4 Management Direction

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An American avocet searches for food along a wetland shore.

The Service decided to carry out the management direction in this chapter, based on a determination that it does the following:

- Best achieves the refuges' purposes, vision, and goals and helps fulfill the mission of the Refuge System.
- Maintains, and where appropriate, restores the ecological integrity of each refuge and the Refuge System and addresses the significant issues and mandates.
- Is consistent with principles of sound fish and wildlife management.

This chapter describes the overall management focus for the refuges, as well as the objectives and strategies that will be carried out to help refuge staffs achieve the goals. In addition, this chapter includes descriptions of the funding, staff, and step-down plans needed to meet the goals and objectives. Finally, this chapter briefly describes the monitoring and evaluation of both the refuge resources and this CCP, along with the process to amend or revise the plan.

4.1 Management Focus

The refuge staffs will manage wetland and upland habitats to meet the refuges' vision and goals by carrying out the objectives described in this chapter. Management objectives for habitat types are based on the habitat preferences of groups of target (indicator) species, which consist of members of taxonomic groups such as waterfowl, shorebird, grassland species, and upland species. Refuge staffs will emphasize adaptive management, including monitoring the effects of habitat management practices and using research results to direct ongoing management. Upland and wetland management will benefit migratory birds, particularly waterfowl species; management efforts will be expanded to benefit species of the Central Flyway.

The national wildlife refuges and wetland management districts in North Dakota received more than 385,000 visitors during fiscal year 2007. It is a high priority for the refuge staffs to foster an appreciation, support, and understanding of the refuges' vision and provide opportunities for wildlife-dependent recreational uses. Audubon National Wildlife Refuge will construct an administrative and learning center to facilitate refuge visitors and provide for a safe, quality visit. Kellys Slough and Lake Alice national wildlife refuges will enhance trails, kiosks, and interpretive displays to provide the public with an awareness of the refuges' resources. Fishing and hunting will be maintained at refuges that are currently open to these uses to provide good-quality experiences for the public.

4.2 Goals, Objectives, Strategies, and Rationale

This section has objectives, strategies, and rationale following each goal to describe how the Service will manage the refuges to meet the goal.

> A *goal* is a descriptive, broad statement of desired future conditions that conveys a purpose, but does not define measurable units.
>
> An *objective* is a concise statement that indicates what is to be achieved, the extent of the achievement, who is responsible, and when and where the objective should be achieved.
>
> *Strategies* provide ways to achieve objectives.
>
> The *rationale* for each objective provides context such as background information, assumptions, and technical details.

Note: Although the Service identified needs during the planning process, there are no assurances that any projects or staff positions will be fully or partially funded. Implementation of some objectives in this chapter will be subject to future increases in staff or funding, or both. However, there are opportunities to examine current allocations of funds and resources and determine the best uses based on a comprehensive evaluation of critical needs.

Habitat and Wildlife Goal

Conserve, restore, and enhance the ecological diversity of grasslands and wetlands of the North Dakota prairie to support healthy populations of ducks and geese, other migratory birds, native species, and other wildlife.

Wetlands

A developed wetland has a water control structure or some other capability for managers to manipulate the water level. Developed wetlands generally are managed impoundments. Their relatively shallow depths and periodic flooding and drying nature make for highly productive systems with respect to invertebrates and wetland vegetation. Corresponding bird use is diverse.

Meeting objectives for developed wetlands will require that water level management is carried out in a timely and appropriate manner. Ideally, impoundments will provide a mosaic of wetland habitat types to a wide variety of wetland-dependent birds such as waterfowl, shorebirds, and wading birds. This mosaic of habitat types will satisfy the needs of nesting, molting, and migrant waterbirds, as well as waterfowl broods and other fledgling waterbirds.

Flooding that began in the mid-1990s within the Devils Lake area has affected about 6,000 acres of developed wetlands at the 12,000-acre Lake Alice National Wildlife Refuge, including refuge structures and facilities. Sixteen water control structures and associated dikes are currently underwater and will likely need major repairs when the water recedes, at which time the refuge staff will evaluate vegetation conditions for reclamation.

Two developed wetlands, Lake Audubon and Lake Ilo, will not be addressed within this CCP. Although they occur within refuges covered by this CCP, these two wetlands have unique management plans, objectives, and purposes. Management of Lake Audubon and Lake Ilo is discussed in a step-down plans located at the headquarters of Audubon National Wildlife Refuge.

Wetlands Objective 1

Provide between 30% and 70% coverage of emergent vegetation (over water) on average, over 11 of 15 years.

Strategies

- Estimate the percent coverage of emergent vegetation through either visual estimation or GIS area determination using aerial photos taken annually in early July.
- Adjust water control structures and management plans to achieve hemi-marsh (see a description under rationale below).
- Review all water management structures for improvements or repairs that will enhance management capability and seek money necessary to carry out the improvements or repairs.

Rationale

Previous research has indicated that wetlands with an approximate 50:50 ratio of open water and emergent vegetation such as cattails and bulrushes, often termed hemi-marshes, attract the highest densities and diversities of wetland birds (Weller and Spatcher 1965).

Open water to emergent vegetation ratios will likely be close to the 50:50 ratio (that is, 30:70 ratio, 70:30 ratio) in most developed wetlands, as recommended by Weller and Spatcher (1965), in most years (about 11 of 15), through targeted water level management.

Because of the dynamics involved with prairie–wetland conditions over time, in certain years the coverage of emergent vegetation may fall well outside of the target range (30%–70% coverage). During years of extreme drought, emergent vegetative cover may exceed the upper-end target of 70%; during extremely wet periods, wetlands may revert to a more open-water state, supporting far less than 30% coverage by emergent vegetation.

Growing-season drawdowns can effectively manipulate plant community composition. Drawdowns and, more specifically, drawdown intervals can influence plant

species composition, structure, and seed production (Frederickson 1991).

A sharp increase in invertebrate populations when wetlands reflood following a dry phase is an important reason for artificially flooding and draining wetlands to enhance waterfowl habitat (Cook and Powers 1958, Kadlec and Smith 1992).

Wetlands Objective 2

Within 10 years of CCP approval, establish a monitoring plan for high-priority wetlands for water quality, aquatic invertebrates, and emergent and submergent aquatic vegetation. Include monitoring the changes in species diversity at a minimum of 3-year intervals for vegetation and 5-year intervals for water quality and aquatic invertebrates.

Strategies

- Randomly sample vegetative zones (wet meadow, shallow marsh, deep marsh, and open water) (Stewart and Kantrud 1971) along transects, using a 2.7-square-foot plot frame (Daubenmire 1959). Measure percent cover of different plant species.
- Randomly sample invertebrate abundance and biomass in all major vegetative zones.
- Sample water quality for salinity and total dissolved solids.

Rationale

Understanding how water management actions alter developed wetlands is critical to ensuring long-term health and sustainability. The composition of aquatic plant and invertebrate communities supported is directly related to hydrology and water chemistry and, in turn, affects habitat. For example, salinity can negatively influence invertebrate composition directly by affecting physiology (Williams and Crawford 1989, Euliss et al. 1999) or indirectly by affecting habitat structure and foods (Krull 1970, Wollheim and Lovvorn 1996). Other examples include documented reports that high concentrations of suspended silt and clay are toxic to zooplankton, and agrichemicals can cause significant mortality of aquatic invertebrates (Borthwick 1988).

Overall productivity in both the short term and the long term could be negatively affected, because plant community structure and composition influences use by invertebrates and vertebrates such as birds (Laubhan and Roelle 2001). Both plants and invertebrates play significant roles in nutrient cycling and are integral to components in the food chains of a wide variety of vertebrates (Murkin and Batt 1987).

The vegetative community of a wetland is one of the most significant driving forces in the makeup of that wetland's other biotic components (for example, invertebrates and birds). Wetland vegetative structure and floristic composition is important to nearly all waterbirds from the standpoint of nesting, brood rearing, foraging, and migration stopover habitat (Laubhan and Roelle 2001). The same vegetative factors influence invertebrate community composition (Voigts 1976). Managing for a diversity of wetland flora in a wetland community generally equates to a corresponding diversity of waterbirds. Decreased waterbird use generally equates to decreased heterogeneity of a wetland's floral community. Variability in a wetland's floral community is driven in part by the temporal influence of climate (Euliss et al. 2004), but may also be tied to alterations that affect fundamental processes (for example, hydrology, water chemistry, and sediment dynamics) and might alter

A mix of open water and emergent vegetation attracts high densities of different wetland birds.

system tolerance with respect to the germination and growth of certain wetland plant species (Laubhan et al. 2006).

The importance of invertebrates is substantial for a number of bird groups. Invertebrates are a key food resource for shorebirds (Helmers 1993, Laubhan and Roelle 2001), cranes, grebes, herons, rails, and ibis (Laubhan and Roelle 2001), as well as a number of duck species (Bartonek 1968, 1972; Krapu and Swanson 1975; Swanson et al. 1979; Meyer and Swanson 1982; Swanson et al. 1984). According to Skagen and Oman (1996), more than 400 genera of invertebrate prey are consumed by 43 species of shorebirds in the Western Hemisphere alone. A diversity of invertebrates is a critical supporting factor of a wetland bird community, not only with respect to various bird groups, but also concerning various foraging guilds (groups of species that use a common resource in a similar fashion, for example, birds that glean and birds that probe) within a specific group (for example, shorebirds). Differences in foraging technique, as well as bill length and body size, allow birds to partition themselves and use different invertebrate species to avoid overlap in habitat use (Recher 1966).

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

Invertebrates that inhabit prairie wetlands are well suited to cope with the highly dynamic and harsh environmental conditions of this region (Euliss et al. 1999). The invertebrate community of the Prairie Pothole Region is comprised mostly of ecological generalists that have the necessary adaptations to tolerate environmental extremes. However, invertebrates are sensitive to agrichemicals that can accumulate in wetlands (Borthwick 1988, Grue et al. 1989), and there is strong interest in their use as indicators of wetland and landscape condition in the Prairie Pothole Region (Adamus 1996).

Invertebrate sampling data could be tied to water quality data to determine if salinity levels are affecting invertebrate composition directly via physiology (Newcombe and McDonald 1991, Euliss et al. 1999), or indirectly by affecting habitat structure and foods (Krull 1970). Eventually, the Service will gain an improved understanding of the invertebrates that developed wetlands support across space and time, through the acquisition of initial baseline data and subsequent periodic monitoring.

Uplands

Native prairie is defined as native ("unbroken") sod and exists in the refuges in various acreages and with broad management histories. Most of the northern mixed-grass prairie and tall-grass prairie have been destroyed through conversion to agriculture, and remnant tracts appear to be particularly vulnerable to invasion by smooth brome and Kentucky bluegrass (Murphy and Grant 2005). Losses are more severe in the Drift Plain physiographic region than the Missouri Coteau physiographic region.

Key roles of the Refuge System include contribution to ecosystem integrity and the conservation of biological integrity. Thus, the refuges should contribute to the conservation of native prairies unique to North Dakota.

USFWS

Prairie Smoke

Uplands Objective 1

Within 2 years of completion of CCP, each national wildlife refuge will identify native prairie tracts and establish permanent vegetation monitoring transects to collect baseline floristic composition data.

Within 2 years of CCP approval, each refuge will identify native prairie tracts and establish permanent vegetation monitoring transects to collect baseline floristic composition data.

Strategies

- Use current vegetation inventory data and landscape characteristics to identify native prairie tracts. Enter tract boundaries into RLGIS.
- Establish permanent transects to collect baseline data about plant species composition, following procedures of the belt transect methodology (Grant et al. 2004).

Rationale

A prerequisite to setting detailed objectives for native prairies is to complete a basic inventory of existing native prairie. Thus, this objective calls for such an inventory, and the next objective states that once the inventory is complete, each refuge will develop a system to prioritize native prairies and subsequently develop detailed objectives for desired vegetation

conditions. The third objective notes that, for units designated as lower priority, the management emphasis will be on providing appropriate structural diversity to meet the needs of a broad array of waterfowl and other grassland bird species.

Uplands Objective 2

Within 2 years of completing the basic inventory of native grasslands (objective 1, above), each refuge will (1) develop a specific and detailed method to prioritize native prairie units, (2) develop detailed objectives describing the desired vegetation conditions in these prairies, and (3) carry out the appropriate management strategies necessary to achieve these conditions.

Strategies

- Following the example from J. Clark Salyer Wetland Management District provided in appendix K (priority-setting example for native prairie), develop a method to prioritize native prairie units and describe desired vegetation conditions.
- Manage tracts or portions of tracts with prescribed fire, grazing (see appendix L, compatibility determinations), "interseeding," herbicide application, or appropriate combinations of these tools.

Rationale

Recent inventory data suggest that relatively intact native herbaceous flora is uncommon in North Dakota, with few remaining large tracts dominated by native grasses and forbs. Native warm-season grasses are especially uncommon. This objective focuses on the restoration and maintenance of floristic composition. Smooth brome, Kentucky bluegrass, and other introduced plants are prevalent in native prairie across North Dakota. Kentucky bluegrass tends to increase under prolonged rest or with grazing but decreases with fire, especially when burning occurs during stem elongation or in dry years. Smooth brome also increases under rest but, in contrast to Kentucky bluegrass, appears sensitive to repeated grazing but unaffected or variably affected by prescribed fire. A strategy to improve competitive abilities of native herbaceous plants should match the types, timing, and frequencies of disturbances under which these plants evolved.

Smooth brome generally is more difficult to control once established than Kentucky bluegrass and more significantly alters the quality and structure of native prairie. Therefore, restoration management focuses more on strategies to reduce brome. Although the focus of this objective is on the restoration and maintenance of floristic composition in native prairie, wildlife such as prairie birds and butterflies will also benefit.

