CHAPTER 4— Management Direction

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Expansive grasslands characterize the districts.

The planning team developed objectives in support of goals identified in chapter 2 to carry out the proposed action (alternative B) for management of the Huron, Madison, and Sand Lake WMDs. This chapter presents suggested strategies to achieve objectives; rationale supporting the goals, objectives, and strategies; and assumptions used in developing the plan.

Biological goals and objectives emphasize management of plant communities as habitat for wildlife, especially migratory birds, and are organized by major habitat types that occur in the three districts. Goals and objectives are habitat- rather than wildlife-based, because wildlife often respond to factors beyond control of local refuge management (for example, disease outbreaks or habitat conditions on important staging or wintering sites can affect populations of migratory birds). Furthermore, management practices (such as fire, grazing, haying, tree removal, and water level manipulation) focus on plant communities rather than wildlife populations. Habitat-based objectives emphasize monitoring of important vegetation attributes such as community composition and vegetation structure over time. In most cases, wildlife population responses to habitat changes are not directly monitored. Rather, site-specific inventories, applied research, and literature reviews allow for reasonable predictions of wildlife response to habitat management.

According to Section 7 of Director's Order 172, "Responsibilities of Federal Agencies to Protect Migratory Birds" (USFWS 2004a):

> Many Service programs are actively involved in bird conservation activities. Our objective for migratory bird management and conservation is to minimize the potential adverse effects of migratory bird take, with the goal of striving to eliminate take, while implementing our mission. All Service programs strive to take an ecosystem approach to protection and restoration of species and their associated habitats. As migratory birds is one of our trust resources, all programs must emphasize an interdisciplinary, collaborative approach to migratory bird conservation in cooperation with other Service programs, in addition to other governments, State and Federal agencies, and non-Federal partners. However, we recognize that direct or indirect actions taken by Service employees in the execution of their duties and activities as authorized by Congress may result in the take of migratory birds. In many instances, short-term negative impacts on migratory birds are balanced by long-term benefits. We will incorporate ecosystem integrity, reduction of invasive species, and long-term adaptive management in migratory bird management, using the best available scientific information.

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

- best achieves the districts' purposes, vision, and goals
- helps fulfill the Refuge System mission
- maintains and, where appropriate, restores the ecological integrity of the districts and the Refuge System
- 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 districts, as well as the objectives and strategies that will be carried out to help district staffs achieve the goals. In addition, this chapter includes descriptions of the funding, staff, and stepdown plans needed to meet the goals and objectives. Finally, this chapter briefly describes the monitoring and evaluation of both district resources and this CCP, along with the process to amend or revise the CCP.

The management direction presented here meets the purposes, vision, and goals of the three districts. Objectives and strategies to carry out the goals would support both resource needs and public use.

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

4.1 Management Direction

Management of the three districts would emphasize developing and implementing an improved, science-based priority system to restore native prairie habitats for the benefit of waterfowl, State- and federally listed species, migratory birds, and other native wildlife. District staff would focus on high-priority tracts and, when possible, on medium-priority tracts. The districts' focus would be to restore ecological processes and native grassland species to the greatest extent possible within the parameters of available resources and existing constraints. District staff would seek to maintain the existing levels and types of public use programs, ensuring that programs offered to the public are of consistently high quality.

Native prairie goal

Conserve, restore, and improve the biological integrity and ecological function of the native prairies to support healthy populations of native plants and wildlife and promote the natural role of fire and grazing in shaping and managing these landscapes.

The native prairie objectives address tracts of native prairie on fee-title lands within the districts. Native prairie is defined as native ("unbroken") sod. It exists in all three districts in various acreages and with broad management histories. Most of the northern mixed-grass prairie and tallgrass prairie has 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).

Contribution to ecosystem integrity and conservation of biological integrity are key roles of the Refuge System. Accordingly, the WPAs should contribute to the conservation of native prairies unique to South Dakota.

Prioritization

Waterfowl habitat protection and restoration are the districts' primary emphases. Strategic planning enables the Service to make decisions on what habitats need protection and what landscapes have the greatest value to the health of waterfowl populations. HAPET, based in Bismarck, North Dakota, conducts research and develops predictive models. Through HAPET's research and modeling of the Prairie Pothole Region of South Dakota, the Service can predict duck pair density. This modeling tool provides the Service with information needed to conserve and restore wetland and grassland landscapes that will benefit waterfowl and other bird species. The Service bases its protection priority for wetland and grassland habitat on this modeling effort. The Service's goal is to protect habitat capable of supporting 25 or more breeding duck pairs per square mile. Figure 10 shows the predicted concentrations of duck pairs throughout the districts.

