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.

"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

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.

Blowout penstemon, University of Nebraska

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 five small areas in the Nebraska Sandhills. The remainder of the turtle's range extends from southern Nebraska through Texas and into Mexico. On the Refuge, it is found almost exclusively at Gimlet Lake. A second large population occurs at Rush Lake, just off the Refuge. Refuge population estimates range from 3,000 to 4,000. These turtles migrate across the County road twice a year and are especially vulnerable to road kill and predation at those times. Improvements in the County road along Gimlet Lake could result in increased mortality from vehicles due to more traffic and higher speeds. 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.

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.

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 untrammeled 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 size 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 restore the wilderness qualities of the Proposed Wilderness Area.*

One of the objectives for the Refuge is to reintroduce bison into the Poposed Wilderness (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 Proposed Wilderness 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. In fact, bison tend to create blowouts that would be beneficial to the endangered blowout penstemon.

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 Proposed Wilderness, 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 until the decision whether or not to reintroduce bison is made.

Interim Strategies (without the presence of bison):

- Prepare, by May 1, 2003, 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 when in compliance with the Natural Area Management Plan (8 RM 10.8 H).
- 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.*

> *"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)

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.

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:

n 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 25 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 were 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.

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. The Refuge currently has 180 blowouts that historically have had penstemon. They average about 10 yards in diameter; some larger, some smaller. Within the five habitat units, we found 80 penstemon plants in 2002.

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.
- Monitor the success of each action taken to verify and quantify results.

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, Cypersus) 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

> *"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

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 exclosure as opposed to 17.9 percent during the same period outside the exclosure. 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.

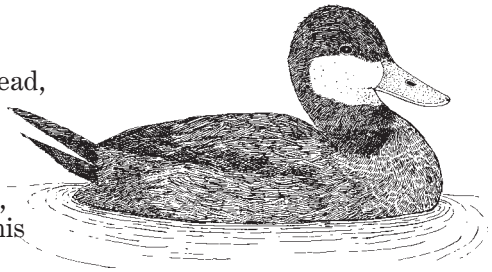
Strategies:

- Achieve and maintain an interspersion 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.



Ruddy duck © Cindie Brunner

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.

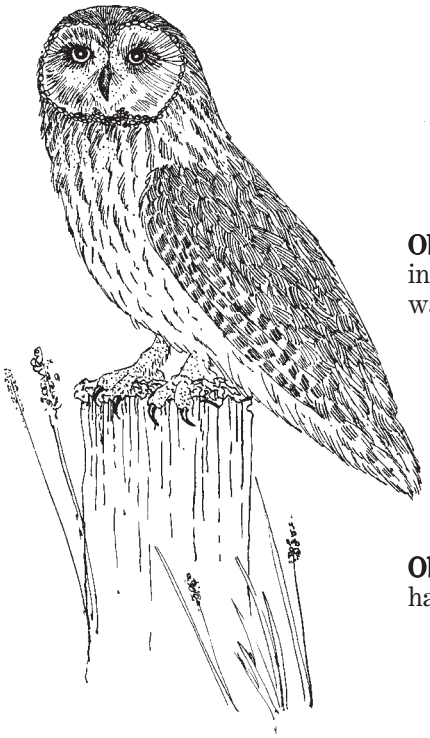
Objective: Maintain and enhance breeding populations of ground-nesting grassland passerines, by achieving apparent nest success of at least 40 percent and/or the following average singing males/station: Choppy Sands and Sands/Choppy Sands mix sites - lark sparrow (2-2.5), grasshopper sparrow (0.5-1), 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.



Short-eared owl © Cindie Brunner

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.