Examples of objectives to prioritize native prairies and describe desired vegetation conditions were developed for J. Clark Salyer Wetland Management District and are provided in appendix K (priority-setting example for native prairie). However, each refuge staff needs to develop objectives specific to their area and situation.

Uplands Objective 3

Each refuge will identify native prairie units that are of high and low priority for native prairie restoration, as described in objective 2. Manage low-priority native prairie tracts to provide a mosaic of vegetative structure across a broad landscape to satisfy the habitat needs of grassland-dependent bird species, primarily waterfowl: a minimum of 40% in a high visual obstruction reading (VOR) category (>8 inches), a minimum of 25% in a medium VOR category (4–8 inches), and a minimum of 5% in a low VOR category (<4 inches).

Strategies

- Manage tracts or portions of tracts with prescribed fire, grazing (see appendix L, compatibility determinations), or a combination of both.
- Manage tracts with select chemical herbicides (imazapic-based).

Rationale

By 2 years after CCP approval, refuges will identify high-priority native prairie tracts to manage for floristic quality, floristic composition, and landscape characteristics that underlie the quality of nesting habitat of grassland-dependent birds. This will improve

Larry Allain/USDA–NRCS PLANTS Database

Smooth brome, an invasive species, is difficult to control once established and significantly alters the quality of native prairie.

the chances of restoring at least some native prairie by more intensively managing these areas. For the remaining native prairie tracts, it is likely most of the prairie has passed a threshold such that restoration of a modestly diverse, native herbaceous flora is an unrealistic and impractical goal. With modest effort, the prevalent, introduced cool-season grasses and scattered low shrubs can be managed to provide a mix of postdisturbance structural types attractive to a broad array of native grassland bird species, with a focus on waterfowl.

This objective focuses on providing vegetation structural diversity, emphasizing structure that is moderate- to tall-dense for nesting waterfowl. Structural habitat preferences of bird species vary widely (for example, VORs, Robel et al. 1970). It is assumed that the needs of all species will not be met on a single tract or management unit, but rather the needs of various species groups will be met by providing a mosaic of vegetative structures (high, medium, and low) across many tracts of land in the refuges. Native prairies will be managed for a higher percentage of high and medium VOR acres (≥40% and ≥25%, respectively) and lower percentage of low VOR acres (≥5%). In addition to mallards, several other upland-nesting duck species (northern shoveler, gadwall, northern pintail, and blue-winged teal) prefer VORs in the medium (4–8 inches) and high (>8 inches) categories (Laubhan et al. 2006).

Invasive Plants

Significant infestations on Service lands have resulted in more than a loss of habitat for wildlife and a decline in species diversity in prairie grasslands. Control of invasive plants is costly in time and money. Control requires careful planning, implementation, and monitoring as defined by an integrated approach to management of invasive plants designed to meet a habitat objective.

Alfred Brousseau/USDA–NRCS PLANTS Database

Yellow star-thistle is a state-listed noxious weed.

Invasive Plants Objective 1

Within 1 year after CCP approval, develop an IPM plan for control of invasive plants, including noxious weeds.

Strategies

- Review and update the IPM plan every 5 years.
- Prepare annual progress reports or have meetings to share current treatment techniques and results. In annual updates, include information on what treatment protocols may or may not have been successful in achieving stated objectives and any future plans.

Rationale

The Service has developed an IPM plan for each refuge. These plans detail strategies (1) for control or elimination of key invasive plants affecting Service resources, and (2) to comply with state and federal noxious weed and invasive plant laws. The Service will use an integrated approach for pest management to treat infestations of invasive plants on Service lands. The plans identify the current extent of encroachment by all species of concern and suitable control methods and monitoring needs. The plans document infestations and provide an index to effectiveness of management actions. A surveillance program will be designed and carried out to document the spread and introduction of invasive plants. The implementation of an early detection and rapid response system will require coordination with North Dakota Department of Agriculture, weed boards, weed management areas, and other state, federal and local partners. During annual coordination, all parties will share information and discuss the most effective, economical, and environmentally appropriate control strategies for priority invasive plant species.

Invasive Plants Objective 2

Within 5 years of CCP approval, establish a baseline inventory of all invasive plants, including noxious weeds, on Service lands.

Strategies

- Conduct inventories following the USFWS Strike Team operational guidelines, when completed, which will include mapping criteria.
- Store all inventory data in RLGIS.
- Repeat inventories at a minimum of 10-year intervals.

Rationale

Invasive plants are a major threat to native ecosystems in the United States, considered second only to habitat destruction in significance. Invasive plants have infested approximately 2 million acres of Refuge System lands. Infestations of invasive plants have a direct effect on the ability of the refuges to

fulfill their wildlife conservation mission including species recovery and maintenance and restoration of biological diversity, biological integrity, and natural functions.

Recognizing the need for a rapid response to invasive plant control, the Service sought increased funding in the fiscal year 2004 budget to support invasive species strike teams for the Refuge System. Specifically the Service sought to "Develop 'Refuge Invasive Species Strike Teams *[ISSTs]*' (similar in organizational structure and responsiveness to 'hot shot' crews used in interagency fire fighting). Strike teams will respond rapidly to invasive species problems identified by a refuge, or a grouping of refuges" (USFWS 1999). This strategy clarifies the intent to create a set of unique teams, ISSTs, to address primarily new infestations of invasive plants. The idea behind ISSTs is to attack invasive infestations in a more effective and cost-effective way. The ISSTs represent a new way of doing business in dealing with invasive plants.

The Service's budget documentation for fiscal year 2004 stated, "The program goal is to increase the rapid response capability for invasive plant management, using a highly trained, equipped, and mobile response force that refuge managers can call on to support control efforts on newly discovered and satellite ('spot fire') infestations. The teams will provide an emergency rapid response initial attack force for a set of refuges within a wide geographic area. The design of the ISST program is based upon models developed for the National Park Service's Exotic Plant Management Teams and interagency firefighter 'Hot Shot' crews." (DOI 2004)

Through these initial efforts, the Service established three geographic ISSTs: Everglades Focus Area based at J.N. Ding Darling National Wildlife Refuge, Florida; Columbia-Yellowstone-Missouri Rivers Focus Area based at the Great Falls, Montana; and Southwest Focus Area (Arizona, California, New Mexico, and west Texas) based at Imperial National Wildlife Refuge, Arizona. In fiscal year 2006, the Service sought and acquired funding for two additional ISSTs: Hawaiian and Pacific Islands Focus Area and the North Dakota Refuges Focus Area.

The ISST program is based on models developed for the National Park Service's "Exotic Plant Management Teams" and interagency firefighter hotshot crews. The Service will develop working relationships with other federal and state agencies to share and incorporate successful and unsuccessful strategies where appropriate, including centralized coordination at a national level. Individual ISSTs must evaluate their programs annually and make adjustments depending on their individual needs and consultation with the Service's invasive species coordinator.

As of July 2007, the Service's ISSTs have operational guidelines in a draft form. The draft mission statement is as follows: "To protect the natural resources of the Refuge System from the impacts caused by invasive plants, primarily through early detection and rapid response principals, which may include prevention, control, monitoring, restoration and education."

The North Dakota ISST first received full funding in fiscal year 2006. North Dakota refuges had recognized the need to fight invasive plants many years ago and were conducting IPM strategies throughout the state. The rapid spread of invasive plants and declining budgets hampered this effort. The focus of the ISST was to provide funding to each refuge to hire and train individuals to identify and treat invasive plants. Many Service lands in the refuges did not have any digital information recorded for invasive plants. One goal of the ISST was to hire and train an inventory crew to traverse all Service-owned lands in North Dakota and collect invasive plant inventory information to be saved in RLGIS. This information will provide managers a starting point in the prioritization of areas to be treated for invasive plants.

Trying to manage an infestation of invasive plants without any idea of the size, canopy cover, or rate of spread jeopardizes the efficiency of the control efforts and wastes precious time and money. An inventory will help prioritize the strategies used to eliminate new and isolated infestations and contain or reduce larger infestations by attacking the perimeter and working toward the center. Inventory maps are an invaluable planning tool for management as well as critical to monitoring efforts. These inventory maps will play a critical role in monitoring the effectiveness of control methods and ensuring the area is not reinfested after several years by dormant viable seed.

The Service, the state of North Dakota, and other partners have not yet developed and universally adopted criteria for mapping invasive plants. Regional invasive species and IPM coordinators in region 6 are in the process of drafting protocols for field mapping of invasive plants for entry and storage in RLGIS. This document will provide guidelines for (1) mapping new and old infestations, (2) minimum mapping units, and (3) the use of a point versus a polygon and canopy cover. These guidelines will incorporate the minimum standards outlined in "The North American Invasive Plant Mapping Standards," approved by North American Weed Management Association, May 7, 2002.

Once a baseline inventory has been completed for Service lands in North Dakota, the focus shifts to more scientific surveys to provide quantifiable data. The Service will conduct surveys every 3–5 years on priority areas to provide information about effectiveness of treatment, response to an IPM strategy, or results of grassland restoration.

Invasive Plants Objective 3

For the next 15 years, annually restore 3% of refuge lands to grasslands that are more resilient to invasive plants.

Strategies

- Apply early detection, rapid response strategies to attack new infestations before they become large and costly to treat.
- Use the GIS to predict areas at greatest risk of new infestations.
- Conduct a surveillance program for new infestations of invasive plants every 2 years.
- Every 5 years, complete surveys for invasive plants, Global Positioning System (GPS)-map locations, create a baseline map, and collaborate with partners to map records for neighboring lands.
- Monitor change over time by collecting RLGIS cover-type data for all invasive plant species.
- GPS-map and store in RLGIS the anecdotal observations of infestations made by Service staffs while conducting other work activities.
- Respond promptly to all landowner or other public complaints.
- Map sites of invasive plant treatment each year in RLGIS.
- Monitor infestation rates and effectiveness of control efforts.
- Share GIS layers of invasive plant infestations with partners.
- Attain help with invasive plants (applications and monitoring) by pursuing additional money through partnerships, grants, and invasive plant programs.
- Communicate with and educate local, state, and federal agencies and the public about invasive plant issues. In a timely manner, make known information about new infestations, effective or ineffective treatment methods, and new treatment options.
- Coordinate invasive plant control by meeting at least once per year with county weed boards, representatives from weed management areas, and other partners to share information and discuss control strategies.
- Address public complaints about invasive plants on Service-owned lands, while using IPM strategies.
- Ensure all seed used to restore habitat is certified weed-free. Avoid purchasing seed from sources known to have violated the weed-free seed regulation.
- Begin habitat management treatments to develop habitat that will be more resilient to invasive plants.

Rationale

Leafy spurge (993,644 acres), Canada thistle (956,335 acres), and absinth wormwood (452,594 acres) are the most widespread and common species infesting lands across North Dakota, as reported by county and city weed boards (North Dakota Department of Agriculture 2006). These problem plants can displace native vegetation over large areas and have the ability to form nearly monotypic stands in the absence of management actions and, therefore, threaten native biodiversity (Watson 1985, Bedunah 1992, Trammell and Butler 1995, Svedarsky and Van Amburg 1996, Hutchison 1992). Due to the large acreage of infestation, these three species have been the priority invasive plants on Service lands.

The first step to control is to prevent the introduction, reproduction, and spread of invasive plants. Many of the newer invasive plant and "watch" species were introduced via seed imported from states and countries that have invasive plants. The most common sources are the states of California, Oregon, and Washington and the country of Argentina (Ken Eraas, North Dakota Department of Agriculture, personal communication, 2007); seed from these locations should be avoided. Wherever possible, all grass seed should be bought from seed grown in North Dakota to minimize the introduction or spread of new invasive plant species.

Farming can be used to rejuvenate DNC and other old cropland areas, fight colonization of invasive plants, prepare ground for grass seeding, and reduce use of nonselective broadleaf herbicides over the long term. Old cropland areas that are heavily infested with Canada thistle or other invasive plants may be completely renovated by temporarily converting these areas to cropland. The crop rotation may include the use of genetically modified varieties of Roundup®-ready corn or soybeans that are sprayed with the nonselective herbicide, glyphosate. By maintaining these fields in crop production for several years, the percentage of viable invasive plant seed in the upper soil layer should be significantly depleted and the germination potential reduced. The Service will replant these fields to a grass and forb mixture designed to meet habitat objectives for individual tracts of land.

Mowing or haying may be used to remove the aboveground growth of invasive plants before flowering and seed production in areas where other treatments may not be available or practical. Neighboring landowners are usually interested in additional forage. Heavily infested areas can often be hayed early to prepare the site for other control practices (for example, biological control agents and chemical control). Two common obstacles to haying for control of invasive plants is (1) excessively rough and uneven ground usually due to pocket gopher activity, and (2) potential to spread the invasive plants via hay transported off Service lands to private lands. (See appendix L, compatibility determinations.)

Grazing by sheep or goats can be used to maintain an invasive plant population at a level that the plant no

longer presents an economic hardship. Grazing may also be used as a pretreatment to prepare for herbicide application. (See appendix L, compatibility determinations.)

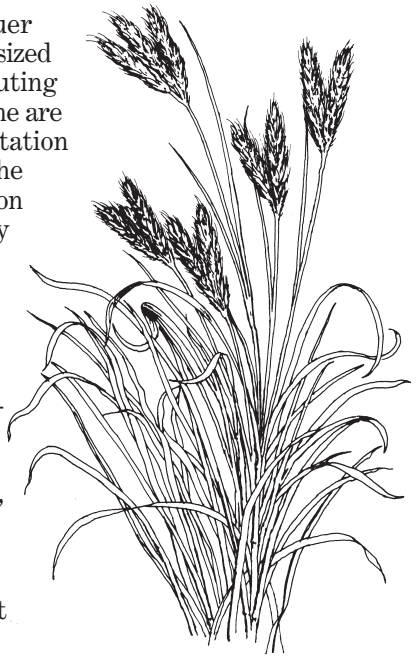
The use of biological control agents—flea beetles (*Apthona* spp.)—for leafy spurge control has shown excellent results. Widespread use of these insects needs to be made by monitoring insectaries for *Apthona* spp. beetles, with redistribution of beetles among leafy spurge patches as needed. The use of other biological control for other invasive plant species needs to be investigated. Releases of the Canada thistle stem mining weevil, seed head weevil, and stem gall fly have shown mixed results. Biocontrol is commercially available for musk thistle, yellow and Dalmatian toadflax, yellow star-thistle, knapweeds, and purple loosestrife.