A 2007 report by the Government Accountability Office analyzed the effectiveness of Service acquisitions under the WPA program. As a consequence of this analysis, the Service recently completed a "decision tree" matrix (shown in figure 11) that outlines how to set priorities for grassland and wetland acquisitions. Strategic planning increases the likelihood of making cost-effective decisions by avoiding misapplications of management treatments or investing in areas with limited potential to affect populations. Strategic planning for waterfowl applies not only to native prairie but to planted grasslands and wetlands as well.

Prioritization Objective

Implement the standardized, science-based prioritization decision tree developed for the CCP (figure 11) so

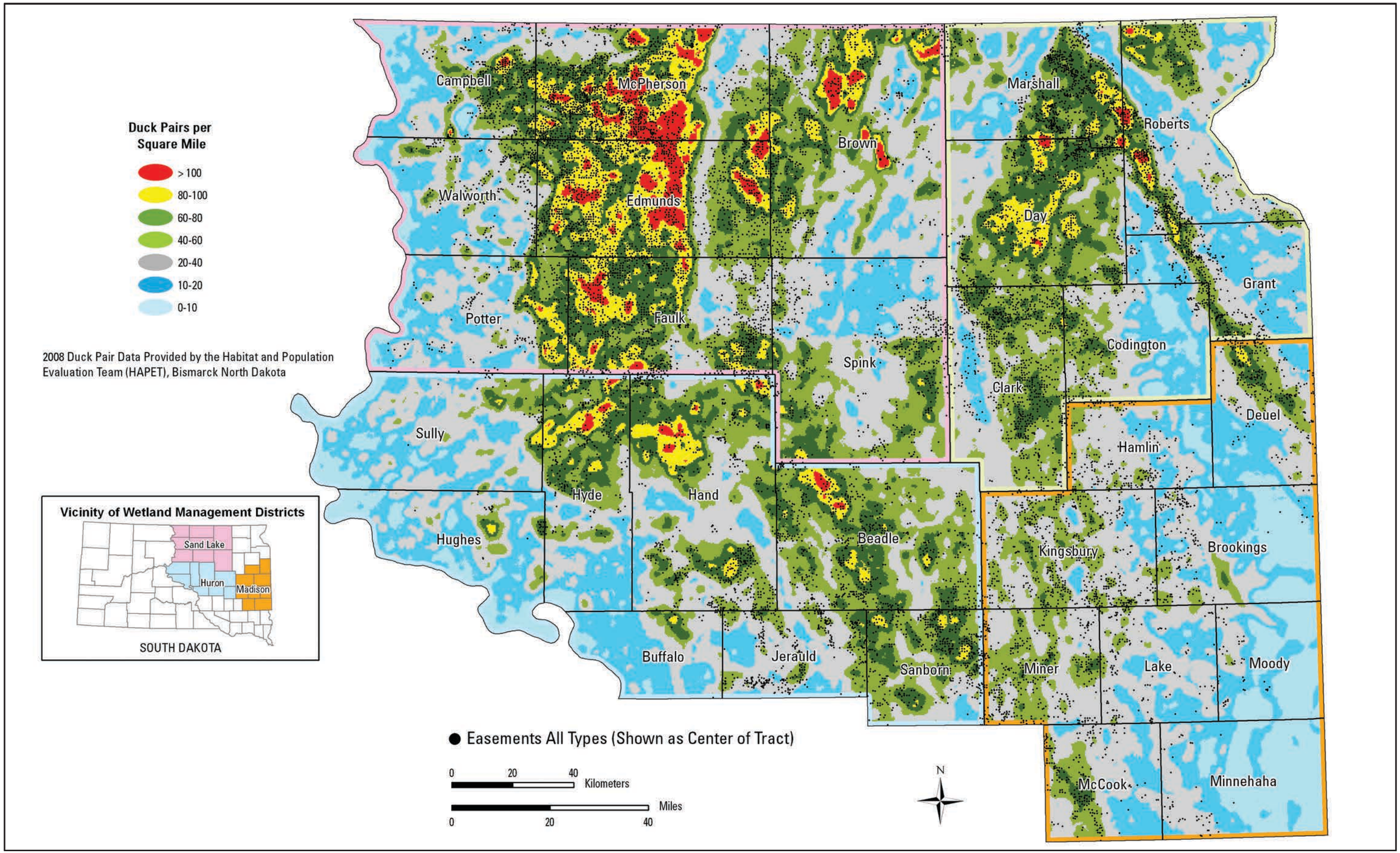

Figure 10. Map of predicted duck-pair concentrations in the three districts, South Dakota.

