants, etc.
- Protect existing penstemon populations on private lands adjacent to the Refuge.

“That, apart from the members of our own species, they (our fellow creatures) are our only companions . . . a perennial joy and consolation.”

-William Morton Wheeler,
Scientist

Objective: Attempt to verify swift fox use on the Refuge.

The Refuge is not considered prime swift fox habitat and the fox is a casual visitor. Their primary range is west of the Refuge.

Strategies:

- Investigate sightings and use scent stations to aid in verifying presence of swift fox.
- Conduct literature search to find ways that habitat may be enhanced for swift fox.

Objective: Maintain present population numbers of 4,000 to 5,000 yellow mud turtles and protect their habitat.

The yellow mud turtle is a Species of Management Concern due to low numbers and isolated populations. It is found in only a few places in Nebraska and Arizona. On the Refuge, it is found almost exclusively at Gimlet Lake. Refuge population estimates range from 4,000 to 5,000. These turtles migrate across the County road twice a year and are especially vulnerable at those times. A long-term study by Dr. John Iverson of Earlham College, Richmond, Indiana, has provided valuable information regarding the biology of the turtle; however, information is limited that provides specific guidance for preservation and management of this species.

Strategies:

- Continue to support the studies conducted by Earlham College and seek information leading to specific management actions.
- Seek ways to eliminate mortality on the County road during migrations.
- Consider yellow mud turtles in all habitat management decisions for Gimlet Lake and their nesting and hibernating area north and east of Gimlet lake during development of the Habitat Management Plan.

Special Places

Wilderness

The Wilderness Act of 1964 (Public Law 88-577/16 U.S.C. 1131-1136) defines wilderness as:

“A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient sizes to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.”

In 1972, 24,502 acres of the Refuge were proposed for inclusion in the National Wilderness Preservation System (see Map 2). Congress has not acted on that proposal. In the intervening years, the area has been managed to maintain and improve the wilderness characteristics that existed at the time of the proposal. For instance, in 1972, there were 42 miles of fence, 39 windmills, and 44 miles of two-track trails within the area. Today, there are 34 miles of fence and 30 windmills; and the two-track trails have been closed and many have healed over.

Goal 2: *Maintain and enhance the wilderness qualities of the proposed Wilderness Area.*

One of the objectives for the Refuge is to reintroduce bison into the proposed Wilderness Area (see Fish and Wildlife Objectives). To do that will require preparation of a bison management plan and a significant increase in funding and staff; a process that could take years. In the interim, the wildlife and habitat management objectives presented in this Plan will apply to the proposed wilderness but the management practices and tools used to implement those objectives will be “minimized.” For instance, motorized vehicles will be used to access the area for noxious weed control only when no other feasible alternatives exist and the action is essential to maintain the grassland ecosystem (see Appendix G).

A need exists for a grazing animal within the Wilderness Area because prolonged rest will result in habitat degradation. Cattle have been used for that purpose in the past. On the Refuge, bison (if approved for reintroduction) would be free ranging and present seasonally or, perhaps, year-round; they would become part of the landscape. Their presence may change the appearance of habitats within the wilderness but in ways that would make it more like the Sandhills Prairie that existed pre-development.

When Henry David Thoreau borrowed an axe from a neighbor and set about building his cabin at Walden Pond, he was determined to “front only the essentials of life, and see if (he) could not learn what it had to teach . . . ”

Perhaps the overriding purpose of these special places is to learn from them what they have to teach.

The specific impacts of bison will be analyzed and presented in a bison management plan. While bison would add to the natural diversity of the Wilderness Area, they would be reintroduced only if compatible with the other wilderness purposes.

Interim Objectives (without the presence of bison):

All wildlife and habitat management objectives in this Plan would apply to the proposed Wilderness Area until the decision whether or not to reintroduce bison is made.

Interim Strategies (without the presence of bison):

- Prepare, by December 31, 2002, an interim wilderness management plan that reevaluates the use of cattle grazing and fire to maintain wilderness characteristics, and further defines the use of “minimum tools.” This Plan would be rewritten to reflect the presence of bison, should that event occur.

The present Upland Habitat Management Plan calls for cattle grazing on a 20-year rotation on sands and choppy sands range sites, and a 6-year rotation on the meadows. Prescribed burning could possibly be substituted for cattle in the meadows. The minimum use of other tools must be more clearly defined, especially the use of motorized access for noxious weed control, law enforcement, wildfire control, management for blowout penstemon (an endangered species), and facilities maintenance. Public use must also be reevaluated. See Appendix G for a preliminary discussion of “minimum tools” and how they might be applied.

- Continue to remove all permanent fences and other livestock facilities not essential to maintain the prairie ecosystem.
- Establish monitoring systems to: evaluate the effects of “minimum” management on wilderness characteristics (to be defined in the interim wilderness management plan); and compare habitat and wildlife use in the wilderness with surrounding Refuge and private lands.
- Seek from the NGPC concurrence for a special regulation which will allow hunters to bone out deer in the field within the proposed wilderness.

Research Natural Areas

Two Research Natural Areas were established in 1955 by a Director's Order and included on a National list of Research Areas (see Map 2). The Goose Lake RNA is 904 acres and the Hackberry RNA is 172 acres. The purposes of Research Natural Areas are: (1) to preserve examples of undisturbed ecosystems for comparison with those influenced by man; (2) to provide educational and research areas for scientists to study ecology, successional trends, and other aspects of the natural environment; and (3) to serve as gene pools and preserves for rare and endangered species of plants and animals.

Both RNAs are treated as separate habitat units in the Upland Management Plan (1996). These areas have been allowed to evolve without interference. Habitat manipulation has been essentially non-existent. Neither area has been grazed since 1955. A portion of the meadow along Goose Lake was included in a prescribed burn in 1985. No wildfires have occurred. Noxious weeds have been controlled since 1992 when Canada thistle invaded the meadows of both units. Both areas are within the closed area of the Refuge, and public use has not been allowed. Unfortunately, no significant research has occurred in either area in part because of the remoteness of the Refuge. See the Upland Habitat Plan for additional information.

***Goal 3:** Preserve plant and animal communities in a natural state for research purposes.*

Objective: Maintain 1,076 acres of the Research Natural Area in a condition approaching grassland climax stages and affected only by natural forces.

Strategies:

- Initiate management practices only where necessary to preserve vegetation and only as stated in a Natural Area Management Plan (8 RM 10.8 F) or amend the 1996 Upland Management Plan or address in a Habitat Management Plan.
- Reduce total thistle acreage, and any other noxious plants that appear, using integrated pest management techniques. Eradication is not feasible but the plant should not be allowed to spread or become the dominant species in a given area.

Upland Habitat

Goal 4: *Preserve, restore, and enhance the ecological diversity of indigenous flora and fauna of the physiographic region described as the Sandhills Prairie.*

An Upland Habitat Management Plan was approved for Crescent Lake Refuge in 1996. Referred to as a “step-down plan,” it presents specific habitat descriptions and management techniques that will enhance and maintain the required habitat necessary to sustain wildlife populations and achieve stated habitat objectives. The following objectives are taken from that document.

The general theme of grassland or prairie management on Crescent Lake Refuge is to maximize native warm season grasses and create a general landscape that resembles “native” Sandhills Prairie throughout the year. This is desirable because surrounding private lands have a different purpose (primarily cattle production) and, thus, have less residual cover available in the early spring for ground-nesting birds. Cool season and exotic grasses (such as Kentucky bluegrass, smooth brome, and cheatgrass) begin growing in early spring and reach maturity (cure out) in mid-summer. By the following spring, they are mostly lying flat and of little use to nesting birds. Native warm season grasses do not begin to grow until early or mid-summer. They are generally bigger, more robust, and remain standing throughout winter and spring. Many bird species are adaptable and can survive in less than optimum habitat, although their numbers are generally fewer. However, some species of birds have specific habitat requirements and are decreasing throughout their range or becoming rare because of changes in vegetation structure and composition resulting from commercial uses. The Refuge can and should provide habitats not common on surrounding private lands.