Old Cropland

This section provides descriptions of declining grassland bird species, old cropland areas, restoration efforts, priority refuge tracts, and the integrity policy.

Declining Grassland Bird Species

According to Conner et al. (2001), the human impacts to the diversity of the biota of the North American grasslands are likely the most significant of all terrestrial ecosystems on the continent. Specifically, the bird species that use grasslands have shown dramatic and consistent declines (Knopf 1994). According to Knopf (1995) and Rich et al. (2004), as an overall group, grassland birds show higher declines than birds of other North American vegetative associations. Breeding Bird Survey data from 1966–96 indicates that populations of 13 species of North American grassland birds declined significantly and, conversely, populations of only 2 species increased (Peterjohn and Sauer 1999). It is hypothesized that major contributing factors to this decline are grassland fragmentation and habitat loss. The native sod conversion to cropland directly impacted wetland and grassland birds by reducing and fragmenting the available breeding cover for grassland-nesting species (Sugden and Beyersbergen 1984, Batt et al. 1989). Further, many grassland- and wetland-dependent birds have few alternatives to the Great Plains (Igl and Johnson 1995), whereas birds associated with woody vegetation appear to have larger distributions across the continent (Johnson et al. 1994).



Native Bluestem Grass

Another proposed cause for declines of grassland birds is the degradation of existing prairie and wetlands. Current day grazing regimes often do not imitate the processes that were in place 200 years ago, which presents the birds with a different structure and, often, a different vegetative composition. In addition, some areas of native sod have been under a management regime of idleness, which appears to have given an advantage to invasive plant species such as smooth brome and Kentucky bluegrass. These species tend to dominate and overtake native species and degrade the habitat. Wilson and Belcher (1989) found that Eurasian plant species in the North American prairie not only replace the native plant community, but also impact the species composition of wildlife communities that use these plant communities. The woody vegetation now commonplace across the formerly open grasslands also negatively influences grassland songbirds by fragmenting the grasslands, which provides habitat for predator species and attracts forest-edge bird species that may displace the grassland species (Johnson 2006b).

Old Cropland Areas

Many of the uplands in the refuges were previously cultivated and are referred to as old cropland. Traditionally, these areas were reseeded to herbaceous mixtures that included species such as cool-season introduced grasses and legumes (intermediate wheatgrass, tall wheatgrass, alfalfa, or sweetclover) and primarily provided nesting cover for mallards and other ducks. This seed mixture has been referred to as DNC (dense nesting cover). Although a viable mixture that is beneficial on multiple levels, this mixture requires intensive inputs to maintain over the long term. First, DNC has a limited lifespan and provides attractive cover to nesting ducks for perhaps only 6–8 years after seeding and up to 15 years with certain management (Higgins and Barker 1982, Lokemoen 1984). At the end of the DNC life cycle, a field is typically cultivated and farmed for 2–3 years, and then reseeded. This leads to a rotation of seeding–managing–farming–seeding into perpetuity. Oftentimes, fields are not reseeded at the prescribed frequencies, which leave decadent, invasive plant-infested uplands across the landscape that are limited in attractiveness to migratory birds. Further, the need to repeat this rotation on a regular basis negatively affects other ecological factors in the surrounding environment. For example, cultivation increases soil erosion, and herbicide use is increased to prepare the seedbed for each new seeding.

Restoration Efforts

As part of this CCP, the 12 national wildlife refuges will restore priority tracts of old cropland back to native vegetation. The Service will revegetate these

areas with a diversity of native vegetation that, with modest management, is relatively resistant to infestation by invasive species including noxious weeds. This will benefit grassland and wetland birds, because providing habitat that is most similar to the historical vegetative condition likely provides habitat for more grassland-dependent wildlife. According to Howell (1988), re-creating the elements found in the original communities may be the optimal method for ensuring continued species interactions and natural selection. As an example, Baird's sparrow and Sprague's pipit appear to use short, sparse grass structure and mostly associate with native bunchgrasses, rather than the broad-leaved, introduced species used for DNC mixes (Madden et al. 2000). Further, according to Stewart (1975), and Kantrud and Higgins (1992), marbled godwit and willet typically select native grass cover over tame grass cover.

Native prairie areas that have not been cultivated, typically (dependent on management) have a diversity of plant forms including short, rhizomatous grasses, taller bunchgrasses, a low shrub component, and a variety of forbs. This structural diversity is usually lower in fields dominated by introduced vegetation (most commonly, smooth brome, Kentucky bluegrass, and invasive plants such as wormwood or leafy spurge) that have a more homogeneous height across a field (Wilson and Belcher 1989). Grassland-dependent birds adapted to the diverse structure the native prairie provided, whereas DNC-type mixtures limit this diversity and likely attract only bird species that key in on this tall, dense cover.

Another benefit of using native seed mixtures to restore old cropland, as compared with using a DNC mixture, is the longevity. In theory, native seed mixtures should persist into perpetuity under appropriate management including disturbances that imitate the natural regimes that sustained wildlife populations before human intervention. Management of refuges in North Dakota typically involves various tools to imitate the defoliation activities through which prairie plants evolved, including prescribed fire and rotational grazing (see appendix L, compatibility determinations). The frequency of certain activities depends on the particular habitat components, for example, a pristine, native prairie tract may require a burn every 3–5 years and intermittent, rotational grazing of domestic cattle. This is much less activity over time than the rotation required to sustain DNC-seeded fields.

Experimentation with native seeding that took place 10–20 years ago in the Drift Prairie and Red River Valley areas of North Dakota usually included three to five, native warm-season grasses. Current research indicates that this may not be an optimal mixture for success of establishment and management. Tilman (1996) states that biological diversity is dependent on the functionality and sustainability of the ecosystem, lending to the thought that grassland restorations should attempt to include diverse seed mixtures. Guo and Shaffer (2006) completed their research in North Dakota, which indicated that the saturation rate for one of their study sites was between 16 and 32 species of native plants.

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Seeding Refuge Land to Native Grass

Inclusion of forbs in native mixtures appears to be necessary in attempts to restore variables such as nutrient cycling and energy flow (Pokorny et al. 2005). Sheley and Half (2006) indicate that seeding a wide range of forbs increases the likelihood that more niches will be filled and facilitates overall survival of the forbs. The use of multiple forbs may help to overcome the temporal weather variations because at least certain species should germinate and respond to the dynamic weather conditions that annually persist (Sheley and Half 2006). More specifically, varying numbers and combinations of species in differing developmental phases may be a requirement for a native seeded area to achieve the best possible results. It is likely too that, as a stand matures, a diverse mixture may play an important role in the belowground community by providing a well-developed root system for sustainability over time (Guo and Shaffer 2006). Further, another benefit to establishment of native vegetation is the suggestion that species-rich seed mixtures may reduce infestation of invasive plants in restored grasslands (Blumenthal et al. 2003, Carpinelli 2001, Pokorny 2002, Sheley and Half 2006, Tilman 1996). In a study by Pokorny et al. (2005), they determined that native forbs resisted invasion by spotted knapweed better than grasses. The overall theory in the literature indicates that seeding a diverse seed mixture increases the inclusion of various functional groups among plant species. With extremely limited data on the reestablishment of native flora mixtures in North Dakota, there is a need to begin long-term research in this area. Ensuring science-based management for reseeding these areas is of chief importance to the perpetuation of the grassland resources.

Priority Refuge Tracts

Based on data in federal, regional, and state plans and several literature sources, the approximate midrange

of habitat requirements for several grassland bird species is 125 acres. Therefore, refuge tracts that are at least 125 acres in size or part of existing habitat blocks greater than 125 acres will be a priority for restoration. For restoration of grasslands, the amount of edge needs to be minimized by designing circular or square fields (Wyoming Partners in Flight 2002). The literature provides evidence that even such smaller areas provide benefits to grassland birds. One study indicated that landscape-level effects are not strong; rather that local habitat management is important for reproduction of ducks and songbirds (Koper and Schmiegelow 2006). Further, Davis et al. (2006) indicate that patch size effects on reproductive success of songbirds of the mixed-grass prairie were relatively small and variable. These studies may indicate variations in regional abundance or landscape composition among species. Regardless, patterns of area sensitivity probably vary for grassland birds (Davis et al. 2006) and likely restoration efforts will provide appropriate habitat size and composition for certain grassland-dependent birds including grasshopper sparrow, Savannah sparrow, bobolink, Le Conte's sparrow, sedge wren, upland-nesting shorebirds, and various waterfowl.

Integrity Policy

The focus on using native plants to restore refuges is in line with the Improvement Act, which includes an integrity policy that states that Refuge System units are to promote biological integrity, diversity, and environmental health and attempt the restoration of historical conditions on Refuge System lands (Schroeder et al. 2004).

Old Cropland Objective

In an attempt to restore grasslands that resemble presettlement conditions, over the next 15 years reseed a total of 100 acres to native herbaceous mixtures in priority refuge tracts that, 10 years postestablishment, will be comprised of ≥60% native grasses and forbs.

(For this objective, planning team members used their knowledge and expertise to obtain an acreage estimate. This acreage seems achievable based on the adequacy of funding and staff levels included in the CCP. The level of 60% presence of native grasses and forbs across seeded areas considers the management challenges associated with control of invasive plants, while targeting a reasonable percentage for maintaining dominance of seeded species. Monitoring these seeded sites is critical for measuring the acreage and percentage listed in the objective.)

Strategies

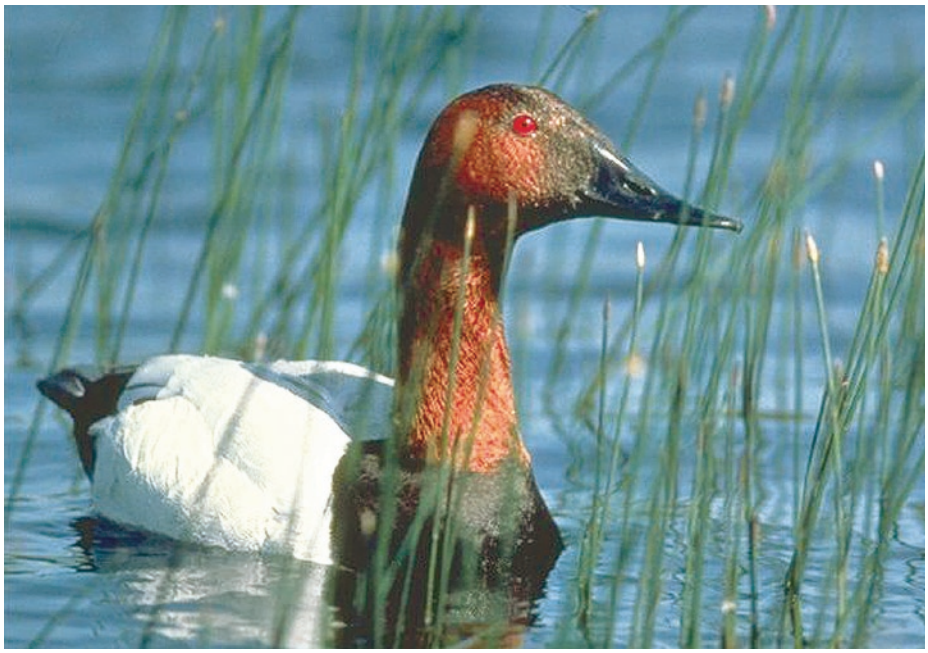
- Use appropriate site preparation techniques to ensure a weed-free seedbed, which may include a combination of cropping and chemical fallowing using glyphosate-based herbicide.
- Identify priority restoration sites in refuges based on block sizes ≥125 acres.
- Develop a seed mixture with a nearly equal cool-season to warm-season grass and forb component.
- Drill or broadcast the native seed mixture.
- Use a variety of tools in postseeding management including clipping, prescribed fire, prescribed grazing (see appendix L, compatibility determinations), and necessary IPM strategies.
- Monitor results of vegetation establishment.
- To ensure that grassland restoration efforts are science-based, conduct research on selected newly seeded sites to determine the establishment success of species included in the mixtures. From this data, within 15 years of CCP approval, develop a decision matrix to help with selecting optimal species to use in grassland restorations.
- To ensure effectiveness of native seed mixes containing grasses and forbs, conduct research on wildlife response that focuses on Lepidoptera and grassland-dependent migratory birds (waterfowl, shorebirds, and songbirds) within 10 years of CCP approval.

Rationale

According to Klett et al. (1984), nest initiation rates for mallard, gadwall, and blue-winged teal in North Dakota and South Dakota were as high or higher in native-seeded fields than in seeded fields that lacked natives. In addition, nest success was not significantly different in native-seeded versus tame-grass-seeded study fields (Klett et al. 1984). Therefore, the Service will seed old cropland to a mix of cool-season and warm-season native grasses over time. The number of species in seed mixes is, in part, dependent on annual budgets; however, more important seed mix considerations concern the ratio of cool-season to warm-season species, with a target cool-season to warm-season grass ratio close to 1:1.