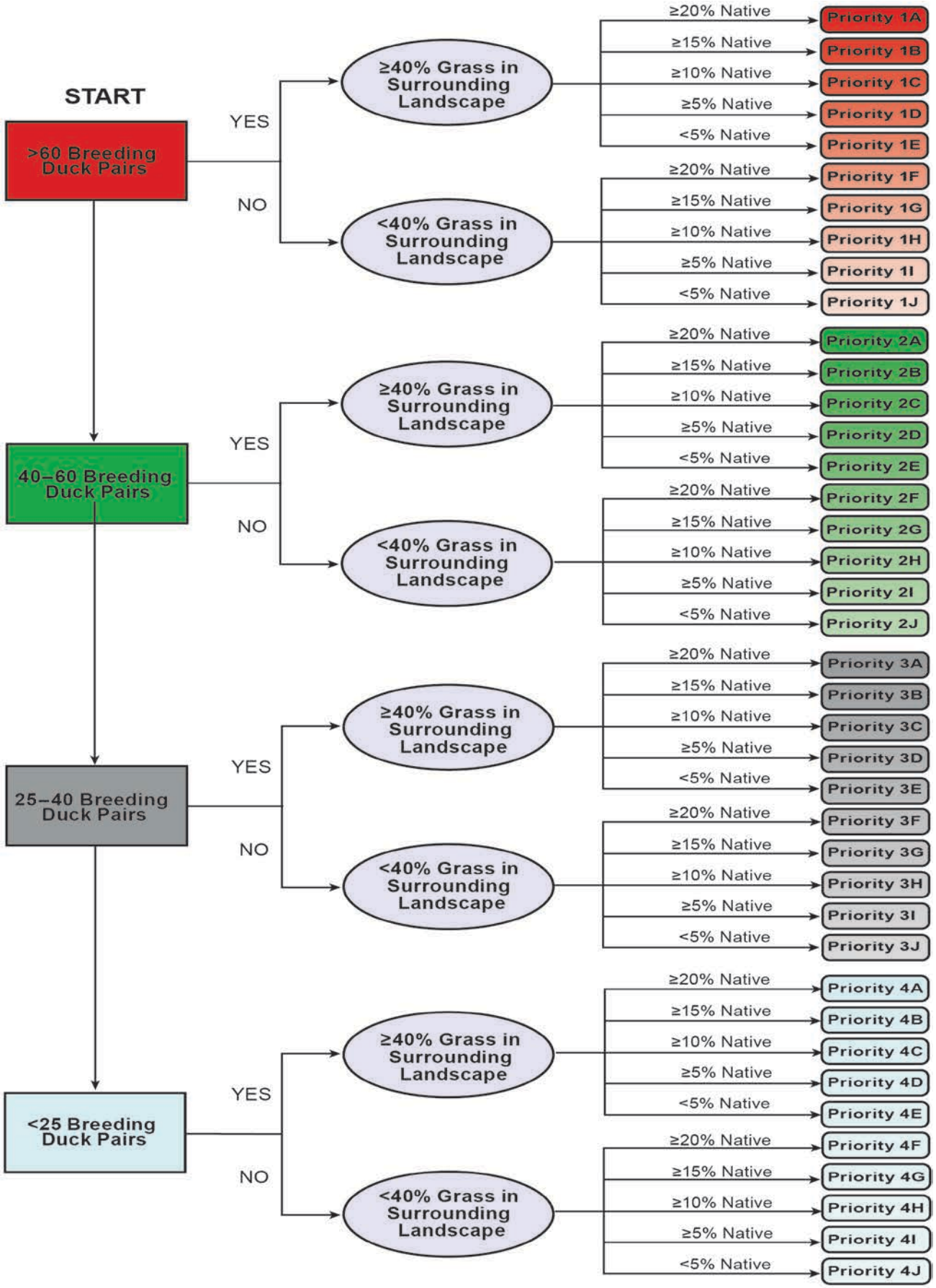

Figure 11. Decision tree for prioritizing management of native sod tracts on WPAs.

that limited funding and management resources are objectively allocated to native prairie tracts according to the potential for that tract to benefit waterfowl and grassland birds. Allocate limited resources to native prairie tracts as discussed in the Native Prairie Restoration Objectives below. Allow each district to further refine the prioritization system as additional biological information becomes available; reevaluate the prioritization system 15 years after CCP approval.