Five major habitat types occur on the Refuge. These include: Wetlands (open water, seasonally flooded, and emergent vegetation 3,110 acres), Subirrigated Meadows (4,195 acres), Sands (27,611 acres), Choppy Sand (1,718 acres), and Sands/Choppy Sands (8,653 acres) mix (see Map 4). These types are defined by a combination of soil type, slope, plant composition, and moisture. Goals, objectives, and strategies will be defined by habitat type. The Refuge also has two Research Natural Areas and a proposed Wilderness Area requiring special management strategies to achieve habitat and wildlife goals and objectives.

The following objectives are designed to result in a landscape simulating native prairie habitat which will support a diversity of wildlife species. These objectives apply to the entire Refuge, including the proposed Wilderness Area (see Wilderness objectives). How these objectives are achieved will be slightly different within the proposed Wilderness Area because, there, the use of management tools must be minimized. The Wilderness Area will be managed under an interim plan until a Wilderness Management Plan is written.

Objective: Develop a vegetative map (in GIS format) that follows the Nebraska Range Site description (NRCS 1995) or is consistent with and/or is easily cross-walked to the NRCS system showing past, present, and desired structure and composition by 2005.

Strategy:

- Contract vegetative mapping to be stored in a GIS Arcview system.

“In general, the trend of the evidence indicates that in land, just as in the human body, the symptoms may lie in one organ and the cause in another.”

- Aldo Leopold
(Sand County Almanac)

Subirrigated Meadow

Goal 5: Preserve, restore, and enhance the ecological diversity of indigenous flora and fauna of the Subirrigated Meadow habitat type.

Past and present management on subirrigated meadows encouraged grass species which provide tall and dense residual cover (e.g. switch grass, Indian grass, big bluestem). Prescribed fire and spring grazing treatment using cattle were, in the past and are now, the primary tools. When the desired landscape is achieved, use of these tools will be minimized to allow maximum nest success. Nest site vegetative structure has been determined for most Species of Management Concern.

The emphasis will be placed on the following wildlife species of management concern when managing for specific vegetation composition and structure in the subirrigated meadow habitat type: eastern meadowlark, prairie chicken, upland sandpiper, Swainson's hawk, short-eared owl, loggerhead shrike, northern harrier, bobolink, and dickcissel. Wildlife species requiring the same habitat quality and type that will also benefit, but not considered species of management concern as defined by the Service, are American avocet, willet, Wilson's phalarope, bobolink, and waterfowl (primarily blue-winged teal, mallard, gadwall, pintail, and shoveler).

Duck nesting preferences are well known. Refuge nest studies indicate that upland nesting ducks generally prefer the tall, mature, dense cover of the subirrigated meadows. The literature supports this general conclusion (Duebbert 1966 and 1969; Duebbert and Lokemoen 1976; Imler 1942, unpub. data; Bue 1952; Clark 1977; Gjersing 1975; and Kirsch 1978). Upland nesting ducks on the Refuge include the blue-winged teal (62%), mallard (33%), gadwall (3%), pintail (1%), and shoveler (1%).

Although sharp-tailed grouse prefer the northeast slopes of sandhills, they do require tall residual cover and will nest in the subirrigated meadows. Prairie chickens have not nested on the Refuge since the early 1970s but, when present, relied almost totally on the subirrigated meadow type for nest and brood habitat.

Objective: Maintain 90 to 100 percent native grass composition on 4,195 acres of subirrigated habitat to meet the needs of species of management concern and associated species as outlined above. Plant composition will consist of approximately 80 to 85 percent grass and sedges (big bluestem, Indian grass, Canada wildrye, prairie cordgrass, slender wheatgrass, prairie sandreed, prairie June grass, sand bluestem, switchgrass and various sedges and rushes), 5 to 15 percent forbs, and less than 10 percent shrubs.

Strategy:

- Develop management treatments using grazing and burning in a Habitat Management Plan based on wildlife species priorities and unit floristics as outlined in the Upland Management Plan.

Objective: Increase (by 5 to 10 percent) or maintain the warm season grass component with native grass species, primarily Indian grass, prairie cordgrass, prairie sandreed, switchgrass, sand and big bluestem, and Canada wildrye, while reducing by 5 to 10 percent introduced cool season grasses, Kentucky bluegrass and reed canary grass.

Strategy:

- Utilize spring grazing and fall disturbance (grazing, burning) to set-back cool season grasses and favor warm season grasses. (See Upland Management Plan for details on timing and stocking rates.)

Objective: Maintain and/or increase residual nesting cover in the spring by creating Visual Observation Reading (VORS) in the following categories: (primarily for shorebirds, waterfowl, bobolinks, and eastern meadow larks) <0.5 dm (~15 percent) (shorebirds), 0.5-1. dm (~ 20 percent) (shorebirds), 1-1.5 dm (~15 percent) (waterfowl), 1.5-2 dm (~15 percent) (waterfowl, eastern meadowlark, bobolink), 2-2.5 dm (~10 percent) (waterfowl), >2.5 dm at least 15 percent (northern harrier and short-eared owl). This information is based on Refuge data nest site vegetation structure collected from 1997 to 2001.

Strategies:

- Graze, burn, or hay no more than 40 percent of the subirrigated meadow type in any one year.
- Remove no more than 10 percent of warm season grass residual cover in fall (late September - early October).
- Utilize spring and fall disturbance to set-back cool season grasses and favor warm season grasses.

Some passerine birds, for example western kingbird and orchard oriole, are present on the Refuge only because of the existing tree cover. Loggerhead shrikes and Swainson's hawks (both Species of Management Concern), great blue herons, and bald eagles are also dependent on trees. Unless there is a demonstrated biological need for more of any species dependent on this habitat, tree cover will be maintained at approximately present amounts and locations. Resident species such as white-tailed deer, mule deer, sharp-tailed grouse, and ring-necked pheasants are dependent, to some degree, on the few trees on the Refuge.

Objective: Maintain tree cover at the present 80 acres with emphasis on willow and cottonwood regeneration.

Strategies:

- Mechanically remove Russian olive which have the potential for rapid expansion.
- Protect willow and cottonwood saplings near current aging trees.

Objective: Reduce total acreage of Canada thistle infestation from the approximate 800 acres (at present) to 350 acres by 2008 and continue control measures in the future to prevent additional acreage infestation.

Strategy:

- Manage Canada thistle using integrated pest management techniques. Eradication is not feasible but the plant should not be allowed to spread or become the dominant species in a given area. Eradicate and/or control, by mechanical removal and spot application of appropriate herbicides, other noxious plants as they appear.

Sands, Choppy Sands, and Sands/Choppy Sands

Mixed Habitats

There are 3 habitat types of uplands on Crescent Lake Refuge based on NRCS habitat typing. They are Sands (27,611 acres), Sandy (which is combined with sands because there is only one small site on the Refuge), and Choppy Sands (1,718 acres). There are also areas of mixed habitat where the scale did not allow Sands and Choppy Sands to be delineated (8,653 acres). In the mixed types, there are those considered Sand/Choppy Sands Mix > 60 percent, Sands and Choppy Sands/Sands Mix > 60 percent, and Choppy Sands. Based on vegetation, structure and species composition these areas need to be separated for management purposes to meet specific wildlife goals.

Goal 6: Preserve, restore, and enhance the ecological diversity of indigenous flora and fauna of the Sands, Choppy Sands, and Sands/Choppy Sands Mixed habitat types.