Dense Nesting Cover

As described under old cropland, certain refuge tracts of old cropland were seeded back to an herbaceous cover of introduced vegetation known as DNC. Traditionally, these seed mixtures included cool-season introduced grasses and legumes (intermediate wheatgrass, tall wheatgrass, alfalfa, or sweetclover) that establish well under a wide variety of soil, moisture, and climatic conditions that exist across the Prairie Pothole Region (Duebbert et al. 1981). Such a mixture provides nesting cover for generalist birds including upland-nesting ducks (Duebbert et al. 1981), northern harrier, and sedge wren (Johnson et al. 2004). DNC provides attractive nesting cover for about 6–8 years after seeding and up to 15 years with certain management (Duebbert and Frank 1984, Higgins and Barker 1982, Lokemoen 1984). At the end of the DNC life cycle, a field is typically cultivated and farmed for 2–3 years, and then reseeded. This leads to a rotation of seeding–managing–farming–seeding into perpetuity to maintain the intended cover.



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Canvasback

The refuge tracts included in the following objective are a lower management priority than native prairie and seeded native tracts. Ideally, the Service will seed back these tracts to a native mixture; however, certain situations may limit this opportunity. Often, newly acquired refuge lands have been under a regime of conventional cropland tillage and wetland drainage for decades. Such areas often have varying challenges in terms of soil quality, especially with salinity. Potentially, a cycle or two of a DNC mixture on these sites may improve the soils to a point where seeding a native mixture is more viable. In addition, several logistics must be considered in the decision to seed DNC versus native mixtures. If a site is such a distance from refuge headquarters that adequate management (especially in the establishment phase) of native species is not possible, a DNC mixture may be more appropriate. Further, DNC mixtures are significantly cheaper than native mixtures at least in the short term and, therefore, may be a more appropriate choice simply based on funding availability. If a DNC mixture is used, intermediate wheatgrass and tall wheatgrass are viable grasses to use and alfalfa an appropriate legume. Under no circumstances should smooth brome or sweetclover be used in DNC mixtures.

DNC tracts must also be managed to maintain optimal vigor throughout the seeding's life cycle. Especially within cropland-dominated areas, invasive plant problems will persist and require appropriate treatments to control (see the invasive plant objective). Other management methods such as grazing (see appendix L, compatibility determinations) and fire may also be used in certain situations to stimulate the height and density of DNC mixtures. Additionally, mechanical methods such as haying may also benefit seedings by removing the litter layer. Finally, the most productive stands of DNC are those that are reseeded approximately every 10–15 years, including appropriate crop rotation frequency as seedbed preparation (Duebbert et al. 1981).

Dense Nesting Cover Objective

Over 15 years, maintain perennial cover (DNC and tame grass) on refuge tracts of old cropland that are in preparation for reseeding to native cover or are considered low priority for management in comparison to native sod and native seeded tracts at the refuges.

Strategies

- Use farming activities (see appendix L, compatibility determinations) to provide an appropriate seedbed for seeding.
- Manage seeded areas using tools such as fire, haying and grazing (see appendix L, compatibility determinations), and idling.
- Control invasive plants using IPM strategies (see the invasive plants objective).

Rationale

Old cropland tracts that have not begun the seedbed preparation process will be maintained in an idle state that generally has a predominance of introduced, cool-season grass species. Before seedbed preparation for seeding to native grass, these sites are of relatively low priority. Management efforts can be better directed toward higher priority upland areas such as native prairie, tracts already reseeded to native grass, and tracts being prepared for native reseeding. Some studies have indicated that, despite the presence of introduced, cool-season perennial grass cover, DNC will likely support multiple plant species and generalist birds including upland-nesting ducks (Mark Sherfy, USGS, unpublished data).

Invasive and Planted Woody Vegetation

The plants and animals of the North Dakota grasslands evolved simultaneously and were influenced by fire, climate, and herbivory (animals eating plants) (Weaver 1954, Weaver and Albertson 1956, Milchunas et al. 1988, Vallentine 1990, Flannery 2001). These factors maintained a predominantly grassland ecosystem, with a limited occurrence of woody plants.

North Dakota's grasslands burned frequently, providing an inhospitable environment to trees (Higgins 1986, Severson and Sieg 2006). The growing points of most grassland vegetation are usually protected at the base of the plant, compared with woody vegetation that has elevated growing points that are more vulnerable to injury or fatality from fire. Grassland plants persist and expand with frequent and repetitive burns, whereas woody plants tend to decrease (Vogl 1974). The tall-grass and mixed-grass prairie types that cover North Dakota produce large quantities of fuel that dry quickly and easily burn (Steuter and McPherson 1995). Specifically, Bragg (1982) states that bluestem prairies recover quickly postfire and can even provide enough fuel for multiple burns in a single growing season.

The climate also played a pivotal role in the development of the grasslands, especially considering that periodic droughts would have limited growth and expansion of trees (Weaver and Albertson 1936). Transeau (1935) states that it is important to consider the climatic extremes in North Dakota to understand the distribution of grasslands, rather than focus on the long-term averages. As an example, the drought of the 1930s likely played a significant role in reducing current trees and eliminating the establishment of new woody vegetation. While it is interesting that the recent climate of the area has been capable of supporting trees (Anderson 1990), that could easily change with the onset of a drought.

Finally, records indicate that the two primary grazing animals, bison and elk, likely negatively affected woody vegetation. Considering that heavy and consistent use by bison occurred across eastern North Dakota, activities such as grazing, trampling, and rubbing suppressed tree growth at some level across the grasslands (Severson and Sieg 2006). Elk, although considered primary grazers, shift to eating woody materials as grasses dry and become less available in the winter (Nelson and Leege 1982). In addition, documentation also exists that elk damaged woody vegetation by other behavioral activities, especially associated with the rut (Severson and Sieg 2006). Considering the cumulative damages occurring from ungulates, fire, and drought, it is evident that tree growth and expansion were limited across the grasslands of North Dakota.

Recent research in North Dakota determined that the probability of occurrence of breeding grassland birds decreased notably for 11 of 15 species as the percent of woody vegetation increased. Further, negative effects on grassland birds increased as the height of woody plants increased: brush→tall shrubs→trees. By most accounts, the grasslands became unsuitable for nine grassland bird species as woodland cover exceeded 25% (Grant et al. 2004). Results of a recent experimental study in North Dakota determined that the bobolink, Savannah sparrow, and sedge wren specifically avoided tree plantings (Naugle and Quamen 2007).

It is apparent that nest predators and nest parasites increase near woody habitat edges (Johnson and Temple 1990, Burger et al. 1994); therefore, planting woody vegetation in these formerly treeless grasslands magnifies these problems. Tree plantings in grasslands are important den and foraging sites for grassland bird and egg predators historically uncommon to grasslands (Sargeant 1972, Sargeant et al. 1987, Pedlar et al. 1997, Kuehl and Clark 2002). Gazda et al. (2002) indicate that duck nest success decreases near planted woodlands, mainly because of increased predation by mammal and bird species associated with trees and shrubs. In addition, other sources state that waterfowl and waterbirds actually avoid wetlands where trees and shrubs occur along wetland margins, presumably to evade predation (Rumble and Flake 1983, Shutler et al. 2000). In their study, Johnson and Temple (1990) determined that nest predation rates were lower for five species of grassland songbirds in large grassland areas where nests were more than 148 feet from woody vegetation.

The brown-headed cowbird is a nest parasite whose numbers have increased in recent decades to the detriment of other birds (Shaffer et al. 2003). A cowbird will lay its eggs in the nest of another bird, and the other bird will act as a foster parent to the cowbird young, thus reducing survival of the host bird's young (Lorenzana and Sealy 1999). Studies in the mixed-grass prairie and tall-grass prairie determined that grassland birds nesting close (less than 541 feet [165 meters]) to wooded edges incur higher rates of brood parasitism from cowbirds than nests further away (Johnson and Temple 1990, Romig and Crawford 1995, Patten et al. 2006). Shaffer et al. (2003) documented that brown-headed cowbird parasitizes 24 of the 36 North American grassland birds.

Historically, most of the national wildlife refuges in the state were part of a grassland-dominated system, where fire, grazing, and drought restricted natural tree growth to limited areas (Higgins 1986). Now, planted trees and shrubs occur at many refuges. Although most woody plantings existed before Service ownership of these lands, the Service did some planting after acquisition. Planted trees and shrubs such as green ash, cottonwood, and buffaloberry are native to North America; however, many others are nonnative species such as caragana, Russian olive, and Siberian elm. Most of these plantings are considered unnatural components of historical habitat. Additionally, nonnative species of woody vegetation such as Russian olive and Siberian elm are invasive and readily spread from both Service-owned and non-Service-owned plantings into new areas.

Preventing the encroachment and planting of woody vegetation into grassland systems contributes significantly to the recovery of grassland bird populations (Herkert 1994). Several sources indicate that the elimination and reduction of existing invasive and planted woody vegetation benefits most grassland-dependent bird species (Bakker 2003, Grant

et al. 2004, Patten et al. 2006, Shaffer et al. 2003, Naugle and Quamen 2007, Johnson and Temple 1990, Sovada et al. 2005). Although many woodland bird species might nest in planted woodlands, few are of management concern. This suggests that the loss of planted woodlands will have negligible effects on these species whose populations are stable or expanding. In addition, tree plantings on the prairie fail to provide habitat for forest birds that are of management concern (Kelsey et al. 2006).

Considering all of this data, systematic removal of invasive and planted woody vegetation from Service lands is central to improvement of habitat for grassland-dependent birds. As described in the objective, HAPET developed a matrix of grassland bird conservation areas (Niemuth et al. 2005), which highlights significant blocks of grassland. Sites for tree removal at the refuges are prioritized based on this matrix, with the majority of removal acres existing in the areas with the largest blocks of grass. Reducing fragmentation in these core areas has the potential to provide the most benefit to grassland-dependent birds. In addition, the removal of woody species >3.3 feet tall should target the removal of larger shrubs and trees that are problematic across Service lands, rather than the native, small shrubs such as prairie rose, lead plant, and western snowberry that are an important component of grassland composition.

Invasive and Planted Woody Vegetation Objective

Over a 15-year period, remove ≥10 acres of invasive or planted woody vegetation (Russian olive, Siberian elm, saltcedar, and caragana) >3.3 feet tall.

Strategies

- Cut standing trees and shrubs and remove belowground woody material (stumps and roots) using chain saws and a variety of heavy equipment. Where removal of stumps and roots is not viable, treat them with appropriate herbicide.
- Apply herbicides in situations where suckering occurs or is anticipated.
- Pile and burn down woody material.
- Use high-intensity spring or fall fires to initially kill trees within 4 years. Then use fire or herbicides to reduce viability of recurring growth. Continue control of trees and tall shrubs with periodic fire (every 3–6 years) applied from March to November.
- Restore bare areas resulting from woody vegetation removal to perennial grass cover.
- Due to the potential controversial nature of this management, conduct outreach and appropriate education to the associated local communities, politicians, media, and other interested individuals.

Steven Perkins/USDA–NRCS PLANTS Database

Saltcedar is an invasive species that occurs on refuge lands in North Dakota.

- Use appropriate bird survey methods to monitor bird response to removal of woody vegetation.

Rationale

Prior to Euro-American settlement in North Dakota, woody vegetation primarily occurred in riparian or streamside areas, in broken topography occurring in the upper drainages of streams, and in escarpments and sandhills. These areas often had increased soil and foliar moisture, standing water, and relatively steep topography that would have provided protection from fires (Severson and Sieg 2006).

Today, although numerous patches of native woodlands still exist in the northern Great Plains, once large expanses of nearly treeless prairie are now intermixed with cropland and scattered small (less than 5 acres) linear and block-shaped tree plantings (also referred to as windbreaks, shelterbelts, and tree belts). Baer (1989) estimated that these plantings cover 3% of the land area in the state. Tree plantings are designed to reduce soil erosion from croplands (Baer 1989) and are viewed by many as striking landscape features that symbolize settlement of the western United States. However, they further fragment remaining grasslands by creating abrupt boundaries that increase edge effects (O'Leary and Nyberg 2000, Winter et al. 2000, Ribic and Sample 2001). Additionally, the suppression of ecological processes such as fire and grazing has allowed an increase in the encroachment of woody plants into grasslands (Bakker 2003). These factors have been linked to the deterioration of grassland bird populations, which are declining faster and more consistently than any other group of North American birds (Samson and Knopf 1994, Herkert 1995). Research indicates that native grassland birds need large, uninterrupted tracts of treeless grasslands (Herkert 1994, Winter et al. 1999, Bakker et al. 2002). The literature overwhelmingly indicates that invasive and planted trees in prairie landscapes often negatively affect a variety of bird

groups (Bakker 2003). Specifically, trees on the prairie are correlated with negative consequences to ducks (Rumble and Flake 1983), wetland birds other than ducks (Naugle et al. 1999), prairie grouse (Hanowski et al. 2000, Niemuth 2000), grassland songbirds (Winter et al. 2000, Grant et al. 2004), and ring-necked pheasant (Snyder 1984, Schmitz and Clark 1999).

Piping Plover (Priority Species)

Piping plovers (federal threatened species) use habitats at nine of the refuges: Audubon, Chase Lake, Lake Ilo, Lake Nettie, Lake Zahl, McLean, Shell Lake, Stewart Lake, and White Lake.

The piping plover occurs in three distinct populations: Atlantic Coast, Great Lakes, and northern Great Plains. Of the roughly 6,000 piping plovers left in the world, about half breed in the northern Great Plains. Unlike the Atlantic Coast and Great Lakes populations, the northern Great Plains population is declining somewhere between 6% and 12% annually (Larson et al. 2002, Plissner and Haig 2000, Ryan et al. 1993), and is expected to go extinct in 50–100 years unless significant conservation activities are started. The decline and poor prognosis led to the listing of this population as threatened in the U. S. and endangered in Canada in the mid-1980s.