Strategy

Apply multiple selection criteria for prioritizing native prairie tracts according to the decision tree (figure 11) and as summarized below.

1. Primary Criterion—Duck Pairs per Square Mile. This criterion is divided into four levels of priority—≥60, ≥40, ≥25, and <25 duck pairs per square mile—that match the Service's Grassland Easement Priority Zones (Ron Reynolds, USFWS, HAPET, personal communication, 2010).
2. Secondary Criterion—Percent Grass on the Landscape. The surrounding landscape is categorized as high or low grass composition—≥40 percent grass or <40 percent grass. This criterion coincides with requirements for maintenance levels of waterfowl nesting success (Reynolds et al. 2001).
3. Tertiary Criterion—Native Floristic Composition. This criterion is divided into five levels characterizing the percentage of native species in the vegetation community—≥20, 15–19, 10–14, 5–9, and 0–4 percent). Vegetation is characterized by mean frequency (percentage occurrence) of South Dakota Upland Plant Associations (Belt Transect Categories; see appendix I) as described in Grant et al. 2004a.

The result of objectively applying these three criteria using the decision tree (figure 11) is the assignment of a priority level for each tract of native prairie in the three districts (table 8). In all, there are 40 priority levels from Priority 1A to Priority 4J. This provides each district with a range of flexibility in applying the

Table 8. Assigned priority levels according to the decision tree for prioritizing management of native prairie.

County	*WPA*	*Priority code*
Huron WMD		
Hand	Slunecka	1A
Buffalo	Mills	1A
Hand	VenJohn	1B
Hand	Treichler	1C
Beadle	LeClaire	1D
Beadle	Bauer	1D
Sanborn	Winter	1E
Beadle	Yauney	1E
Beadle	Weiting	1E
Beadle	Maga-Ta-Hohpi	1E
Beadle	Shoemaker	1E
Beadle	Ruppel	1E
Beadle	Rogers	1E
Hand	Lingemann	1E
Beadle	Kleinsasser	1E
Beadle	Ingle	1E
Hand	Campbell	1E
Beadle	Cain Creek	1E
Beadle	Boomsma	1E
Beadle	Andressen	1E
Hand	Reinhardt	1E
Hand	Mullenberg	1E
Sanborn	Kraft	1E
Sanborn	Jackson	1E
Hand	Cahalan	1E
Hand	Weideman	1E
Sanborn	Long Lake	1E
Hand	Spring Lake	1E
Jerauld	Johnson	1J
Beadle	Moser	1J
Hand	McGillvrey	2A
Hyde	Cowan	2A
Hyde	Harter	2A
Hand	Boomsma	2C
Hand	Millerdale	2D
Hughes	Robbins	2D
Beadle	LeClaire	2D
Sanborn	Reed	2E
Beadle	Reed	2E
Beadle	Mud Lake	2E
Hand	Johnson	2E
Sanborn	Hoarty	2E
Sanborn	Brandenburg	2E
Hand	Fischer	2E
Sanborn	Linn	2E
Sanborn	Long Lake	2E
Hand	Spring Lake	2E
Beadle	Glanzer	2J
Hughes	Hyde	3A
Sanborn	Zink	3E
Madison WMD		
Deuel	Schafer	1A
Deuel	Coteau Prairie	1A

Table 8. Assigned priority levels according to the decision tree for prioritizing management of native prairie.