Undeveloped Sandhill Prairie supported a mixture of tall warm season grasses, shorter cool season grasses, and a variety of forbs. Today, this native mixture is not common on surrounding private rangeland. However, these private lands do provide an abundance of short grasses for wildlife which need short grass for all or a part of their life cycle. While the original mosaic cannot be duplicated, by emphasizing warm season grasses and forbs on the Refuge, a mixture of habitats can be provided over a larger area.

Species which will benefit from taller vegetation include the grasshopper sparrow, bobolink, and prairie chicken. Birds which may be disposed to shorter grass surrounding the Refuge include killdeer, willet, horned lark, and lark bunting (Kantrud 1982; Kirsch 1978; and Ryder 1980).

The year-round requirements of sharp-tailed grouse are met by the mixture of grasses and forbs on the sands and choppy sands range sites. They do show a preference for the northeast slopes of sandhills for nesting, often adjacent to subirrigated meadows, although they will also nest in the meadows.

Duebbert (1974) states “Residual nesting cover or dead vegetation carried over from year-to-year is a very important component of nesting cover. However, if the non-use period extends for too many years, the vigor of the vegetation and its value as nesting cover eventually declines. A system of vegetative management that includes several years of non-use interrupted by nearly complete cover removal during one year appears to maintain good nesting.”

The desired vegetation and wildlife use on these two range sites is encouraged by a combination of fire, grazing, and rest. Management will strive for a balance between providing undisturbed wildlife cover and maintaining vegetative composition and structure to benefit primarily grasshopper sparrows, western meadowlarks, sharp-tailed grouse, mourning doves, vesper sparrows, and lark sparrows.

Objective: Maintain 90 to 100 percent native grass composition on Sands (27,611 acres), Choppy Sands (1,718 acres), and Sands/Choppy sands (8,653 acres) mixed habitat types to meet the needs of species of management concern and associated species as outlined above. Plant composition will consist of approximately 80 to 85 percent grass and sedges; (blue and hairy grama grass, sand lovegrass, needle-and-thread, sand dropseed, prairie sandreed, prairie June grass, sand bluestem, switchgrass) and 5 to 10 percent forbs.

Strategies:

- Develop management treatments using grazing and burning in a Habitat Management Plan based on wildlife species priorities and unit floristics as outlined in the Upland Management Plan.
- Implement spring grazing and fall vegetation disturbance to set-back cool season grasses and favor warm season grasses. (See current Upland Management Plan for details on timing and stocking rates.)

Objective: Increase the warm season grass component of the Sand and Choppy Sands range types by 10 percent; emphasize sand bluestem in sand range sites and sand bluestem, sand dropseed, and sand lovegrass in choppy sands range sites.

Strategies:

- Utilize spring and fall disturbance to set-back cool season grasses and favor warm season grasses. (See current Upland Management Plan for details on timing and stocking rates.)
- Conduct one prescribed burn on a Sand or Choppy Sand range site each year as a test to determine the effects of burning on habitat and wildlife use and the effects of fire on creation and maintenance of blowout penstemon habitat.
- Do not graze/burn/hay more than 40 percent of the Sands habitat type in any one year.
- Do not remove more than 10 percent of warm season grass residual cover in the fall.
- Utilize inter-seeding of sand bluestem, prairie sandreed, and switchgrass in pockets to develop higher VOR areas for nesting, thermal, and escape cover.

Objective: Maintain quality nesting cover by providing residual cover in spring. Develop spring VORS in the 0.5-1.5 dm (grasshopper sparrow) and 1.5-2.5 dm (upland sandpiper, long billed curlew, sharp-tailed grouse) ranges on 40 percent and 20 percent of VOR readings respectively. (Based on nest site vegetation structure data from Refuge records collected 1997-2000.)

Strategies:

- Do not graze/burn/hay more than 40 percent of the Sands, Sands/Choppy type any one year.
- Do not remove more than 10 percent of warm season grass cover in fall (late September - early October).
- Utilize spring and fall disturbance to set-back cool season grasses and favor warm season grasses. (See current Upland Management Plan for details on timing and stocking rates.)
- Utilize inter-seeding of sand bluestem, prairie sandreed and switchgrass in pockets, to develop higher VOR areas for nesting, thermal, and escape cover.

Choppy Sands and Sands/Choppy Sands Mix

Choppy Sands site have been separated from Sands site because they provide unique habitat for Refuge species. Blowout penstemon occurs in this habitat were blowouts are more likely to occur. Lark sparrow also only nest in this habitat type on the Refuge because the habitat type meets the open requirements of this grassland nester.

Goal 7: Preserve, restore, and enhance the ecological diversity of indigenous flora and fauna of the Choppy and Sands/Choppy Sands mix habitat types.

Historically, the Sandhills had large amounts of blowouts and bare sand runs. Possibly more than 50 percent may have been open sand. Blowout penstemon was common. Historical fire intervals were 3 to 5 years, with spring and fall wildfires. Species of Management Concern and associated species include: lark sparrow, sharp-tailed grouse, mourning dove, western meadowlark, vesper sparrow, grasshopper sparrow, upland sandpiper, long-billed curlew, and blowout penstemon.

Objective: Create and maintain blowouts in five habitat units to maintain blowout penstemon populations.

Strategies:

- Reduce cover by frequent disturbance to expose sand to wind, primarily through fall grazing.
- Use mechanical means to create new blowouts in areas where blowouts have healed.
- Disturb designated areas on an average of every 3 to 4 years with some variation in time and intensity of grazing.
- Protect plants from grazing in May and early June.
- Plant seedlings provided by the University of Nebraska, Lincoln.

Objective: Maintain 90 to 100 percent native grass composition on Choppy Sands (1,718 acres) and Sands/Choppy Sands (8,653 acres) mix habitat types to meet the needs of Species of Management Concern and associated species as outlined above. Plant composition will consist of approximately 90 to 95 percent grass and sedges (sandhills muhly, blue and hairy grama grass, sand lovegrass, needle-and-thread, sand dropseed, blowout grass, prairie sandreed, prairie June grass, sand bluestem, switchgrass) and 5 to 10 percent forbs.

Strategies:

- Develop species priority for each habitat unit and develop grazing and burning treatments within the Habitat Management Plan based on individual unit floristics (identified in the 1996 Upland Management Plan).
- Implement spring and fall grazing and prescribe burning programs with different durations of rest, depending on units and wildlife uses, to set-back cool season grasses and stimulate warm season grasses.
- Maintain 20 to 40 percent bare ground, or less than 60 percent litter cover, using rest rotation grazing cycles every 3 to 4 years.

Objective: Maintain quality nesting cover by providing residual cover in spring. Develop spring VORS in the 0.5-1.5 dm (to meet open requirements of some species) and 1.5-2.5 dm (lark sparrow, sharp-tailed grouse) ranges on 40 percent and 20 percent of VOR readings respectively.

Strategies:

- Do not graze/burn/hay more than 40 percent of the Choppy and Sands/Choppy Sands mix types in any one year.
- Do not remove more than 10 percent of warm season grass residual cover in the fall.
- Utilize spring and fall disturbance to set-back cool season grasses and favor warm season grasses. (See current Upland Management Plan for details on timing and stocking rates.)

Wilderness - *Special considerations to above habitat goals, objectives, and strategies*

Goal 8: Preserve, restore, and enhance the ecological diversity of indigenous flora and fauna of the physiographic region described as the Sandhills Prairie, while maintaining and enhancing the wilderness quality.

Objective: Maintain the integrity of the 24,502-acre proposed Wilderness Area as intended by Congress in the Wilderness Act of 1964, Service policy, and Director's Order #116, Wilderness Stewardship Training.

Strategy:

- Utilize bison and, where possible, prescribed fire as a "natural" disturbance to meet above habitat goals, objectives, and strategies.

The Refuge staff believes that neither the wilderness characteristics nor the established wildlife goals can be met without the use of grazing and fire.