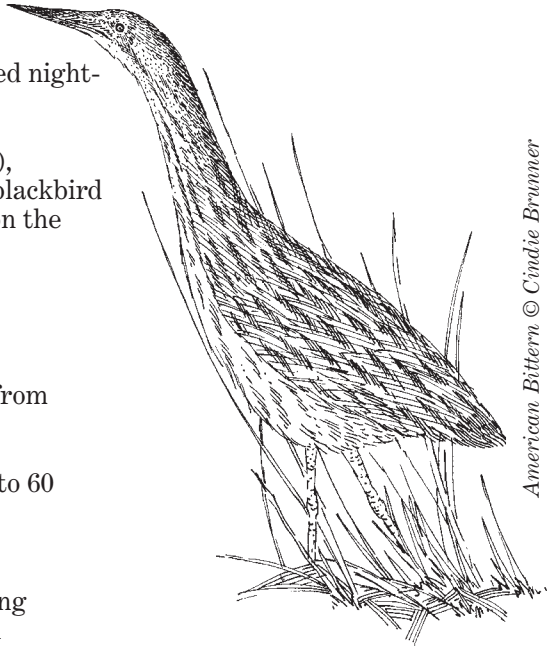
Strategy:

- 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.



American Bittern © Cindie Brunner

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.

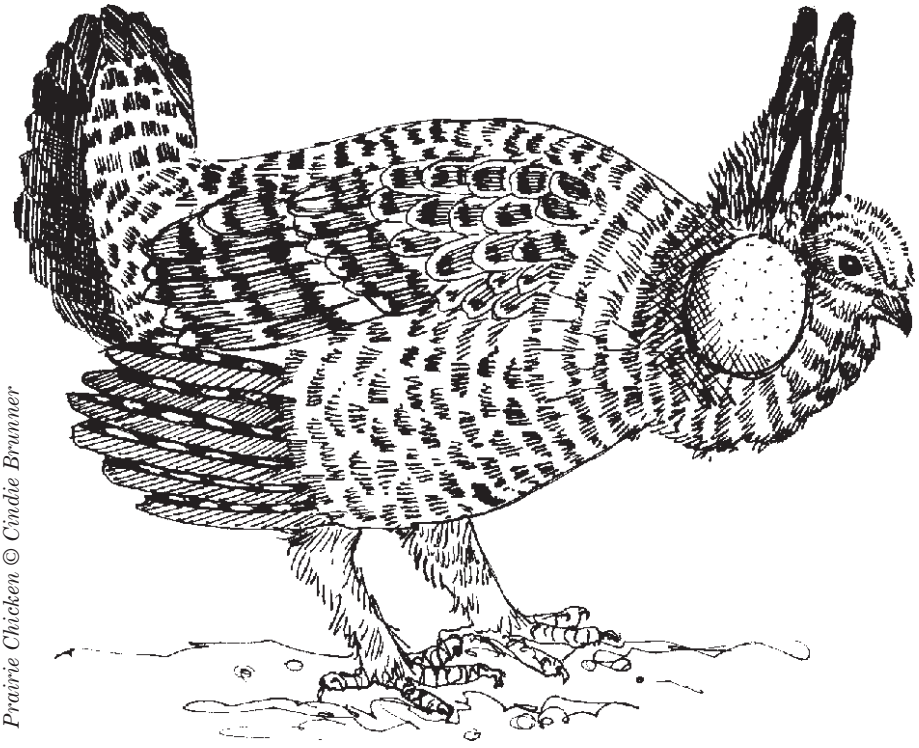
The prairie chicken is now a rare nester on Crescent Lake Refuge and a Refuge Species of Special Interest. The Refuge is on the edge of historical prairie chicken range, and Refuge records indicate that numbers never exceeded 100. A "trap-and-release" program conducted from 1984 to 1986 moved 275 birds 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

White-tailed deer © Cindie Brunner

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, defendable 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 though 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.

"Of what use are wild areas destitute of their distinctive faunas?"
- Aldo Leopold
(Sand County Almanac)

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.

Dale Henry

It is not the purpose of the 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 and wildlife biologists.

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 May 1, 2003.

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?

"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

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).

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 and supports a second population of yellow mud turtle. This is the only other large population of yellow mud turtle in the area.