County	*WPA*	*Priority code*
Deuel	Eilen	1A
Deuel	Miller	1B
Miner	Sullivan	1D
Miner	North Windedahl	1D
Miner	Hepner	1D
Deuel	Bunde	1E
Kingsbury	R.S. Anderson	1E
Kingsbury	Silver Lake	1E
Miner	Corbin	1E
McCook	Gottlob	1E
McCook	Huls	1E
Miner	Twin Lakes	1E
McCook	Sabers	1J
McCook	Schuldt	1J
McCook	Hamaker	1J
Hamlin	Peterson	2A
Deuel	Nelson	2A
Deuel	Stoltenburg	2A
Lake	Alquire	2A
Deuel	Severson	2A
Moody	Long	2A
Brookings	Goodfellow	2B
Brookings	Errington	2C
Kingsbury	Shutler	2C
Brookings	Bjornlie	2C
Lake	Katke	2C
Brookings	Gerdink	2D
Lake	Murfield	2D
Miner	Raesley	2D
Miner	Foos	2D
Kingsbury	Muser	2E
Brookings	Brush Lake	2E
Brookings	Cotton	2E
Brookings	Lund	2E
Brookings	Eriksrud	2E
Deuel	Adams	2E
Kingsbury	Apland	2E
Kingsbury	Holland	2E
Kingsbury	Neu	2E
Kingsbury	Plum Lake	2E
Lake	Pekarek	2E
Miner	South Windedahl	2E
Miner	Hein	2E
Miner	Johnston	2E
Lake	Lake Henry	2E
Moody	Thompson	2E
Miner	Muller	2E
Brookings	Wenk	2J
Hamlin	Rider	2J
Kingsbury	Hodges	2J
Kingsbury	Katke	2J
Kingsbury	Ratfield	2J
Kingsbury	Williams	2J
Lake	Fischer	2J
Lake	Pearson	2J
Moody	Heinricy	2J
McCook	Reif	2J
Moody	Benson	2J
McCook	Holm	2J
Lake	Cassutt	2J
McCook	Hamilton	2J
Deuel	Nordquist	3A
Hamlin	Cox	3A
Lake	Long Lake	3B
Lake	Madison	3C
Minnehaha	Petri II	3C
Minnehaha	Jordan	3C
Hamlin	Wayrynen	3D
Minnehaha	Wise-becker	3D
Minnehaha	Kindt-Munce	3D
Deuel	Kreger	3E
Brookings	Pittenger	3E
Lake	Wolf	3E
Minnehaha	Island Lake	3E
Minnehaha	Graham	3E
Minnehaha	Petri I	3E
Minnehaha	Acheson	3F
McCook	Lukes	3F
Deuel	Lounsbery	3H
Kingsbury	Schultz	3H
Lake	Gerry	3H
Brookings	Bjornlie	3H
Lake	Katke	3H
Deuel	Bork	3I
Brookings	Dry Lake	3I
Minnehaha	Costello	3I
Brookings	Bolstad	3J
Brookings	Brookings	3J
Moody	Reaves	3J
Moody	Anderson	3J

Table 8. Assigned priority levels according to the decision tree for prioritizing management of native prairie.

County	*WPA*	*Priority code*
Moody	Petsch	3J
Minnehaha	Clear Lake	3J
Minnehaha	Buffalo Lake	3J
Minnehaha	Voelker II	3J
Minnehaha	Lost Lake	3J
McCook	Bank	3J
McCook	Deneui	3J
Minnehaha	Schaefer	3J
Brookings	Kasperson	3J
Brookings	Kasperson	3J
Brookings	Kasperson	3J
Lake	Long Lake	4B
	Sand Lake WMD	
Campbell	Goetz	1A
Campbell	Cooper	1A
McPherson	Anderson-Vilhauer	1A
McPherson	Burrer-Schnabel	1A
McPherson	Dockter	1A
McPherson	Eureka Grazing Association	1A
McPherson	Long Lake	1A
McPherson	Imberi	1A
McPherson	Schafer-Schafer-Hoffman	1A
McPherson	Weisser	1A
McPherson	Woehlhaff-Schnabel	1A
Edmunds	Bowdle Lake	1A
Campbell	Schlomer	1B
Brown	Hayes	1B
McPherson	Buntrock	1B
McPherson	Charley-Harley	1B
McPherson	Rau Lake	1B
Edmunds	Dewald	1B
Edmunds	Hosmer	1B
Edmunds	Schurr	1B
Edmunds	Stephan North	1B
Brown	Proud	1C
Brown	Ristau	1C
Edmunds	Anderson	1C
Edmunds	Stephan South	1C
Faulk	Christianson	1D
McPherson	10/45	1D
McPherson	Cantwell	1D
McPherson	Ehresman	1D
McPherson	Hoffman-Gottleib	1D
McPherson	Klooz	1D
McPherson	Mehlhaff II	1D
McPherson	Perch Lake	1D
McPherson	Schafer	1D
McPherson	Swisher	1D
McPherson	West North	1D
Campbell	BLM-1A	1E
Faulk	Lane	1E
Faulk	Seidschlaw	1E
Faulk	Stephan	1E
Faulk	Waldman	1E
Faulk	Zell Lake	1E
Faulk	Zens	1E
McPherson	Adam-Gienger	1E
McPherson	Bauer-Fischer	1E
McPherson	Schnabel-Hoff	1E
McPherson	Eureka Demonst. Area	1E
McPherson	Feickert	1E
McPherson	Haerter	1E
McPherson	Helfenstein-Opp	1E
McPherson	Heyd Lake	1E
McPherson	Highland	1E
McPherson	Job-Anderson	1E
McPherson	Mehlhaff I	1E
McPherson	Neuharth	1E
McPherson	Schultz-Reinhold	1E
Edmunds	Bierman	1E
Edmunds	Hettich	1E
Edmunds	Kindlespire-Leboldus	1E
Edmunds	Ryman	1E
Edmunds	Mitzel	1E
Edmunds	Rieger	1E
Edmunds	Stotz	1E
Edmunds	Tang	1E
Spink	Jessen	1E
Brown	Lord Lake	1I
Brown	Maunu	1I
Brown	Engle Dam	1J
Walworth	Leibelt	2A
Campbell	Thullner	2E
Campbell	Goehring	2E
Spink	Boekelheide East	2E
Spink	Boekelheide West	2E
Faulk	Voight	2E
McPherson	Mettler	2E
Spink	Hahler-Carda	2J
McPherson	Mettler	3E
Spink	Sanderson, Bruckner	3I