Wetland Habitat

Wetlands (lakes and marshes) constitute about 18 percent of the total Refuge. Most wetlands are shallow and dependent on annual precipitation; only nine lakes have any potential for water level manipulation. The overriding concern is the gradual filling of wetlands by emergent vegetation, windblown sand, and decaying plant material until they eventually become dry land. This process is particularly important because the Sandhills Prairie is a managed area and becoming more stable and less subject to natural forces. Wetlands were formed during periods of prolonged drought by wind cut depressions occurring in the Sandhills landscape. As water tables were restored, wetlands appeared and vegetation stabilized the surrounding areas forming permanent wetland depressions. Wetlands are no longer being created naturally and probably will not be until the next prolonged drought, if then.

Management emphasis will be placed on the following species: waterfowl, white-faced ibis, American bitterns, Virginia rails, red-winged and yellow-headed blackbirds, marsh wrens, black and Forster's terns, black-crowned night-herons, and the yellow mud turtle.

Goal 9: Maintain natural and artificially managed permanent and semipermanent wetlands to provide habitat for migratory waterfowl, shorebirds, wading birds, and associated wetland-dependent species.

Natural Lakes

There are 15 named lakes on the Refuge and more than 100 ponds of varying sizes that provide a wide range of habitats for wildlife. Each lake/wetland contains specific morphological, physiological, and biological characteristics that combine to determine the ability to support and maintain certain species of vegetation as a food source for migrating waterfowl, shorebirds, and marsh related species and as an important substrate for invertebrate resources. Natural functions are allowed to dominate these bodies of water, but can be augmented to meet specific wildlife goals or needs.

Objective: Maintain and/or augment the quality of the wetland habitat (submergent and emergent vegetation and invertebrate levels) for breeding and migrating birds as well as resident wildlife populations.

Strategies:

- Allow for a natural cycling (wet and dry cycles) to occur as a means to maintain necessary nutrient levels (e.g. plant and animal detritus) to support targeted wildlife species.
- Utilize prescribed fire and grazing on shorelines and emergent vegetation.
- Utilize pumping of lakes to eliminate the carp and allow for stabilization of lake bottoms and annual vegetation encroachment on occasion.

Objective: Prevent phragmites from occupying more than 15 percent of any wetland basin.

Strategy:

- Treat 100 percent of the phragmites areas with Rodeo (chemical treatment) where possible.

Objective: Treat other invasive wetland plants if they appear on the Refuge.

Strategy:

- Conduct annual surveys to detect the presence of any exotic wetland plant; coordinate with landowners and local County and State officials to monitor the presence or expansion of purple loosestrife on adjacent private lands.

Artificially Managed Lakes

The following lakes (wetlands) are artificially managed to provide the habitat requirements necessary for the above listed wetland-dependent species: Martin, Ramalli Marsh, Smith, Perrin, Redhead, Upper Harrison, Gimlet, West Jones, and Duck Slough. Each lake/wetland contains specific morphological, physiological, and biological characteristics that combine to determine the ability to support and maintain certain species of vegetation as a food source for migrating waterfowl, shorebirds, and marsh related species and as an important substrate for invertebrate resources. Specific resource management information and recommended management direction for these lakes and the following objectives are based on information found in Fredrickson (2001).

Water management involves water level manipulation of the lakes, limited dewatering of lakes without inflow or outflow by pumping, flowage ditches, and water control structures.

Since the 1930s, the natural lakes along the Moore Valley drainage have been equipped with water control structures and/or had small dikes constructed to increase levels and allow for manipulation of water. However, it appears that only Smith and Martin Lakes outlets were utilized prior to 1958. Also, because most of these lakes are closed drainages and permanent types of water, stagnation occurs. To remedy this, pumping for drawdown began in about 1972.

Applications for State water rights have not been filed on these lakes because Nebraska law does not allow for protection of “natural” lakes. No records exist documenting the natural elevations and the amount of additional water impounded above the natural levels.

The only Refuge water right of record is Permit No. A-16382 for 13 cfs from Eldred Lake. The lake (currently a hay meadow) is located on private lands and covered under a perpetual easement, permitting diversion of water to the Refuge via the Eldred Diversion Ditch. Consumptive water use has not be quantified.

Objective: Provide vegetative composition (sago pondweed, softstem/hardstem bulrush, spikerush, Cyperus) and structure (tall emergents) as a food source, and invertebrate substrate, for waterfowl, shorebirds, and marsh-dependent bird species during spring and fall migration and summer nesting to meet the necessary life requirements as described in the Wetland Management Plan and/or the Habitat Management Plan (to be developed).

Strategy:

- Develop a Wetland Management Plan or Habitat Management Plan incorporating the following strategies.
 - ✓ Define each lake's best wildlife use and potential and the habitat necessary to meet the life requirements needed for targeted wildlife species.
 - ✓ Utilize complete drawdowns for 1 to 2 growing seasons to recharge the nutrient cycle.
 - ✓ Utilize partial drawdowns during a single year to provide foraging habitats, with some variation in season, length, and amount of drawdown defined by wildlife needs.
 - ✓ Utilize high water levels, grazing and prescribe fire to control vegetation, with some variation in season, and length.
 - ✓ Implement complete drawdowns on no more than two lakes in a given year.
 - ✓ Utilize complete drawdowns and Rotenone application to eliminate carp.
 - ✓ Utilize prescribed fire and grazing on shorelines and emergent vegetation.
 - ✓ Treat cattail edges to maintain "soft" edge for waterfowl nesting.
 - ✓ Maintain the existing database of surface and groundwater resources. A record of surface and groundwater levels has been maintained almost from the establishment of the Refuge. It is essential that this record continue in order to detect vegetation and other biological changes due to changes in water levels and document wildlife use of these habitats.

Objective: Prevent phragmites from occupying more than 15 percent of any wetland basin. Phragmites are firmly established in the Refuge wetlands and are invading adjacent vegetative types. It is estimated that phragmites occupies about 2 percent of the wetland area. Total eradication is not feasible.

Strategy:

- Treat 100 percent of the phragmites areas with Rodeo (chemical treatment) where possible.

Objective: Treat other invasive wetland plants if they appear on the Refuge. Purple loosestrife, a particularly aggressive exotic plant, is found within 100 miles of the Refuge on private lands.

Strategy:

- Conduct annual surveys to detect the presence of any exotic wetland plant; coordinate with landowners and local County and State officials to monitor the presence or expansion of purple loosestrife on adjacent private lands.

Fish and Wildlife

Wildlife objectives, particularly those for migratory species, must be considered in the light of: Continental and Statewide populations and trends; the role of Crescent Lake Refuge; the potential of the Refuge to make a measurable contribution at reasonable cost; and the effect of applied management on other species. For instance, if a migratory species, or group of species, is declining because of problems on wintering grounds to the south, it does not automatically follow that this Refuge should make significant adjustments in management to produce or sustain more - but neither should that possibility be ignored. Or, for example, if increases are indicated, care should be taken that Refuge management is resulting in a net increase, not simply redistributing animals from surrounding areas.

Goal 10: *Preserve, restore, and enhance the ecological diversity and abundance of migratory birds and other indigenous fish and wildlife with emphasis on grassland-dependent species.*

Waterfowl

Objective: Strive to maintain a 10-year average of 15 to 20 percent Mayfield nest success in the subirrigated meadow (4,195 acres) habitat type.

Historically, between 1,000 and 3,500 ducks are hatched per year, and 80 to 100 resident Canada geese nests result in 175 to 250 goslings hatched per year. As stated before, Crescent Lake Refuge is not considered a waterfowl production refuge. The Refuge's overall contribution to the recruitment of waterfowl to the Central Flyway is considered minimal. Heavy predation by bullsnakes, weasels, coyote, skunks, and raccoons limit production of the waterfowl and, it is assumed, other upland nesting species. In the past, extraordinary efforts, such as snake fences and traps which were tended every day during the nesting season, resulted in significant increases in duck production. A 7-year average of 34.7 percent Mayfield hatch success was observed within a snake enclosure as opposed to 17.9 percent during the same period outside the enclosure. However, the effort required to maintain the fence was extraordinary and non-target species were being killed and injured in the fences. Such effort is questionable, especially when duck populations are at high levels throughout the Flyway.