In any given year, 50%–80% of the piping plovers that nest in the United States' portion of the northern Great Plains do so in an eight-county area that stretches from central North Dakota to northeastern Montana (see figure 21, map of the core area for piping plover, in Chapter 3, Refuge Resources and Description). Plovers in this core area breed on barren shorelines associated with alkali lakes and wetlands. Unlike the Missouri River, alkali lake habitat is relatively more stable within and between years and it is free of the social, political, and economic conflicts that plague piping plover recovery along the river. In addition, piping plover productivity is more stable from year to year on alkali lakes, whereas the Missouri River is a "boom or bust" environment for plovers (Adam Ryba, piping plover coordinator, USFWS, North Dakota, personal communication).

Depending on water levels and availability, occasional plover use may occur outside of the core area in the northern Great Plains. However, these occurrences have been rare and no active management has been pursued in these other areas, with the exception of taking part in the International Piping Plover Census.

Piping Plover Objective 1

Over a 15-year period, annually protect piping plover nests found within the refuges and monitor the success of protected nests and hatched young. Strive for fledging rates of >1.24 per pair in the Alkali Lake core area to stabilize the northern Great Plains population (Larson et al. 2002), in an attempt to reach a population goal of 2,300 breeding pairs in the United States (USFWS 1994a).

Strategies

- Erect wire mesh cages with netted tops over piping plover nests or provide nest protection by electric fence exclosures, or both.
- Monitor the success of protected nests by searching for pip chips in or near the nest bowl; or timing nest visits based on known or suspected nest initiation date, laying rate, and mean incubation period; or both.
- Monitor hatched young to fledging.
- Identify lands sensitive to piping plover nesting for consideration of added protection through land acquisition.

Rationale

The Service listed the northern Great Plains population of piping plovers as threatened in the United States due to a poorly understood decline in abundance. Mabee and Estelle (2000) suggested that nest predation is a major problem limiting piping plover nest success throughout their range.

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The piping plover (top) makes its nest (bottom) on open shoreline.

However, according to Murphy et al. (2003), predators can successfully be deterred from depredation of eggs of piping plovers by placing large (10-foot diameter) mesh exclosures (cages) over individual nests. Recruitment has improved with these cages in the northern Great Plains (Murphy et al. 2003). Service staffs plan to erect these exclosures over piping plover nests that are encountered within the boundaries of the Alkali Lake core area, not limited to Service lands, when permission is granted on private property. Exclosures placed after one or more eggs have been laid in the nest bowl have resulted in <2% nest abandonment in the northwestern portion of the state and northeastern Montana (Adam Ryba, piping plover coordinator, USFWS, North Dakota, personal communication).

Piping Plover Objective 2

Over a 15-year period, annually use a variety of vegetation control methods to eliminate vegetation on known plover beaches in the Alkali Lake core area. Do not conduct vegetation control between May 15 and August 7 (Stewart 1975) or any time that piping plovers are present on the beaches.

Strategies

- Determine percent coverage of vegetation by visual estimation.
- Apply herbicides, mechanical disturbance, or other means to remove upland vegetation.

Rationale

Piping plovers do not generally nest in areas of dense vegetation (Prindiville-Gaines and Ryan 1988). Additionally, Espie et al. (1996) found that depredated piping plover nests in Saskatchewan were closer to vegetation than successful nests. Although many sandy beaches in the refuges are suitable for plover nesting, the beaches will revegetate periodically. Without intervention (herbicide application, prescribed fire, mechanical disturbance), vegetation may expand to become the predominant cover type on these beaches. The refuge staffs will remove (when needed) as much of this vegetation as possible, before and after the piping plover nesting season, to continue to provide quality breeding habitat for piping plover.

Piping Plover Objective 3

Over a 15-year period, continue the International Piping Plover Census for the presence of piping plovers in 100% of the wetland basins across the nine refuges with historical nesting habitat for piping plovers.

Strategies

- Survey wetlands for piping plovers by the most appropriate means (for example, boat, walk the shoreline, view from a vehicle with a spotting scope).
- Conduct surveys between early and mid-June.

Rationale

Beginning in 1991, biologists throughout North America collaborated in a monumental effort known as the International Piping Plover Census (Haig and Plissner 1993). Plovers nest on open gravel patches and avoid areas dominated by mud, heavy cobbles, or dense vegetation (Prindiville-Gaines and Ryan 1988). Both breeding and wintering habitats are censused in an effort to (1) establish benchmark population levels for all known piping plover sites, (2) survey additional potential breeding and wintering sites, and (3) assess the current status of the species relative to past population estimates.

Since 1991, the International Piping Plover Census has been conducted at 5-year intervals (1996, 2001, and 2006) at sites censused in 1991 and a limited number of new sites (Plissner and Haig 2000). In the 2006 census, a total of 1,481 pairs were counted in the United States (Adam Ryba, piping plover coordinator, USFWS, North Dakota, personal communication); the recovery plan goal is 2,300 pairs (USFWS 1994a). Continuation of this effort allows refuge staffs to develop a better understanding of where to use nest protection measures (see piping plover objective 1) in a given year, as well as determine wetlands in need of protection through acquisition (fee title or wetland easement) or designation as piping plover critical habitat.

Whooping Crane (Priority Species)

Each spring and fall, endangered (federally listed) whooping cranes use wetlands and agricultural fields within all the refuges as migratory stopover areas en route to their summer and winter grounds (see figure 22, map of whooping crane sightings, in Chapter 3, Refuge Resources and Description).

Whooping Crane Objective

Over a 15-year period, annually inform the public of migrant whooping cranes stopping in the refuges, in an effort to reduce the risk of an accidental shooting or other disturbances.

Strategies

- Post warning signs in the areas being used by whooping cranes.
- Contact the local media (radio, television, newspapers), upon confirmed observations, where it appears that whooping cranes will stay in the area for multiple days and where hunting activity exists or is likely.
- Actively patrol areas being used by whooping cranes to periodically monitor their whereabouts and inform the public of their presence.
- On a case-by-case basis for each individual occurrence of a whooping crane, consider the merits of a possible voluntary hunting closure on private lands where whooping crane use is occurring regularly. If this is deemed appropriate,

contact the necessary landowner(s) to discuss a possible voluntary closure in accordance with the whooping crane contingency plan (USFWS 2001).

Rationale

The whooping crane is one of the most endangered birds in North America. This species' current population has increased to 509, of which 360 individuals are part of the wild population of whooping cranes.

In addition to occasional whooping cranes, several thousand sandhill cranes stage in the refuges each fall, where they are a relatively popular game species. Because of the often-close interaction between sandhill cranes and whooping cranes and their use of similar habitats, potential exists for a whooping crane to be mistaken for a sandhill crane. In 2004, sandhill crane hunters in Kansas mistakenly shot and killed two whooping cranes near Quivira National Wildlife Refuge. Since 1968, there have been other shooting incidents involving the whooping crane—four in Texas and one in Saskatchewan, Canada (Richard Hinton, Bismarck Tribune, personal communication, 2003). The Service hopes that by informing and educating area hunters about whooping cranes' use of the refuges, it can greatly reduce any risk of an accidental shooting. The Service will consult the whooping crane contingency plan (USFWS 2001) for appropriate actions when dealing with migrant whooping cranes that show potential for remaining in the refuges for multiple days.

Dakota Skipper (Priority Species)

Kellys Slough National Wildlife Refuge is the only 1 of the 12 refuges that is within the range of and has suitable habitat for the Dakota skipper butterfly (federal candidate species). The skipper is a species of concern whose numbers have decreased. Its current distribution straddles the border between tall-grass prairie and mixed-grass prairie. The Dakota skipper occurs in two types of habitat (USFWS 2002):

- Flat, moist, native bluestem prairie in which three species of wildflowers are usually present—stage-wood lily, harebell, and smooth camas.
- Upland (dry) prairie that is often on ridges and hillsides; bluestem grasses and needlegrasses dominate these habitats and three wildflowers are typically present in quality sites—pale purple, upright coneflowers, and blanketflower.

The Dakota skipper's historical range is not known precisely, because extensive destruction of native prairie preceded widespread biological surveys in central North America. Although this butterfly likely occurred throughout a relatively unbroken and vast area of grassland in the north-central United States and south-central Canada, it now occurs only in scattered blanketflower remnants of high-quality native prairie.

Scientists have recorded Dakota skippers from northeastern Illinois to southern Saskatchewan. Dakota skippers now occur no further east than western Minnesota and scientists presume that the species no longer exists in Illinois and Iowa. The most significant remaining populations of Dakota skipper occur in western Minnesota, northeastern South Dakota, north-central North Dakota, and southern Manitoba. Its current distribution straddles the border between tall-grass and mixed-grass prairie ecoregions.

Robert Dana/USFWS

Dakota Skipper Butterfly

Dakota Skipper Objective

At 5-year intervals, reevaluate native prairie portions >80 acres for suitability as Dakota skipper habitat, based on new vegetative species composition data. Manage sites deemed suitable for Dakota skipper (tier 2, after Murphy 2005) in accordance with its habitat needs. Within 5 years of classification, survey sites one or more times to document Dakota skipper presence or absence.

Strategies

- Use data from new belt transects (Grant et al. 2004) to reevaluate vegetative species composition.
- Systematically survey for Dakota skipper using either the checklist or Pollard Walk methods (Royer et al. 1998).
- Contract survey work to qualified lepidopterists.

Rationale

Dakota skipper populations have declined due to widespread conversion of native prairie for agriculture and other uses. This has left the remaining skipper populations isolated from one another in relatively small areas of remnant native prairie. In addition, many of the habitats where the species persists are threatened by overgrazing, conversion to cultivated agriculture, inappropriate fire management and herbicide use, woody plant invasion, road construction, gravel mining, invasive plant species, and historically high water levels (in some areas).

All refuges that have habitat capable of supporting Dakota skippers need to be systematically surveyed in an attempt to document the presence or absence of this species. Periodic reevaluation (every 5 years) of native prairie tracts must be completed to capture changes in vegetative species composition that occur over time as a result of management, climatic changes, or other factors (such as new infestations by invasive plants).

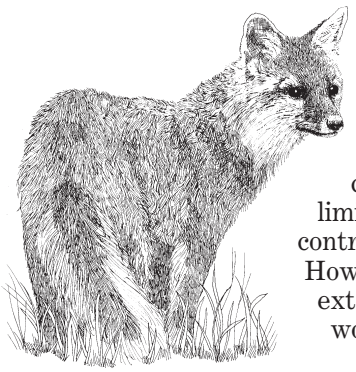
Predator Management

This section describes predator–prey dynamics, related waterfowl nest success, and predator management.

Predator–Prey Dynamics

Across the prairie landscape, grassland and wetland conversions changed the predator–prey relationships and actually bolstered the populations of several waterfowl predators (Sovada et al. 2005). Before settlement, the highest-ranking predator across the landscape was the gray wolf and an occasional grizzly bear. Less abundant were coyote and red fox, while swift fox populations were high.

After settlement, the near elimination of the gray wolf from this area had a profound effect on mesopredators (intermediate predators), especially canids such as the red fox and coyote. Wolves are territorial and intolerant of other canids; thus, fox and coyote abundance was limited and somewhat controlled by wolves. However, after the extermination of gray wolves from the prairie, fox and coyote populations grew. Subsequently, the coyote was targeted with a bounty and populations were driven down. This increased the abundance and distribution of the red fox, which adversely affected waterfowl populations because red fox are a primary predator of nesting waterfowl and eggs (Sargeant et al. 1993, Sovada et al. 1995). Populations of other species that were scarce and narrowly distributed expanded greatly as well, including raccoon and American crow.



The red fox is a primary predator of nesting waterfowl.

Predator species composition is noteworthy because of the impacts on waterfowl survival (Greenwood et al. 1995, Sovada et al. 1995). Franklin's ground squirrel and six carnivores (raccoon, mink, striped skunk, badger, red fox, and coyote) cause most waterfowl depredation (Sargeant and Arnold 1984). Sargeant et al. (1993) determined that predation rates on waterfowl nests early in the nesting season increased simultaneously with the increase in the abundance of red fox, badger, and American crow; whereas, late in the nesting season, predation increased with the abundance of red fox and striped skunk.

Additionally, fragmentation of the landscape caused by loss of wetland and grassland created edge effect that negatively affected many native species and increased predation. Predators live in areas where their needs are met at a more efficient level than by the surrounding landscape (Charnov 1976, Stephens and Krebs 1986). Relating this to the prairie, patchy grassland habitats that are interspersed throughout agricultural lands provide attractive food sources to predators as compared with the surrounding cropland (Greenwood et al. 1999). Charnov (1976) indicates that predators will spend more time in these isolated grassland patches, even considering the increased effort required to access these areas (for example, predators must traverse crop fields, roads, and human dwellings to get to grasslands).

Waterfowl Nest Success

In the Prairie Pothole Region, nest success of upland-nesting waterfowl declined between 1935 and 1992: nest success in 1935 averaged 30% and by the early 1990s it was around 10%. Likely reasons for the decline include habitat alteration, drought, farming practices, nest predation, overhunting, environmental contaminants, and disease (Beauchamp et al. 1996).