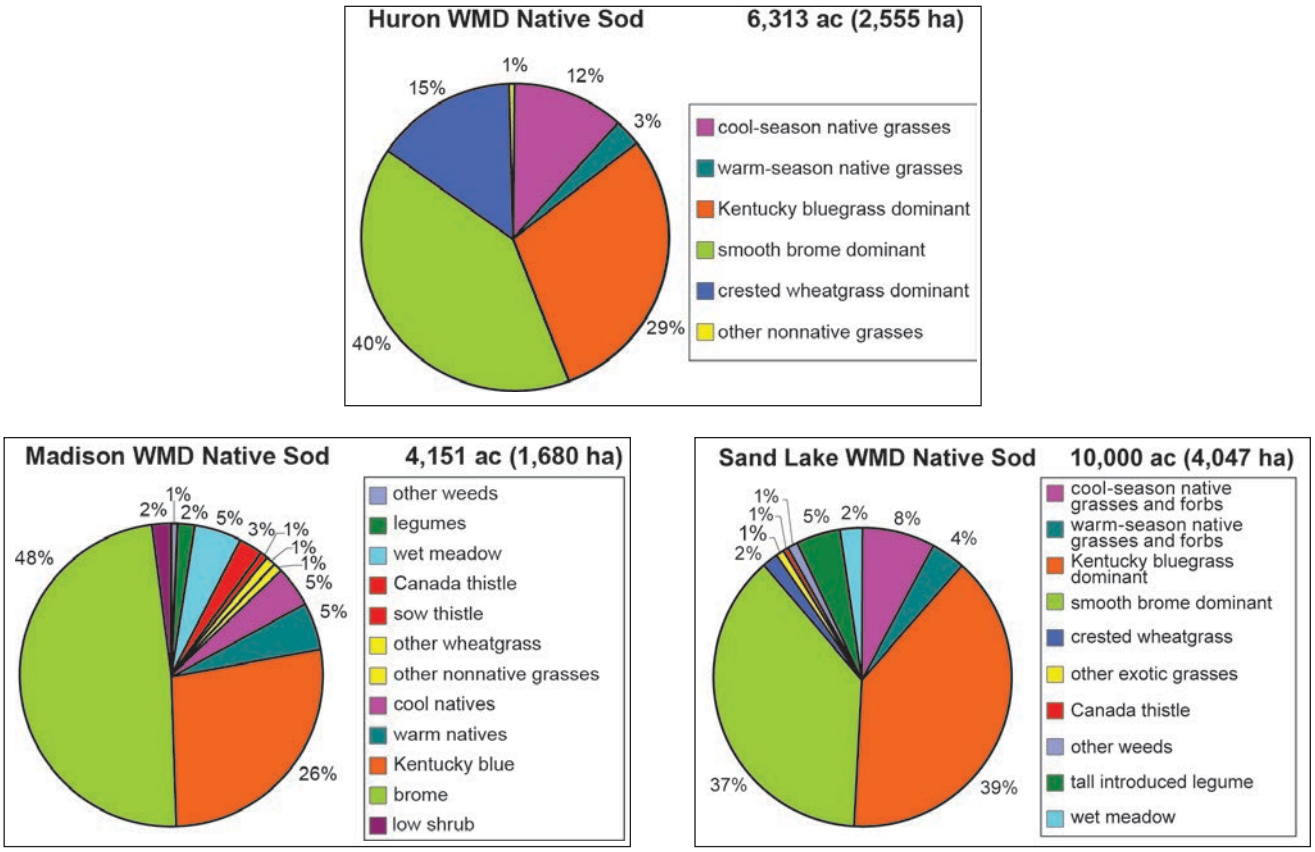

Figure 12. Dominant vegetation community types on native prairie, averaged by district, 2006–2008.

standardized decision tree. Each district is permitted to individually identify high-priority, moderate-priority, and low-priority levels as outlined in the Native Prairie Restoration Objectives below.