Strategies:

- Achieve and maintain an interspersed and diversity of successional grassland stages as outlined in the Upland Habitat section.
- Utilize grazing (intensity, season, and duration) and prescribed burning as management tools to achieve the habitat objectives as outlined in the Upland Habitat section.

Objective: Provide nesting and brood-rearing habitat, primarily in the artificially managed lakes/wetlands, for over-water nesting ducks (redhead, canvasback, and ruddy).

Strategy:

- Develop and implement a long-term Wetland Management Plan, with goals, objectives, and strategies from Wetland section of this Plan.

“What is man without the beasts? If all the beasts were gone, men would die from a great loneliness of spirit, for whatever happens to the beasts also happens to man.”

- Sealth, American Indian

Objective: Provide quality feeding areas (abundant aquatic seed and invertebrate production), on 5 to 7 lakes where water control is possible, for spring and fall migrating waterfowl.

Strategies:

- Develop and implement a long-term Wetland Management Plan, with goals, objectives, and strategies from Wetland section, to provide quality feeding habitat.
- Provide spring feeding areas from late March through mid-May.
- Provide fall feeding areas from late August through early November.

Ground-nesting Grassland Passerines, Owls, Harriers, and Shorebirds

Of the 15 common ground-nesting passerines, owls, harriers, and shorebirds on the Refuge, nine are USFWS Region 6 Species of Management Concern. Loss or alteration of large expanses of grassland has made these species vulnerable.

Objective: Maintain and enhance breeding populations of ground-nesting grassland passerines, by achieving apparent nest success of at least 40 percent and/or the following average singing males/station: Choppy Sands and Sands/Choppy Sands mix sites - lark sparrow (2-2.5), grasshopper sparrow (0.5-1), Sands sites - grasshopper sparrow (7-9), long-billed curlew (0.1-0.5), upland sandpiper (0.1-0.5), Subirrigated Meadow sites - eastern meadowlark (1-1.5), bobolink (0.1-0.5), upland sandpiper (0.1-0.5), dickcissel (0.25-0.5).

Less work has been done with these species than the water-dependent species, but it is known that some, such as the long-billed curlew, prefer the shorter grass on the more heavily grazed areas which are common outside the Refuge (Bicak 1977; staff observations). Therefore, management designed specifically to increase such species on the Refuge may not be necessary.

However, some species are more dependent on the habitats on the Refuge. For example, a study of upland sandpiper preferences in the area of the Refuge indicated that undisturbed cover was preferred for breeding territories (Bandy 1980). Similarly, a study of habitat selection by grasshopper sparrows in Garden County Nebraska (Hopton 1996) indicated that ungrazed habitat had significantly higher populations. Therefore, more information is needed to determine how habitat management helps or hinders each species of concern and whether the Refuge has significant potential to produce or support more.

Strategies:

- Implement goals, objectives, and strategies from Upland Habitat section to provide quality breeding, nesting, and fledgling habitat.
- Devise and implement monitoring techniques to determine status, trends and effects of management on land-based Species of Management Concern.
- Increase emphasis on and knowledge of non-waterfowl species; devise and implement additional surveys and monitoring to determine population status/trends and effects of management on all Species of Management Concern.
- Develop a species richness/diversity index to establish baseline levels and measure population trends; this would apply to wildlife in general.

Objective: Provide quality feeding areas (abundant aquatic seed and invertebrate production), of exposed mud flats on 1 to 3 lakes a year where water control is possible, for spring and fall migrating shorebirds.

Strategy:

- Develop and implement a long-term Wetland Management Plan, with goals, objectives, and strategies from Wetland section of this Plan to provide quality feeding habitat.
- Provide spring feeding areas from late April through early June.
- Provide fall feeding areas from late August through early October.

Objective: Maintain breeding populations of 8 to 10 pairs of northern harriers and provide habitat for 2 to 3 pairs of short-eared owls.

Strategy:

- Implement goals, objectives, and strategies from Upland Habitat section to provide quality breeding, nesting, and fledgling habitat.

Marsh Birds and Terns

Objective: Maintain present breeding populations and production of indigenous, water-dependent Region 6 Species of Management Concern including: American bittern, white-faced ibis, black rail, and black terns.

Objective: Maintain the habitat for nesting black and Forester's terns at Martin, Smith, Shafer, and Deer Lakes.

Objective: Maintain the habitat for nesting colonies of black-crowned night-heron and white-faced ibis on Smith and Goose lakes.

Objective: Maintain breeding populations of American bittern (.5-1), Virginia rail (.75-1.5), red-winged blackbird (3.5-5), yellow-headed blackbird (1-3), and marsh wren (2-4) based on average singing males found on the Refuge 30 station Call/Playback Survey.

Strategy:

- The above objectives will be addressed by developing and implementing a long-term Wetland Management Plan and incorporating the habitat goals, objectives, and strategies from wetland section of the CCP.

Objective: Maintain a great blue heron rookery with a target of 50 to 60 nests on Island and Crane lakes.

Strategy:

- Maintain tree groves at Island and Crane lakes by protecting existing trees from fire and grazing and preserving natural regeneration.

Tree Nesting Species of Management Concern

Objective: Maintain habitat for a nesting population of 3 to 5 pairs of Swainson's hawk and the loggerhead shrike. Both the Swainson's hawk and loggerhead shrike are USFWS Region 6 Species of Management Concern. Their preferred habitat is large expanses of grass for feeding with occasional trees for nesting.

Strategy:

- Maintain isolated trees throughout the Refuge by planting individual trees near current trees as replacements.

Prairie Grouse

Objective: Establish and sustain two leks of prairie chickens (8 to 12 dancing males) on the Refuge.

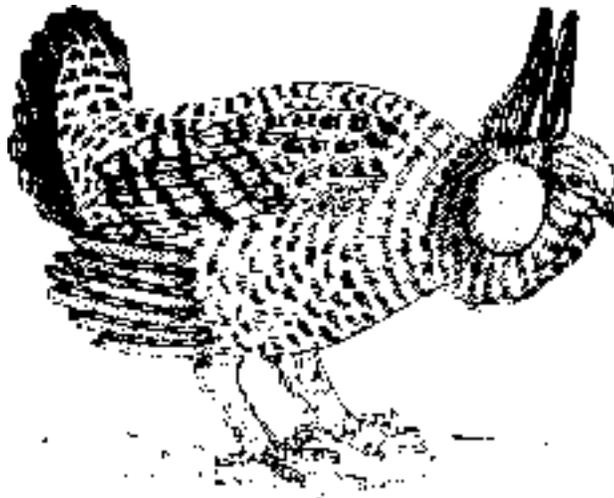
The prairie chicken is now a rare nester on Crescent Lake Refuge and a Refuge Species of Special Interest. The Refuge is on the edge of historical prairie chicken range, and Refuge records indicate that numbers never exceeded 100. A “trap-and-release” program conducted from 1984 to 1986 moved 275 birds onto the Refuge; all had disappeared by 1989. During the 2000 prairie grouse lek survey, a lek of 5 to 10 males was confirmed within 1/4 mile of the east boundary near Big Soddy.

In the past, prairie chickens on the Refuge used primarily subirrigated meadows for nest and brood habitat. The literature indicates that residual cover is particularly important (Kirsch 1973; Schwartz 1945; Jones 1963; Yeatter 1963; Christisen 1969; Lehman 1963; and Vichmeyer 1941). It also appears that the best prairie chicken habitat is vegetation in an early successional, sub-climax stage; this is supported by an apparent close relationship between prairie chicken success and the frequency of fire.