In the late 1980s and early 1990s, this area experienced widespread drought, which reduced the already limited wetland habitat available to waterfowl and caused significant reductions in productivity (Samson et al. 1998). Such conditions resulted in poor nesting efforts and success and low survival rates of young (Austin 1998). Varying precipitation characteristic of the area greatly influenced the number and distribution of waterfowl despite restoration and regulatory practices that were becoming more prominent across the landscape (Batt et al. 1989). As an example, before the drought years, most of the area encountered a wet cycle that began in late 1993 and continued through the 1990s. Most populations of waterfowl appeared to recover quickly at the onset of the wet years, with obvious reasons being (1) the increased quality of readily available wetland habitat (Austin 1998), and (2) the large number of cropland acres (about 4.8 million acres in the Prairie Pothole Region) that were converted to perennial grass through the Conservation Reserve Program (Kantrud 1993). Greenwood and Sovada (1996) indicate that other factors likely contributed to the large and rapid recovery of waterfowl following the drought years. Specifically, low red fox populations likely were a significant factor in the increased nest success in ducks, while duck survival was also enhanced by the low mink numbers (Austin 1998). The landscape conditions were ideal for a boom in waterfowl populations—favorable water conditions, reduced predator pressure, and increased availability of upland cover. However, these conditions that favor increased duck numbers appear to be in synchronization

A mallard hen and her brood head for water.

for only a short time following the drought years. Habitats highly dominated by agriculture, which are commonplace across the Prairie Pothole Region of North Dakota, may only generate high duck production for 2–3 years out of 10 (Lynch et al. 1963).

Predator Management

In breeding grounds of cropland-dominated landscapes, wildlife managers must deal with predation issues. The major source of mortality for North American waterfowl during the breeding season is predation (Sargeant and Raveling 1992), with greater than 70% of nest failures attributed to predation (Sovada et al. 2001). Various studies indicate that predator removal increases waterfowl nest success (Mense 1996, Garrettson et al. 1996, Zimmer 1996, Hoff 1999, Garrettson and Rohwer 2001). Sovada et al. (2001) state that extensive predator removal will improve waterfowl productivity. Several other studies document intensive predator removal that can increase duck nest success and brood production (Balser et al. 1968, Duebbert and Lokemoen 1980, Sargeant et al. 1995, Garrettson et al. 1996). In situations where habitat protection and management is not enough to maintain and enhance waterfowl nest success, predator management is an acceptable and viable alternative (Sovada et al. 2005).

In addition to predation of waterfowl, predation of songbirds and other nongame birds is an important cause of nest failure (Martin 1988, 1995). Predator communities in fragmented landscapes such as the Prairie Pothole Region do not provide safe nesting sites for songbirds (Dion et al. 2000). An independent group of ornithologists (Berkey et al. 1993) stated that the following species would benefit from predator fence exclosures designed to reduce the impact of medium- to large-sized mammals: sedge wren, common yellowthroat, dickcissel, clay-colored sparrow, lark bunting, Savannah sparrow, song sparrow, bobolink, and red-winged blackbird. Berkey et al. (1993) concluded that predator barriers (fences) are very beneficial to larger nongame migratory birds such as northern harrier, short-eared owl, and American bittern. Additionally, Helmers and Gratto-Trevor (1996) determined that predation causes a significant impact on shorebird nest success, especially in southern areas of their breeding range. Witmer et al. (1996) indicate that two factors—protection and restoration of habitat and predator management—may curtail listing and extinction rates of bird species.

Predator Management Objective

Annually use at least one predator management technique that, in areas where carried out, will achieve a Mayfield nest success of ≥40% for waterfowl, to help increase recruitment of ground-nesting birds at refuges in cropland-dominated areas of North Dakota.

(Several predator management techniques are available for use in North Dakota; therefore, it is reasonable for each refuge to carry out at least one on an annual basis. Details and background on techniques are documented in Dixon and Hollevoet (2005). In addition, most techniques for predator management are intended to provide a significant benefit to many ground-nesting birds. Therefore, ≥40% Mayfield nest success is intended; this is well above maintenance levels of dabbling ducks that nest in the area.)

Strategies

- Hire professional trappers to trap selected 36-square-mile predator management blocks.
- Carry out predator management activities in the spring on islands associated with refuges.
- Annually maintain established predator exclosures.
- Install and maintain nesting structures.
- Remove artificial microhabitats such as rock piles, abandoned buildings, downed fences, and miscellaneous junk. Remove invasive and planted trees.

Rationale

Wildlife managers in North Dakota are well aware that management of ground-nesting birds requires the protection and restoration of prairie grasslands and wetlands. However, there has been recent emphasis on identification of effective methods that reduce the negative effects of predation on waterfowl and other grassland-nesting birds. The refuges intend to carry out science-based management that will reduce the effects of predation on grassland-nesting birds.

The Red River Valley, Drift Prairie, and eastern portions of the Missouri Coteau lie within a cropland-dominated landscape. The cropland-dominated landscape is an area altered to such a degree that, despite perpetual habitat protection of refuge lands, consistently maintaining recruitment of migratory birds above maintenance levels is not possible. It is likely that this area consists of less than 20%–40% grassland cover, with the majority of the landscape in agricultural commodity production.

Wildlife Disease

There is a wildlife disease contingency plan specific to each refuge (completed in 2006). Each staff will annually review the refuge plan and update it as new information becomes available. Because of emerging disease threats, Service staffs can no longer rely on past informal disease protocols. Two new diseases that have the potential to affect management at the refuges are highly pathogenic avian influenza (HPAI) and chronic wasting disease (CWD).

Wildlife Disease Objective

Annually review and update disease contingency plans.

Strategies

- Follow the monitoring and response protocols outlined in disease contingency plans.
- Maintain a supply of personnel protective equipment on hand for emergency cleanup operations.
- Cooperate with USDA's Animal and Plant Health Inspection Service (APHIS) wildlife services for HPAI, where possible.
- Continue to support the NDGF with CWD surveillance.

Rationale

Bird disease response is a readily evolving process. Prior to 2006 and the present threat level of HPAI in North American migratory birds, most refuges dealt primarily with two diseases in bird communities: botulism and West Nile virus. Although safe handling practices such as rubber gloves have always been used, human health threats are relatively minor from handling birds with botulism (Friend and Franson 1999) and West Nile virus (Domek 1998). However, the highly pathogenic H5N1 strain of HPAI presents Service staffs and other wildlife resource personnel with unknowns, including possibly serious human health threats.

HPAI (bird flu) is a disease caused by a virus that infects both wild birds (such as shorebirds and waterfowl) and domestic poultry. Each year, there is a bird flu season just as there is an influenza season for humans. As with people, some forms of the influenza are worse than others (USGS 2006). Recently, the H5N1 strain of HPAI has been found in an increasing number of countries in Europe, Asia, and Africa. This strain is not present in the United States, but is likely to spread to this country (Dr. Thomas Roffe, veterinarian, USFWS, Montana, personal communication). There are a number of ways that the H5N1 strain could potentially reach the United States including (1) wild bird migration, (2) illegal smuggling of birds or poultry products, and (3) travel by infected people or people traveling with virus-contaminated articles from areas where H5N1 already exists (USGS 2006).

CWD is a disease of the nervous system in deer and elk that results in distinctive brain lesions. CWD has not been detected in either wild or captive white-tailed deer, mule deer, or elk in North Dakota (Dorothy Fecske, furbearer biologist, NDGF, personal communication). The NDGF has conducted surveillance for this disease since 2002, testing tissue samples from more than 8,500 deer heads (mostly hunter-harvested). Through 2006, all samples were negative (NDGF, news release; April 16, 2007).

CWD has been documented in captive deer and elk in the surrounding states (Minnesota and Montana) and Saskatchewan, Canada (Samson et al. 1998). There is potential for CWD to be present, but undetected, or eventually infect deer and elk in the state. Service staff helped NDGF with CWD surveillance efforts by establishing drop-off sites for white-tailed deer (heads) harvested on or near Service lands during the state's firearm deer season. Service staffs will adhere to protocols in the "Chronic Wasting Plan for U.S. Fish and Wildlife Service Lands in the Dakotas" (USFWS 2004) for all future CWD-related work. This plan acknowledges the NDGF as the lead in all CWD efforts in the state and describes the Service's role as a supporting partner.

Monitoring and Research Goal

Use science, monitoring, and applied research to advance the understanding of natural resources and management within the North Dakota national wildlife refuges.

USFWS

The refuge staff monitors grassland and restoration efforts.

Monitoring and Research

Habitat goals and objectives are the basis for monitoring and research priorities for the refuges. Goals and objectives emphasize management of vegetative communities as habitat for wildlife. Monitoring and research should be used to predict and validate wildlife response to management. Too often, biological needs of wildlife species and their habitats receive less consideration than socioeconomic and political factors in the decision-making process. Biology should guide management decisions for the Refuge System.

Most factors that influence the dynamics of wildlife populations, especially those of migratory birds, may not be directly influenced at an individual refuge, but can be influenced indirectly through appropriate or inappropriate management of habitat. Because the CCP is a broad umbrella plan that provides general concepts and specific management and operational objectives for Service lands, it is imperative that step-down plans such as inventory and monitoring plans and habitat management plans are produced. The purpose of step-down plans is to provide detail and clear direction to Service managers and other employees who will carry out the strategies described in the CCP. A habitat management plan provides staff with detailed information about various management practices. An inventory and monitoring plan outlines activities for habitat and wildlife and provides detailed information on methodology and analysis.

Monitoring and Research Objective 1

Within 2 years of CCP approval, establish permanent vegetation monitoring transects to collect baseline floristic composition data for all major plant communities in all refuges.

Strategies

- Establish permanent transects to collect baseline data about plant species composition following standardized methodologies (belt transects [Grant et al. 2004]).
- Conduct periodic (every 5 years) surveys to assess vegetative composition and structure of habitats.
- Enter all inventory and survey mapping into RLGIS.

Rationale

A basic inventory of habitats is the first step in development of detailed objectives describing the desired future vegetation conditions. Permanent vegetation transects, following standardized methodologies across all refuges and that can be repeated periodically, are needed to help assess change over time.

Monitoring and Research Objective 2

Within 2 years of gathering baseline floristic composition data (see monitoring and research objective 1), each refuge will complete a habitat management plan.

Strategy

- Refuge staffs will develop specific habitat goals and objects for priority management units based on data from baseline surveys.

Rationale

Following completion of baseline floristic surveys, managers will be able to identify high- and low-priority native prairie tracts, invasive plant infestations, and wetland vegetation composition. The habitat management plans will identify specific habitat objectives for each refuge. Each plan will also provide detailed information about various management practices (such as timing of prescribed fire; timing and intensity of grazing; timing, application rate, and pesticide type for chemical applications; and water level manipulations). If a separate water management plan is not needed, the habitat management plan will provide guidance for management of wetlands and uplands.

Monitoring and Research Objective 3

Within 1 year of CCP approval, identify and prioritize research needs required to meet the goals and objectives.

Strategies

- Develop a research team with responsibility to identify and prioritize research needs within North Dakota or the northern Great Plains.
- Compile annual progress reports that describe current monitoring and research, results to date, and future projects. Include information on what treatment protocols may or may not have been successful in achieving stated objectives and include plans for future treatments.

Rationale

In 2005, the Dakota Working Group's grasslands monitoring team put together a grassland habitat management/monitoring survey to assess management issues and threats to grasslands in Service lands. The survey resulted in identification of smooth brome invasion as the most common threat to native prairie. Following a 2-day technical meeting, the Brome Summit, to discuss the ecology and control strategies for smooth brome, the grasslands monitoring team started the smooth brome research project. This project is a large-scale investigation of the efficacy and effectiveness of various management treatments used to promote recolonization by native species. The project has the potential to involve all refuges and districts in North Dakota and South Dakota that have intact native prairie or native sod

never broken and cropped. The monitoring team successfully competed for USGS Science Support Program funding to complete vegetation inventories of plant communities on native prairie tracts for most refuges and districts in North Dakota and South Dakota during the 2007 and 2008 field seasons. Completion of all inventories will provide a baseline for monitoring changes and evaluating success of management actions, as well as be used to develop a monitoring plan.

Research needs include information about treatment tools, response to various treatments, and wildlife response as a result of treatments. Wildlife population research should focus on assessments of species–habitat relationships.

Monitoring and Research Objective 4

Over the 15-year life of the CCP, begin at least one monitoring or research project every 2 years that investigates needs identified in monitoring and research objective 3, and apply resulting information in efforts to achieve habitat and wildlife goals and objectives.

Strategies

- Develop a research team with responsibility to develop study plans, apply for funding, and begin the selected research.
- Participate in large-scale monitoring and research projects by providing on-the-ground study plots or indirectly by providing equipment or staff for data collection.
- Design and conduct issue-driven research.
- Focus wildlife population research on assessments of species–habitat relationships.
- Promote research and science priorities within the broader scientific community. Ensure that cooperative research addresses information needs identified in habitat management goals and objectives.
- Annually complete progress reports that summarize the current year's monitoring and research efforts. If applicable, include discussion on past and current techniques that did or did not produce expected results.

Rationale

Knowledge gaps regarding natural resources are many and varied. Investigations must be sufficiently designed, funded, and carried out to reliably address proposed hypotheses or questions. All research needs will need to be prioritized because resources (funding, staff, and equipment) are always limited and oftentimes insufficient. Partnerships will need to be developed for a variety of disciplines from various state and federal agencies and institutions to meet the research goal and objectives. Cooperative efforts will be supported with shared funding, lodging, vehicles, equipment, knowledge, and expertise.

Examples of specific research needs identified during the CCP process include the following:

- Ensure that predator management in blocks does not negatively affect nongame migratory birds: research will determine the nest success of breeding shorebirds and ground-nesting songbirds on controlled and trapped sites within 15 years of CCP approval.
- Ensure functionality of restored temporary and seasonal wetlands: conduct research on appropriate levels of sediment removal in wetlands.
- Ensure that grassland restoration efforts are science based—conduct research on newly seeded sites that focuses on the establishment success of species included in the mixtures. From these data, within 15 years of CCP approval, develop a decision matrix for selection of optimal species to use in grassland restorations.
- Ensure the effectiveness of native seed mixes that contain grasses and forbs—conduct research on wildlife response, focusing on Lepidoptera and grassland-dependent migratory birds (waterfowl, shorebirds, and songbirds) within 10 years of CCP approval.
- Identify restorable prairie tracts using objective criteria that focuses on (1) contemporary composition, emphasizing diversity and prevalence of native plants, and (2) landscape area and connectivity to adjacent grasslands, especially native prairies (large tracts of high-quality native prairie provide the most suitable habitat for grassland birds, especially those species of significant conservation concern)—conduct research in the next decade that investigates threshold levels for infestation of invasive plants.
- Review the list of seven current research needs identified by Naugle et al. (2000), which provides ideas for development of a prioritized research list.