Rationale

Most northern mixed-grass and tallgrass prairie has been destroyed. Key roles of the Refuge System include conservation of biological integrity, diversity, and ecological health (USFWS 2001a). Accordingly, the Huron, Madison, and Sand Lake WMDs should contribute to the conservation of native prairie communities.

However, Service-owned native prairie is badly deteriorated, mainly through extensive invasion by introduced, cool-season grasses. Recent inventory data suggest that relatively intact native herbaceous flora is uncommon on Service-owned land in the Dakotas, with few remaining large tracts dominated by native grasses and forbs (Grant et al. 2009). Across-district averages based on current inventory data (2008 for the Sand Lake and Madison WMDs and 2006 for the Huron WMD) indicate that native grasses and forbs comprise 12, 10, and 15 percent of the native prairie, respectively (figure 12).

It is likely that some native prairie in the districts has already passed a threshold—in other words, restoration of a modestly diverse, native herbaceous flora in such areas is an unrealistic and impractical goal. Multiple experiments in the northern Great Plains have found that fire and other control methods such as herbicide applications depend heavily for their success on the presence of a minimum of 20 percent of native species in the matrix (Dill et al. 1986, Willson and Stubbendieck 2000). A grass matrix dominated by a few introduced species inhibits the germination, establishment, and persistence of most native species. However, restoration may be possible on some tracts, especially where native grasses, sedges, and forbs are more common and widespread. Such tracts need to be identified by objective criteria that focus on (1) the diversity and prevalence of existing native plants, and (2) landscape area and connectivity.

Both criteria underlie the quality of nesting habitat for grassland birds, a species guild of significant conservation concern. Grassland birds have become the fastest and most consistently declining guild of birds in North America (figure 13) (Herkert 1995, Knopf 1994, Peterjohn and Sauer 1999, Samson and Knopf 1994, Vickery and Herkert 2001); 48 percent of grassland species are of conservation concern and 55 percent show significant declines (North American Bird Conservation Initiative 2009). As a result, a multitude of grassland-dependent birds are of conservation concern (table 5). Johnson (2006) found that at current rates of decline, within 40 years only 10–25

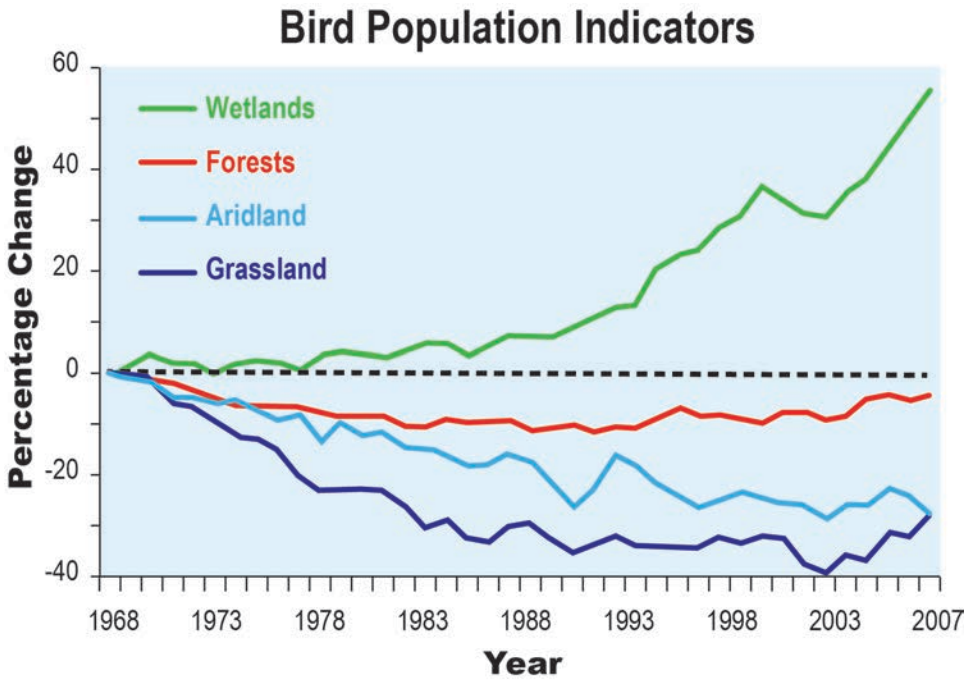

Figure 13. North American bird population indicators based on trends for obligate species in four major habitats.
Source: North American Bird Conservation Initiative 2009.