Although nesting requirements for prairie chickens are similar to those of some ducks (see Upland Habitat Objectives), more consideration must be given to seasonal feeding requirements, roosting habitat, and the use of management tools. Kirsch and Kruse (1973) found an increase in fruit and seed production and plant variety on burned areas. It is possible that annual requirements for prairie chickens cannot be met on the Refuge without substantial changes in upland habitat management which may or may not be compatible with management for other species. It is also possible that special management areas would have to be set up to sustain nesting populations.

Strategies:

- By June 2003, determine the feasibility of reestablishing prairie chickens.
- If determined feasible, transplant prairie chickens at potential sites in Red Kate and Lower East Jones meadows.
- Develop and/or amend the Habitat Management Plan to reflect the goals, objectives, and strategies in the Habitat section of this Plan.



Prairie Chicken © Cindie Brunner

Objective: Maintain or enhance sharp-tailed grouse densities at a 10-year average of 220 to 250 males on dancing grounds.

In 1998, the Refuge population was 235 dancing males, significantly lower than the average of 380 in the late 1980s. An analysis of State survey data indicates that a similar decline occurred throughout western Nebraska, so the decline is not Refuge-specific. Although, specific causes of the general decline are unknown, prolonged bad weather during the nesting season and a high period in the cycle for predator populations are possibilities.

Strategies:

- Conduct an annual lek survey to determine population trends.
- Develop and augment the Habitat Management Plan to reflect goals, objectives, and strategies in the Habitat section of this Plan.
- Participate with the State in area-wide management strategies.

Objective: Strive to achieve a harvest ratio equal to or greater than 2.0 juveniles per adult based on the Refuge average harvest during stable and growing population periods.

Strategies:

- Obtain funding for a study on nest and brood rearing success.
- Develop and augment the Habitat Management Plan to reflect goals, objectives, and strategies in the Habitat section of this Plan.

Objective: Provide habitat for representative numbers of other migratory birds.

As stated earlier, species or groups of species are given some relative priorities. Migratory species that have not been identified as having some management concern are lower priority in the act of balancing the habitat for the greatest diversity. The Refuge lacks information to determine if management for higher priority species is to the detriment of others.

Strategy:

- Develop specific methods for monitoring population trends and determining the effects of habitat management on individual species or groups of species.

Mammals, Reptiles, Amphibians, Invertebrates, and Fish

Deer

Objective: Maintain healthy deer population (300 to 400) through habitat management, population monitoring, and, if needed, harvest regulation at the Refuge level.

Deer are an important attraction because most private lands in the Sandhills are closed to public entry. Therefore, the Refuge should provide viewing opportunities. Providing such management is compatible with the needs of Federal trust species.

Both mule deer and white-tailed deer are very mobile and move on and off the Refuge. Thus, Refuge populations vary from year-to-year and season-to-season. Mule deer with identifiable characteristics often seen on the Refuge have also been seen 15 miles southwest of the Refuge. Harvest surveys have been conducted for years, however, by themselves, yield questionable results. Available information suggests that the population is not being over exploited because a substantial number of older deer are being harvested.

Strategies:

- Evaluate the reliability and usefulness of present surveys.
- Develop and augment the Habitat Management Plan to reflect goals, objectives, and strategies in the Habitat section of this Plan.
- Cooperate with the State in area-wide management strategies and annual evaluations of Refuge hunting regulations.

Mammals, Reptiles, Amphibians, and Invertebrates

Objective: Ensure the diversity and abundance of indigenous mammals, reptiles, amphibians, and invertebrate populations remain intact through habitat manipulation.

Little is known about the status and trends of these other species; thus, problems and needs may simply be unknown. Scientifically based, defensible surveys and research are very time consuming and often expensive, and past and present funding has limited such activity. Caution must be exercised because poorly designed, erratic surveys can yield misleading information. Crescent Lake Refuge is in a remote location and it is difficult to attract long-term research or volunteers on a sustainable basis.

Strategies:

- Continue to seek more information on habitat requirements and effects of management on reptiles, amphibians, fish, invertebrates, and mammals.
- Develop and augment the Habitat Management Plan to reflect goals, objectives, and strategies in the Upland and Wetland Habitat sections of this Plan.
- Establish average densities of key indicator species to document baseline levels and determine population trends.
- Continue to seek alternative ways to obtain missing information using valid, scientific methods (e.g., university studies, graduate level research, volunteer assistance for surveys and census).
- Seek funding for a permanent, full-time biologist and seasonal support staff.

Fish

Objective: Maintain fish populations to provide a food source for fish eating bird species and sport fisheries, when deemed compatible.

The Nebraska Game and Parks Commission manages sport fisheries on the Refuge with the concurrence of the refuge manager, an arrangement that has been valuable to both agencies. At present, Island, Smith, Crane, and Blue Lakes have sport fisheries. Island, Crane, and Smith Lakes have a variety of warm water species and are open to fishing. Only the corner of Blue Lake is within the Refuge; the remainder is on private land and not accessible to the public.

Carp are present in several lakes connected by a ditch in the Moore Valley, West Jones Lake and in Island Lake. Populations can be controlled by periodic drawdowns in those lakes where such control exists, including the three lakes with sport fisheries.

Strategies:

- Maintain management agreements with NGPC for Refuge sport fisheries, for NGPC monitoring Refuge fish populations, and stocking recommendations with the Refuge staff making the final management decisions.
- Write and implement long-term Wetland Management Plan with goals, objectives, and strategies coming from the Wetland section of this Plan.
- Monitor carp populations and reduce and/or eliminate them through drawdowns or pumping and pesticide treatments when water quality does not support good invertebrate populations and/or submergent vegetation.
- Maintain year-round sport fishery at Island Lake. Maintain winter fishing only on Smith and Crane lakes to minimize disturbance to wildlife.
- Evaluate any restocking of Smith Lake when carp control is needed.
- Evaluate any restocking of Crane Lake when the lake winter-kills. Crane Lake historically has experienced winter-kills about every 4 to 5 years.
- Have NGPC continue to sample and monitor Island Lake for increases in the carp population; initiate control if necessary to protect the sport fishery.
- Conduct literature search and or studies to evaluate management and habitat needs of fish eating birds to provide for their needs.

Bison

Objective: Reintroduce bison into the 24,502-acre proposed Wilderness Area as part of an ecosystem that mimics the prairie ecosystem as it functioned before changes brought on by development.

Grazing and fire were the major factors, together with soil and climate, that interacted to make the Sandhill prairies what they were before commercial grazing and other development arrived on the scene. The grazing part of that equation was fulfilled largely by bison. Today, cattle have replaced bison and fire is infrequent and rigorously controlled.

Wilderness, on the other hand, is an idea - a concept. One envisions a "natural" area, affected only by natural forces and free from modern human influences. In the case of the proposed Crescent Lake Wilderness Area, the natural part of that vision, the wilderness characteristics themselves, cannot be maintained over time without the forces that created them in the first place. Two of those forces, fire and grazing, are now tightly controlled. A need exists for a grazing animal in the proposed Wilderness Area and cattle, a "man-made" influence, have served that purpose in recent years - but so could bison.

The bison is the native ungulate missing from the equation. Free-ranging bison could serve as both an agent for change and an addition to biotic and aesthetic diversity. The presence of bison would contribute significantly to the legal purpose, the vision and the goals of Crescent Lake National Wildlife Refuge.

The Concept: Cattle have been used as a tool to help create and/or maintain specific grassland scenarios (see Habitat Objectives). They are allowed to graze for short periods of time under controlled conditions and only when necessary - they are not a feature of the landscape. Bison, on the other hand, would be resident wildlife, allowed to graze freely seasonally or year-round, and help simulate the natural forces with as little interference as possible. However, as fenced animals, bison would still be considered tools, and changes in numbers and grazing patterns may be needed to maintain healthy grasslands and wilderness characteristics. The emphasis would be on the wilderness ecosystem, not the bison. The presence and management of bison must also be compatible with other Wilderness and Refuge purposes.