Cultural Resources Goal

Identify and evaluate cultural resources that are on Service-owned lands or are affected by Service undertakings. Protect resources determined to be significant and, when appropriate, interpret resources to connect staff, visitors, and communities to the area's past.

Cultural Resources Objective 1

Avoid, or when necessary mitigate, adverse effects to significant cultural resources in compliance with section 106 of the National Historic Preservation Act, at all times.

Strategy

- Continue cultural resource review of the refuges' projects to identify concerns.

Cultural Resources Objective 2

Always successfully integrate the process for section 106 of the National Historic Preservation Act into all applicable refuge projects by notifying the Service's cultural resource staff early in the planning process and, whenever possible, completing the review without delay to the project.

Strategies

- Incorporate the section 106 of the National Historic Preservation Act review in project design as early as possible and complete the process, as applicable.
- Complete a programmatic agreement with the State Historic Preservation Office to expedite project review.

Cultural Resources Objective 3

Within 3 years of CCP approval, rehabilitate the historic stone bathhouse and two stone outhouses at Lake Ilo National Wildlife Refuge.

Strategies

- Find an architectural student to do the research as an independent study.
- Apply for grants to fund construction.

Rationale

The protection and interpretation of cultural resources is important to the public and the Service. Federal laws and policies mandate the consideration and often the protection of significant cultural resources.

Visitor Services Goal

Provide visitors with opportunities to enjoy wildlife-dependent recreation where compatible and expand their knowledge and appreciation of the prairie landscape and the National Wildlife Refuge System.

Hunting

Since the late 19th century, hunters concerned about the future of wildlife and outdoor tradition have made countless contributions to the conservation of the nation's wildlife resources. Today, millions of Americans deepen their appreciation and understanding of the land and its wildlife through hunting. Hunting organizations contribute millions of dollars and countless hours of labor to various conservation causes each year.

The Service recognizes that, in many cases, hunting is an important tool for wildlife management. Hunting gives resource managers a valuable tool to control populations of some species that might otherwise exceed the carrying capacity of their habitat and threaten the well-being of other wildlife species and, in some instances, that of human health and safety.

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The Improvement Act identifies hunting as one of the six wildlife-dependent recreational uses of Refuge System lands.

Hunting Objective 1

Where hunting is allowed at Audubon, Chase Lake, Lake Alice, Lake Nettie, and Lake Zahl national wildlife refuges (per refuge and state regulations), provide information about current opportunities and maintain a good-quality experience for hunters of waterfowl and other resident species. Within 5 years of CCP approval, increase hunting opportunities by opening new areas if determined compatible.

Strategies

- Limit driving access for hunting by closing some roads. Through visitor contact and hunting information, encourage hunters to walk in to hunt.
- Identify new lands where quality hunts could take place and where hunting is compatible with habitat management objectives.
- Work with the state of North Dakota to determine appropriate hunting levels and evaluate the need to limit the number of hunters.
- If deemed necessary due to increasing hunting pressure and crowds, implement a refuge permit system to control the number of hunters.
- Seek out partners (such as Wheeling Sportsmen and Wilderness on Wheels) to help fund universally accessible visitor service facilities such as blinds and trails.

- Work with the state to establish and coordinate hunter days or events for hunters with special needs.
- Identify areas that are suitable for hunters with special needs and provide universal access to select hunting areas.
- Establish criteria for eligibility to use the special needs hunter privileges such as drive-in access.
- Work cooperatively with the NDGF to conduct law enforcement patrols at the refuges to ensure compliance.

Rationale

Hunting currently occurs at Audubon, Chase Lake, Lake Alice, Lake Nettie, and Lake Zahl national wildlife refuges. The popularity of hunting at these refuges is increasing and, as a result, crowding is becoming an issue that affects the quality of the hunting experience. Crowds of hunters lead to unsafe hunting conditions and compromised harvest opportunities. It is important to disperse hunters to avoid crowded hunting areas. Opening day for pheasant hunting is already very crowded at Audubon National Wildlife Refuge; after the first morning, the hunting pressure lessens.

With a growing number of private property acres off limits to hunting, pressure is intensifying on Service lands. The number of nonresident hunters is also increasing. To ensure a good-quality hunting experience, it will be essential to maintain healthy populations of resident wildlife and migratory birds through habitat management. There is a growing demand for hunting opportunities accessible to hunters with special needs, such as hunters with mobility impairments.

Hunting Objective 2

Within 4 years, expand hunting opportunities for youths to include at least one youth hunt in conjunction with NDGF.

Strategies

- Determine which refuges do not have a youth hunt and which could support a youth hunt.
- Only open areas where hunting is deemed compatible.
- Work with the state of North Dakota to establish a refuge weekend youth hunt in conjunction with the NDGF youth hunts for deer and pheasant.

Rationale

It is important to engage young people in wildlife-dependent recreation and engender enthusiasm and support for hunting, wildlife conservation, and the Refuge System to build a conservation ethic. Early season or preseason hunts are best suited for youth since they provide the best harvest opportunities.

Fishing

The Audubon and Lake Ilo national wildlife refuges offer abundant fishing opportunities. Fishing generates tremendous economic benefit through federal taxes on fishing equipment. Revenues paid by anglers are distributed by the Service to North Dakota's state government and spent by state resource agencies on aquatic habitat enhancement, fishing and boating access, education, and invasive species eradication.

Fishing Objective 1

Within 5 years of CCP approval, evaluate the potential effects of open-water fishing on waterfowl and other wildlife and, where compatible, open new areas to open-water fishing.

Strategies

- Determine if there are times of the year when open-water fishing will not conflict with migratory birds and what types of fishing (such as shoreline fishing) will not impact other wildlife.
- Work with the state to maintain healthy fish populations.
- Seek out partnerships to develop facilities such as piers that accommodate anglers with disabilities.

Rationale

Fishing is available summer and winter. Fishing on the ice in winter is far more popular than fishing during warmer weather. Permanent lakes at Audubon and Lake Ilo national wildlife refuges offer fishing for northern pike, perch, walleye and a few other species. These areas are open to fishing according to state regulations and special refuge regulations.

Fishing Objective 2

Within 5 years of CCP approval, establish clear access points for ice fishing to minimize impacts on upland habitat from vehicles and explore opportunities for opening new areas to ice fishing.

Strategies

- Seek partnerships or alternative funding for establishment of access points. Analyze the area to determine which access points will provide convenient access to the ice while minimizing impacts on uplands and wildlife.
- Follow state regulations for establishment of permanent and portable fishing houses.
- Work with the state to maintain healthy fish populations.

Rationale

Ice fishing is currently permitted at Audubon and Lake Ilo national wildlife refuges. Lake Alice National Wildlife Refuge is interested in exploring opportunities for opening the lake to ice fishing.

Fishing Objective 3

Within 5 years of CCP approval, evaluate opportunities for establishing a youth fishing day at additional refuges in cooperation with the North Dakota's free fishing weekend.

Strategy

– Work with the state to establish a youth fishing day in conjunction with the NDGF's youth program.

Rationale

North Dakota has a statewide free fishing weekend and Lake Ilo National Wildlife Refuge participates in cooperation with the state. The opportunity to expand and develop a closer partnership with the state and its fishing outreach to youth will benefit the refuges' goal to introduce youth to the Refuge System.

Wildlife Observation and Photography

Wildlife observation and photography is available to visitors all year at the 12 refuges. Due to the vast distribution of the refuges throughout North Dakota, the public from major cities of the state and Canada seize on the tremendous opportunities for viewing wildlife resources. Because of the relatively small size of many refuges, wildlife observation and photography can usually be done from rural roads or refuge tour routes. Appendix L contains the compatibility determinations for wildlife observation and photography.

Wildlife Observation and Photography Objective

Throughout the life of the CCP, increase opportunities for wildlife observation and photography by expanding the number of observation facilities such as blinds, tour routes, and trails at the refuges.

Strategies

– Host bird identification events in conjunction with International Migratory Bird Day in May and other special events.

– Recruit volunteers for the Christmas bird count and other birding-related events.

– Incorporate refuges as stops into the North Dakota and regional birding drives. Seek out partners to establish and promote birding drives. Provide support materials to guide visitors through the state and direct them to key birding spots.

– Explore new areas to open to wildlife observation and photography where compatible. Where possible, establish universally accessible observation blinds.

– Identify open observation areas to the public through signage and maps.

– Develop website-based observation materials such as bird lists and information, maps, and web cams.

– Where feasible, develop a simple map for each visitor center where visitors can record what they saw and where (for example, a laminated map that people can write on with a dry-erase marker or magnet board).

– Where feasible, provide a computer kiosk where visitors can access birding information (for example, songs, using Thayer birding software).

Rationale

Wildlife observation and photography are wildlife-dependent recreational uses listed in the Improvement Act. In fiscal year 2007, wildlife photography alone accounted for more than 26,000 visits to North Dakota's refuges and districts. Facilities that support these activities include visitor centers, interpretive displays, auto routes, overlooks and observation platforms, and informational kiosks.

USFWS

Phalarope Chicks Nesting in Wetland Grasses

Environmental Education and Interpretation

Parents, educators and civic groups have been visiting refuges for an educational outdoor experience for many years. Special use permits are available in support of education, and educators are encouraged to use refuges as outdoor classrooms. Educational opportunities are available to public and private schools and home-schools, as well as Scout groups and other interested parties. Appendix L contains the compatibility determinations for environmental education and interpretation.

Environmental Education and Interpretation Objective

Throughout the life of the CCP, develop exhibits, pamphlets, and expanded programming where appropriate to promote public awareness of and advocacy for the Refuge System, refuge resources, and refuge management activities that conserve habitat and wildlife.

Gary Eslinger/USFWS

Monarch Butterfly on Switchgrass

Strategies

- Develop materials such as exhibits and pamphlets, as well as educational programs, that explain the region's conservation priorities and the refuges' resources.
- At refuges without any visitor use infrastructure, develop at least minimal information such as signage and an information kiosk. For some refuges, information kiosks off-site in outlying communities may be a viable option.
- Ensure refuges are signed and that directional signage is in place. Collaborate with the highway department to develop and position signage.
- Complete annual reviews and, if necessary, updates of informational and educational products for the refuges.
- Promote programming that incorporates the Children in Nature initiative in both structured and unstructured ways. Encourage family visits and family awareness of the refuges.
- Work with the North Dakota tourism department to promote the refuges and their resources.
- Keep each refuge website up-to-date.
- Conduct information sharing with the media (for example, local newspapers), chambers of commerce, congressional contacts, and tourism outlets. Focus outreach on wildlife, conservation, and community groups.
- Educate educators, Scout leaders, and others so they can educate their students and group members.
- Seek out partnerships with the Department of Public Instruction to encourage expansion of environmental education programs among local schools. Build on existing relationships with schools for both on-site and off-site programming. Promote education at an early age about natural resources and national wildlife refuges.
- Build on the state's Outdoor Wildlife Learning Site program (Audubon National Wildlife Refuge has an Outdoor Wildlife Learning Site).
- Expand educational and interpretive programming to foster greater visitor awareness and appreciation of refuge habitats.
- Continue to coordinate and promote the junior Duck Stamp program.

Rationale

Targeting teachers within the commuting areas of the refuges is an efficient means of promoting awareness of the refuges and developing support for the Refuge System. The teachers educate the students who, in turn, explain to their families about intact ecosystems and the refuges.

The internet is an increasingly popular source of information and can serve as an excellent and efficient tool for keeping the public informed about programs and resources at the refuges.

Visitor Service Facilities

Environmental education and interpretation are two of the six wildlife-dependent recreational uses listed in the Improvement Act. The refuges and districts in North Dakota received more than 385,000 visitors during fiscal year 2007. Interpretative programs and special events help foster an appreciation, support, and understanding of refuge-specific topics and the Refuge System.

Some refuges have self-guided exhibits, interpretive panels, and brochures to provide educational and interpretive information. Facilities used to support visitor services include visitor center exhibits. However, some contact stations are ill-equipped to handle any exhibits or provide for in-house educational opportunities.

Visitor Service Facilities Objective

Establish a minimum level of visitor use facilities and information: within 10 years of CCP approval, all refuges should have, at a minimum, an entrance sign and information kiosk.

- At Audubon National Wildlife Refuge, within 5 years of CCP approval, design and construct an education center to house exhibits, classrooms, visitor information, and office space.
- At Audubon National Wildlife Refuge, within 3 years of CCP approval, design and construct an amphitheater adjacent to the current educational classroom, construct two observation decks along the auto tour route, and upgrade the Outdoor Wildlife Learning site's trail and interpretive facilities.

- At Chase Lake National Wildlife Refuge, within 5 years of CCP approval, replace or upgrade visitor facilities.
- At Lake Alice National Wildlife Refuge, within 5 years of CCP approval, replace or upgrade visitor service facilities such as information kiosks.
- At Lake Ilo National Wildlife Refuge, within 2 years of CCP approval, replace the fishing pier with an accessible pier and replace the courtesy dock for anglers.

Strategies

- Inventory all refuges to determine the type and location of existing facilities.
- Identify appropriate locations to provide facilities such as hook-ups and amenities to support volunteers.