"Of what use are wild areas destitute of their distinctive faunas?"

- Aldo Leopold
(Sand County Almanac)



Dale Henry

It is not the purpose of this draft CCP to present a specific proposal or to answer the many questions. It is, rather, to obtain public reaction to the concept of reintroducing bison as a natural component of a grassland ecosystem, raise the important issues and questions, and seek ideas for input into the bison management planning process.

Strategy:

- Plan, start small, watch, learn as you go, change.
- Step 1. Establish an advisory council of experienced bison and wilderness managers.
- Step 2. Conduct a feasibility study and prepare a bison management plan which includes methods to: evaluate the effects of bison on the natural ecosystem, habitat and other wildlife; and compare habitat and wildlife use in the wilderness with areas outside the wilderness.
- Step 3. Amend the wilderness management plan to reflect the presence and influence of bison.
- Step 4. Introduce the minimum number of animals.
- Step 5. Evaluate, learn, adapt, and change.

Discussion: The bison management planning process itself could take several years. If approved, it may be more years before funds and staff are available to implement the plan. In the interim, the habitat management objectives of this Plan will apply to the proposed Wilderness Area. An interim wilderness management plan reflecting the use of minimum tools to maintain wilderness characteristics will be prepared by December 31, 2002.

The proposed Wilderness Area is relatively small and bison cannot be present without some management. The boundary would, of course, be fenced and some interior fencing may be required. Artificial water supplies may be necessary. Overall, it is felt that bison would require less infrastructure than cattle, due to their willingness to move farther from water sources to graze. These and other issues would be addressed in the course of writing the bison management plan. There are many questions and some will be answered only through trial-and-error.

Perhaps the most important questions revolve around herd types and herd composition. There are, basically, two alternatives for the initial herd type and revolve around private herds. They are:

1. Breeding herd
2. Sterile herd

Other obvious questions are:

- How "wild" should or can this herd be?
- How will the presence of bison affect other wildlife? Habitat? Wilderness character?
- How will the presence of bison affect public use and environmental education?
- Can funding or other support be obtained through partnerships with non-government entities?

Public Use

Interpretation and Recreation

Since Leopold made this statement, farsighted people created laws that give national wildlife refuges a protective shield called “compatibility” (see Appendix A). Public use cannot, by law, interfere with or detract from the legal purposes or the fish and wildlife objectives of a Refuge.

Crescent Lake is a rather isolated Refuge. The nearest town and the nearest Federal highway are 28 miles away. Primary access is by narrow, rough County road. This isolation gives the Refuge a unique quality of solitude considered very desirable by most of the 7,000 to 9,000 people who visit annually. The proposed Wilderness Area adds to and protects that quality.

Goal 11: *Provide visitors an opportunity to enjoy, learn about and utilize fish and wildlife in a setting that emphasizes an undisturbed natural environment and minimum human interaction.*

Objective: Designate an environmental education site for use by teachers and students which represents a cross-section of Refuge habitats.

Strategy:

- Provide facilities needed for the education process, minimize the area affected, and protect Refuge resources.

Objective: Establish one, perhaps two, interpretive walking trails with a total length of about two miles; add pullouts to the existing auto tour route; and upgrade the exhibits at the Refuge headquarters.

There are no interpretive walking trails on the Refuge. The existing auto tour route is on the County road, the only road passable to two-wheel drive vehicles year-round; it is not ideal for a quality interpretive experience. Adding pullouts to the existing roads could provide safer, more interesting experience, and could also provide access to the walking trails. Any new route would require expensive upgrades to be passable to all vehicles. The exhibits in and around Refuge headquarters are old and should be upgraded.

Strategy:

- Prepare a public use plan to: identify sites; determine feasibility, capacity and compatibility; and estimate costs (this strategy applies all public uses).

“But the conservation of wildness is self-defeating, for to cherish we must see and fondle, and when enough have seen and fondled, there is no wildness left to cherish.”

- Aldo Leopold

Fishing

Objectives: Continue to provide the year-round, warm water fishing in a largely natural setting presently offered on Island Lake and winter fishing at Smith and Crane Lakes (see Fish and Wildlife Objectives).

Impose use limits if more than 100 anglers per day commonly use any one lake.

Strategies:

- Continue the informal agreement with the Nebraska Game and Parks Commission for their involvement as the primary fishery manager.
- Conduct public use surveys to assure the number of anglers does not detract from the natural setting and feeling of relative isolation; use tools to control angler numbers, such as reduction of bag limits, or catch-and-release fishing, if necessary; a permit system would only be used as a last resort.

Hunting

Objective: Expand hunting to include limited waterfowl hunting.

The Refuge is now open to hunting for sharp-tailed grouse, pheasants, and deer. Expanding hunting to include waterfowl would provide additional public enjoyment without interfering with the sense of isolation so important to many users. It would also make hunting on Crescent Lake Refuge more consistent with the two other national wildlife refuges in the State. The expansion would require a Compatibility Determination and a revision of the present Hunting Plan; additional public involvement would be part of that process.

The relatively small amount of public use (about 8,000 visitors per year) is concentrated in time and space. For instance, seasonal hunting and fishing account for about 70 percent of this use. Most hunting occurs on a few opening weekends in the fall and the largest concentration occurs on opening weekend of deer season (about 60 hunters in recent years). Fishing is limited to three lakes. Aside from these concentrations, the Refuge is underutilized.

Strategies:

- Open waterfowl hunting on a limited area and prevent conflict with fall and winter fishing.

Objective: Limit overall hunting to fewer than 150 hunters on any one day; maintain the present aesthetic qualities of the hunting experience.

While current peak use is about half of this estimated maximum figure, growth should not be allowed to continue until a problem exists. Aesthetics is important to most hunters now using the Refuge and an integral part of Refuge objectives.

Strategy:

- Monitor all public use, obtain continuous feedback from hunters, and amend the Hunting Plan to include specific procedures.

Cultural Resources

Historic, archaeological, and paleontological resources on Crescent Lake Refuge are the responsibility of the Service. A review of existing information about archaeological and other cultural resources was conducted in 1999 (Burgett and Nickel 1999). Little systematic work has been conducted within the Nebraska Sandhills, and none is known on the Refuge. Individual sites affected by management activities are surveyed prior to disturbance.

Goal 12: *Preserve the cultural resources of Crescent Lake Refuge.*

Objective: Identify and protect cultural resources for scientific, educational, and interpretive purposes.

Strategies:

- Conduct a Refuge-wide survey to determine the presence of cultural resources on the Refuge when funded under RONS program.
- After completion of the survey, prepare a cultural resources management plan which includes protection, interpretation, and educational use.
- Continue to conduct site-specific surveys for lands and facilities that will be disturbed by refuge management activities; take advantage of prescribed burns and wildfires to detect the presence of cultural resources.

Lands and Facilities

The projects listed in the Service-wide Maintenance Management System (MMS) and the Refuge Operations Needs System (RONS) include those needed for protection of lands and facilities (see Appendix D). A few are highlighted here because they bear directly on the other objectives in this Plan and/or involve safety of employees.

Goal 13: *Protect all government lands and facilities; eliminate unnecessary facilities.*

Objective: Protect headquarters buildings, equipment, and residences from wildfires.

The headquarters area is vulnerable to wildfire, especially from the west. The area is remote and local fire departments could not be on the site in less than 30 minutes. Rough terrain and cedar windbreaks west of headquarters would make control very difficult even with wildland fire pumper units.

Strategies:

- Cover all buildings with fire resistant exteriors.
- Store all firewood and flammable materials well away from buildings.
- Keep vegetation within 50 feet of buildings mowed short.

(Note: Firebreaks are not an option in naturally vegetated areas of the Sandhills because repeated mowing or plowing results in blowing and large-scale wind erosion).

Objective: Remove unnecessary grazing management facilities.

Grazing practices have changed over the years and some windmills and fences can be removed. Such facilities require maintenance and detract from the aesthetic qualities of the Refuge, particularly in the proposed Wilderness Area. Windmills are needed to provide water for firefighting and should be better distributed for that purpose. Service roads should be minimized.

Community Involvement / Support Systems

Goal 14: Interact with communities and organizations to create mutually beneficial partnerships.

Objective: Maintain existing partnerships and agreements, and add others that will strengthen management of the Refuge and contribute to surrounding communities.

Strategies:

- Encourage and support scientific research, with emphasis on information needs of the Refuge.
- Participate with other Fish and Wildlife Service divisions and the State in the “ecosystem approach to resource management” and define the Refuge role in that effort.
- Participate in planning efforts at the State and local levels.
- Continue interagency cooperation in such activities as wildfire and noxious weed control.

Lands of Interest

Goal 15: Protect important wildlife and endangered plant habitat surrounding the Refuge.

The Refuge, within the Nebraska sandhills, is not an island capable of supporting all wildlife during all seasons of the year. Much of the wildlife that use the Refuge also use, and to varying degrees are dependent on, wetlands and upland habitats on surrounding private lands. For instance, ducks that use Refuge wetlands as breeding pair habitat may nest across the fence on private lands, or vice versa. And sharp-tailed grouse that breed and nest on the Refuge may winter on private lands, sometimes several miles away. Thus, additional protection for habitats surrounding the Refuge would help assure that present numbers and distribution of wildlife can be sustained into the future.

To achieve the stated goals of endangered species, fish and wildlife, upland habitat, wetland habitat, and public use, land acquisition is not needed at this time. However, some areas surrounding the Refuge have the potential to secure habitat for the protection of trust species, such as the endangered blowout penstemon, which may contain small populations and would be considered for additional transplanting efforts.

Additional protection can be achieved in several ways: perpetual conservation easements; short-term agreements for specific actions or projects; and fee-title acquisition. In all cases, the additional protection would be acquired only from willing sellers. Further, no formal steps can be taken until the FWS completes a Preliminary Project Proposal, for the USFWS Director’s approval, which specifically delineates the resources for which additional protection should be considered. National Environmental Policy Act requirements must also be met, which include additional public involvement.

Conservation easements offer permanent protection but leave the land in private ownership and, depending on the conditions of the easement, do not inhibit present economic uses of that land. Some of the basic types of easements are:

- (1) wetlands easements which assure wetlands will not be drained or filled;
- (2) grassland easements which assure grasslands will not be converted to farmland or other uses, but allow grazing and haying to continue; and
- (3) a general easement which protects all lands within a given area from conversion to other uses.

Short-term agreements are offered under a FWS program, Partners For Fish and Wildlife. These agreements are usually for some specific management action such as changing the method or season of grazing to protect nesting birds or protecting or restoring stream banks from erosion caused by cattle grazing.

It is a vision of Refuge staff to evaluate habitat protection measures at a future date that may add to the protection of trust resources and add to the biological diversity of the sandhills surrounding the Crescent Lake Refuge. The following areas would be considered to study in more detail as a protection strategy for wildlife and endangered plant habitat surrounding the Refuge:

- ✓ The area west of Black Steer Lake is an area where blowout penstemon either exists or could exist.
- ✓ The area that surrounds Black Steer Lake which is an important area for trumpeter swans and other waterfowl.
- ✓ The area that includes Crescent Lake, Blue Lake, and a section of Nebraska School Land. These lakes are valuable wetlands for migratory birds.
- ✓ The area west of Upper Harrison Lake either has or could have blowout penstemon and should be protected.
- ✓ The area that includes Swan Lake, Lower Harrison Lake, and subirrigated meadows. It is important habitat for wetland birds.
- ✓ The area that includes Border Lake and Bean Lake is important for migratory birds, especially shorebirds. Also, the area either has or could have blowout penstemon.
- ✓ The area that includes Rush Lake is valuable migratory bird habitat.

V. Implementation and Monitoring

Funding and Personnel

Staffing Needed for Implementation

The following staffing chart shows current staff and additional staffing needed to implement this Plan. All personnel would be part of the Crescent Lake National Wildlife Refuge Complex and some positions would be shared with the North Platte Refuge. If positions are not filled, some aspects of this Plan would not be completed or may take longer to complete.

<u>Position</u>	<u>Current</u>	<u>Proposed</u>
Project Leader *	X	X
Refuge Manager	X	X
Wildlife Biologist #		X
Refuge Operations Specialist		X
Outdoor Recreation Planner *		X
Administrative Support Assistant *	X	X
Engineering Equipment Operator #	X	X
Maintenance Worker	X	X
Fire Program Technician	X	X
Fire Management Officer/ LE #		X
Maintenance Worker		X
Biological Aid		X
Range Technicians (fire/seasonal)	X(4)	X(5)

* Shared in the Complex and stationed at Scottsbluff

Shared in the Complex and stationed at Crescent Lake Refuge

Funding Needed for Implementation

The Service maintains two national databases for tracking funding needs: (1) The Maintenance Management System (MMS) which records needs for maintaining or replacing existing facilities and equipment; and (2) the Refuge Operating Needs System (RONS) which documents new or additional projects, facilities, equipment, and personnel needed to implement CCPs.

The Crescent Lake maintenance backlog was \$4,437,000 in 2000 (see Appendix D for a project summary). New projects, or additions to existing projects, needed to fully implement this Plan total \$2,244,000. Projects on both lists are in priority order as viewed by the Project Leader. Those priorities are sometimes changed as funding requests move up through the Service to the Department of the Interior and Congress. More specific information about each project can be found in the database on file at the Refuge headquarters.

Refuge Management Policies and Guidelines

In addition to the laws, policies, and regulations under which all national wildlife refuges operate, Crescent Lake Refuge is guided by a number of agreements with State and local agencies (see Section I and Appendix C). The public involvement/scoping process did not reveal a need to change these agreements.

Partnership Opportunities

The Service and Crescent Lake Refuge will continue to seek opportunities to work with Federal, State and local agencies, conservation groups, and private corporations and organizations to advance the purpose of the Refuge and the community. For instance, if bison are reintroduced, there may be opportunities for cooperative herd management. Also, there are many gaps in the biological database, and the Refuge will seek university-level research and management studies to help fill those gaps. Volunteer partnerships to assist with surveys, environmental education, and other activities are always needed although the remoteness of the Refuge limits such opportunities. Partnerships are, and will continue to be, an important part of future Refuge operations.

The Service is currently working with Garden County to improve the County road accessing the Refuge from the north and south. Improving this road will not only provide better access to the Refuge for the visiting public but will also benefit local residents who use the road for commercial agricultural business and fire protection.

Monitoring and Evaluation

This Plan emphasizes the importance of monitoring and evaluating the effects of applied management and public use on plants and animals. Additional scientific, long-term monitoring is needed in order to measure progress toward stated objectives, detect successes and failures, make adjustments in management techniques, and modify plans and budget requests. Some monitoring needs and techniques are documented in the step-down plans; others have been identified but not designed.

At this writing, a lot goes undone. The above staffing plan will contribute significantly to monitoring and evaluation and to conducting refuge management studies, but the Refuge staff will also be dependent on university level research and volunteers to get the whole job done right.

Plan Amendment and Revision

This is a dynamic Plan and will be adjusted to include new and better information. It will be monitored continuously, reviewed during inspections and programmatic evaluations, dove-tailed with budget requests and annual work plans, and formally reviewed every five years. Public involvement will be part of any substantive change. The Plan will be formally revised at least every 15 years.