Rationale

Spread throughout the state, many of the refuges are accessible from metropolitan areas such as Bismarck, Fargo, Grand Forks, and Minot. In addition, the refuges have numerous visitors from the Canadian provinces of Saskatchewan and Manitoba.

The refuges have potential for outreach and education through establishment of new facilities and update of existing facilities. An education center will draw a broader visitor base to Audubon National Wildlife Refuge and expand opportunities to educate people about refuges and resources.

Partnerships Goal

A diverse network of partners join with the North Dakota national wildlife refuges to support research, accomplish habitat conservation, and foster awareness and appreciation of the prairie landscape.

Partnerships

The 12 national wildlife refuges reach across much of the North Dakota landscape and have the potential to affect neighbors and communities. Communication is vital through various outlets, as well as on an individual basis. Refuge staffs participate in local events and activities that maintain and support the refuges' programs.

The Service assigns personnel to the Partners for Fish and Wildlife Program (Partners Program), which is an internal Service partner that works with neighboring private landowners. This program helps with restoration and enhancement of habitat to benefit federal trust species, while also helping Refuge System units through a landscape-scale approach to conservation. The Partners Program provides technical assistance to private landowners to give them the information they need to apply for other habitat improvement programs. In addition, program personnel work with private landowners interested in perpetual conservation easements with the Service to maintain wetland and grassland ecosystems for future generations. Private lands adjacent to Refuge System lands benefit species that require larger landscapes for their survival. These partnerships benefit many sensitive fish and wildlife species.

Partnerships Objective

Join a wide range of partners to support and promote awareness of the Refuge System and foster an appreciation of the grassland, prairie pothole ecosystem. Maintain and, where appropriate, build the North Dakota Education Team, a statewide approach to environmental education.

Strategies

- Work with partners to develop and maintain a statewide approach to environmental education (North Dakota Education Team). If possible, increase the number of Service representatives on the team within 5 years.
- Maintain and build on partnerships with county wildlife clubs. Work with these clubs to maintain trails and interpretive sites.
- Maintain and build on partnerships with county sporting groups. Work with these groups to help with improvements.

Rationale

Many of the refuges' wildlife, habitat, and visitor service programs will not continue without the support from partners. Without partners, many of the habitat protection, restoration, and enhancement projects will go unfunded. Over time, the diversity of wildlife species will begin to decline as habitat became degraded.

Operations Goal

Efficiently employ staff, partnerships, and volunteers and secure funding in support of the Refuge System's mission.

Staff and Volunteers

Operations and visitor services staffs maintain, enhance, and monitor wildlife-dependent operations and recreational opportunities for a diverse audience. Within the 12 refuges, staffs are limited and often shared with other units such as wetland management districts. The demand on the refuges' wildlife resources is increasing through such visitor activities as bird watching, photography, educational activities, and general outdoor appreciation.

Those that volunteer for the Service generally do so in the area of visitor services. Visitor services require extensive Service staff time to coordinate, develop, and maintain. Volunteers ease some of those time requirements.

Volunteers for the refuges are

individuals who want to give back to their communities;

parents who want to be good stewards of the land and set examples for their children;

retired people willing to share their wealth of knowledge;

concerned citizens of all ages who want to learn more about conservation;

passionate people who enjoy the outdoors and want to spread the word about America's greatest natural treasures.

Staff and Volunteers Objective

Within 3 years of CCP approval, identify strategic locations to station outdoor recreation planners to coordinate programming among North Dakota's national wildlife refuges and wetland management districts.

Within 5 years of CCP approval, increase law enforcement staffing to oversee the expanded programs and continue to work with NDGF to enforce regulations.

Within 2 years of CCP approval, recruit volunteers to help with annual events, visitor services, and biological, maintenance and administrative programs.

Strategies

- Work with the North Dakota working group to locate the strategic locations for positioning additional staff.
- Research methods for recruiting volunteers. Determine what other refuges have done to attract and retain volunteers. If possible, tap into existing volunteer networks to recruit volunteers. Determine incentives or benefits for volunteers (for example, privileged access, amenities, and interagency annual parks pass).
- Develop "friends of the refuge" groups to help the refuges (except Audubon and Chase Lake national wildlife refuges, which already have friends groups).

Rationale

The Improvement Act identifies six wildlife-dependent recreational uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation—that receive enhanced consideration over other general public uses in planning and management of the refuges. Other uses can occur but must support a wildlife-dependent recreational use or not conflict with these uses. No use of a refuge can detract from accomplishing the purposes of the refuge or the mission of the Refuge System. North Dakota's refuges and districts received more than 385,000 visitors that enjoyed the some of the wildlife-dependent recreational uses the Refuge System offered.

4.3 Funding and Staff

Goals, objectives, and strategies described in this chapter are based on full, adequate funding and staff. The Service is currently reviewing a staffing model that will revise the basis by which a refuge determines its needed staff. The Service anticipates that, by the time of CCP implementation, the new staffing model will be in effect and all refuges will have a new staff level goal.

A national team of Refuge System professionals developed this staffing model to determine the level of staff needed to most effectively operate and manage the variety of field stations in the Refuge System. The staffing model uses 15 factors that drive workload, including the following: total number of acres, number of easement contracts, number of acres actively managed, level of invasive species, endangered species, biological management and monitoring, wilderness management, visitor services, and maintenance needs. Data for the model was drawn from the Service's "Annual Report of Lands," "Refuge Annual Performance Plan," "Real Property Inventory," and other Service data sources.

4.4 Step-down Management Plans

The CCP for the 12 refuges is intended to be a broad umbrella plan (1) that outlines general concepts and objectives for habitat, wildlife, visitor services, cultural resources, and partnership; and (2) that guides refuge management for the next 15 years. Step-down management plans provide detail needed to carry out specific actions authorized by the CCP. Tables 7–17 list the step-down management plans associated with each refuge (except for Stump Lake National Wildlife Refuge, which is currently under water).

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4.5 Monitoring and Evaluation

Adaptive management is a flexible approach to long-term management of biotic resources. The results of ongoing monitoring activities and other information are evaluated to guide adaptive management over time. Adaptive management is a process by which projects are carried out within a framework of scientifically driven experiments to test the predictions and assumptions outlined in the final CCP (see figure 23, the adaptive management process).

To apply adaptive management, specific survey, inventory, and monitoring protocols will be adopted for each of the 12 refuges. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. If monitoring and evaluation indicate undesirable effects for target and nontarget species or communities, the management projects will be altered accordingly. Subsequently, the CCP will be revised.

Table 7. Step-down Management Plans for Audubon National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	1999	2008
Fishing plan	1960	—
Grassland management plan	1981	—
Habitat work plan (annual)	2007	2008
Hunting plan	1992	—
IPM plan	2002	2008
Law enforcement plan	—	2013
Predator management plan	1988	2010
Safety plan	2006	2011
Sign plan	1984	—
Visitor services plan	2006	2009
Water management plan (annual)	2007	2008
Water management plan (long range)	1983	—

Table 8. Step-down Management Plans for Chase Lake National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	2001	2008
Grassland management plan	—	2011
Habitat work plan (annual)	2008	2009
IPM plan	2005	2010
Law enforcement plan	—	2013
Predator management plan	2004	2010
Safety plan	2006	2011
Visitor services plan	2005	2015
Water management plan (annual)	2007	2008

Table 9. Step-down Management Plans for Kellys Slough National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	2002	2008
Grassland management plan	—	2010
Habitat work plan (annual)	2007	2008
IPM plan	2005	2010
Law enforcement plan	—	2012
Predator management plan	2004	2010
Safety plan	1986	2010
Sign plan	—	2010
Visitor services plan	1993	2015
Water management plan (annual)	—	2015
Water management plan (long range)	—	2015

Table 10. Step-down Management Plans for Lake Alice National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	2002	2008
Grassland management plan	—	2010
Habitat work plan (annual)	2007	2008
Hunting plan	—	2010
IPM plan	2005	2010
Law enforcement plan	—	2012
Predator management plan	2004	2010
Safety plan	1986	2010
Sign plan	—	2010
Visitor services plan	1993	2015
Water management plan (annual)	—	2015
Water management plan (long range)	—	2015

Table 11. Step-down Management Plans for Lake Ilo National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	1999	2008
Fishing plan	1969	—
Grassland management plan	1981	—
Habitat work plan (annual)	2007	2008
IPM plan	2002	2008
Law enforcement plan	—	2013
Predator management plan	1988	2010
Safety plan	2006	2011
Sign plan	1984	—
Visitor services plan	2006	2009
Water management plan (annual)	2007	2008
Water management plan (long range)	1983	—

Table 12. Step-down Management Plans for Lake Nettie National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	1999	2008
Grassland management plan	1981	—
Habitat work plan (annual)	2007	2008
Hunting plan	1979	—
IPM plan	2002	2008
Law enforcement plan	—	2013
Predator management plan	1988	2010
Safety plan	2006	2011
Sign plan	1984	—
Visitor services plan	2004	2009
Water management plan (annual)	2007	2008
Water management plan (long range)	1983	—

Table 13. Step-down Management Plans for Lake Zahl National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	2000	2008
Grassland management plan	2007	2008
Habitat work plan (annual)	2007	2008
Hunting plan	2000	—
IPM plan	—	2008
Law enforcement plan	—	2013
Predator management plan	2004	2010
Safety plan	1995	2011
Sign plan	1987	—
Visitor services plan	—	2012

Table 14. Step-down Management Plans for McLean National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	1999	2008
Grassland management plan	1981	—
Habitat work plan (annual)	2007	2008
IPM plan	2002	2008
Law enforcement plan	—	2013
Predator management plan	1988	2010
Safety plan	2006	2011
Sign plan	1984	—
Visitor services plan	2004	2009
Water management plan (annual)	2007	2008
Water management plan (long range)	1983	—

Table 15. Step-down Management Plans for Shell Lake National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	2000	2008
Grassland management plan	2007	2008
Habitat work plan (annual)	2007	2008
IPM plan	—	2008
Law enforcement plan	—	2013
Predator management plan	2004	2010
Safety plan	1995	2011
Sign plan	1987	—
Visitor services plan	1999	2012

Table 16. Step-down Management Plans for Stewart Lake National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	1999	2008
Grassland management plan	1981	—
Habitat work plan (annual)	2007	2008
IPM plan	2002	2008
Law enforcement plan	—	2013
Predator management plan	1988	2010
Safety plan	2006	2011
Sign plan	1984	—
Visitor services plan	2004	2009
Water management plan (annual)	2007	2008
Water management plan (long range)	1983	—

Table 17. Step-down Management Plans for White Lake National Wildlife Refuge, North Dakota.

Plan Type	*Completion Year*	*Revision Year*
Fire management plan	1999	2008
Grassland management plan	1981	—
Habitat work plan (annual)	2007	2008
IPM plan	2002	2008
Law enforcement plan	—	2013
Predator management plan	1988	2010
Safety plan	2006	2011
Sign plan	1984	—
Visitor services plan	2004	2009
Water management plan (annual)	2007	2008
Water management plan (long range)	1983	—

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4.6 Plan Amendment and Revision

The Service will annually review the final CCP to determine the need for revision. A revision will occur if and when significant information becomes available. The final CCP will be supported by detailed step-down management plans to address the completion of specific strategies in support of the refuges' goals and objectives. Revisions to the CCP and the step-down management plans will be subject to public review and NEPA compliance.

At a minimum, the Service will evaluate the final CCP every 5 years and revise it after 15 years.

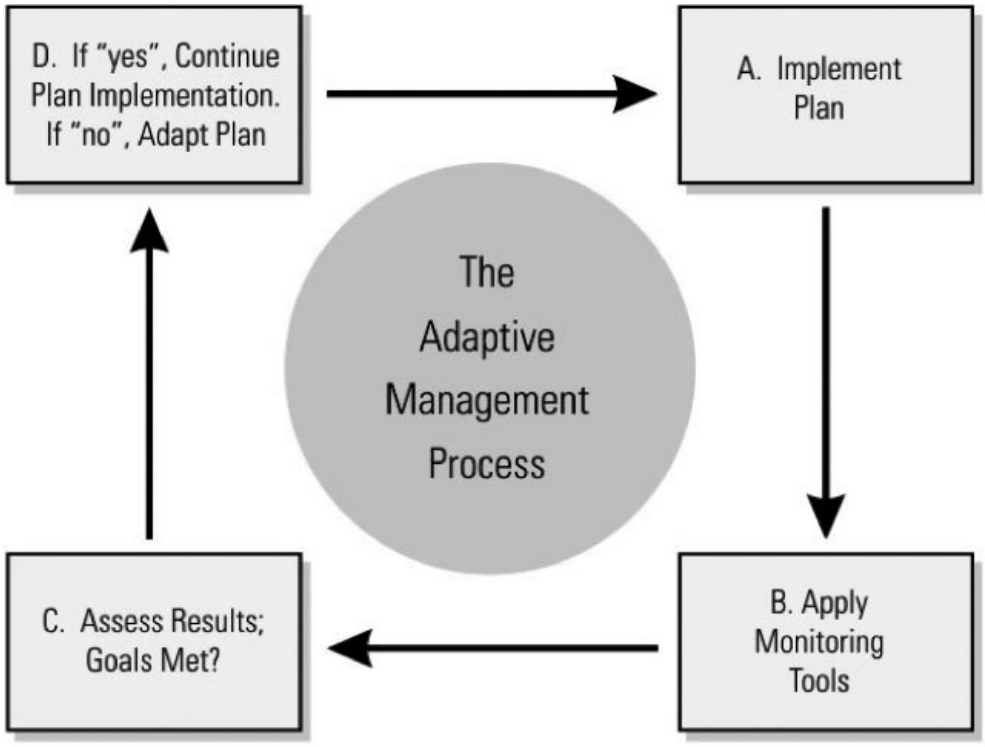

Figure 23. The adaptive management process.