percent of the population of these grassland bird species will remain. Accordingly, because South Dakota constitutes the central portion of many grassland obligate bird species' geographical ranges (Sauer et al. 2008), managing habitat for grassland birds is of critical importance. Each district has developed a list of focal species it is best positioned to help protect and maintain on the basis of the species' geographic ranges and specialized habitats (table 6).

A recent evaluation of habitat use and requirements for grassland bird species of greatest conservation need in central and western South Dakota provided the following recommendations to managers for preservation and restoration of grassland habitat to help maintain populations of grassland obligate bird species.

To maintain current populations and species diversity, it is critical that managers preserve as much native grassland as possible. Due to the diverse habitat requirements of these species of concern, grasslands should be under varying management regimes including rest, grazing (in varying intensities), mowing, and prescribed burning. Reduction and removal of exotic plant species should be a key element in establishing habitat for grassland obligate species as many were negatively affected by increases in exotic plant coverage. Preserved patches should be large in size as some species were area sensitive and preferred patches ≥250–1,600 ha. Grassland patches should also have little to no woody edge. Finally, these patches should be located in close proximity to one another, or in areas of little fragmentation, to help increase the amount of grassland habitat in the landscape, as many of these grassland bird species were positively associated with the landscape variables, some up to 3,200 meters (Greer 2009).

A fundamental assumption is that, under current management—which lacks an objective, science-based system of identifying and prioritizing restoration of native prairie tracts—native herbaceous flora would continue to decline and disappear. Implementation of the Prioritization Objective and its supporting strategy would improve the chances that some native prairie would be restored.

Native Prairie Restoration

Native Prairie Restoration Objective 1

On high-priority native prairie tracts, apply frequent and precisely timed disturbance (principally fire and grazing) to restore vegetation to the following standards within 15 years of CCP approval. This would provide habitat for most wildlife species that were characteristic of South Dakota's eastern prairie regions.

- At 5-year intervals, increase the composition of natives by at least 5 percent.
- At 5-year intervals, maintain or decrease levels of smooth brome to the Huron WMD's 2006 baseline levels and to the Madison and Sand Lake WMDs' 2008 baseline levels.
- No planted shelterbelts or invasive volunteer trees, whether nonnative (such as Russian olive or Siberian elm) or native (such as eastern red cedar), exist on the landscape.

Strategies

- On high-priority tracts, disturb the vegetation, typically using livestock grazing or fire, at least 2 of every 3 years.
- Actively participate in the NPAM project throughout its duration to maximize understanding of best management practices (BMPs) for restoration.
- Reseed adjoining old cropland units into native vegetation that includes cool-season and warm-season grass components, as well as a native forb component. Manage these intensively, in concert with the high-priority tracts they adjoin, to sustain a native-dominated flora and to reduce sources of invasion by introduced cool-season grasses and noxious weeds (see Tamegrass Objective 1).
- Experiment on low-priority tracts with new or high-risk restoration methods for use on high-priority tracts.
- Experiment with control of introduced, cool-season grasses and subsequent release of native plants on a small, localized scale with selective herbicide treatment.
- Periodically survey for noxious weeds. Use herbicides, mechanical treatment, or biological control as needed, especially along boundaries with private lands.
- Avoid herbicides that are unnecessarily detrimental to native forbs. Stay abreast of advancements in chemical herbicides that increasingly do a better job of targeting State-listed noxious species while leaving desirable native forbs unharmed.
- Remove local human disturbances and artifacts of twentieth-century origin. These include rock piles, junk piles, and old machinery. Restore such sites as close as possible to their original condition.
- Experiment with noninvasive methods to interseed native plants into heavily invaded native prairie, such as prescribed fire followed by seeding with a grass drill.
- *NOTE: Service policy regarding refuge management implicitly promotes seeding to reestablish native plants in native prairie where such plants have become rare or absent (National Wildlife Refuge System Biological Integrity, Diversity, and Environmental Health [BIDEH], 601 FW 3, 2001).*

Rationale

Native Prairie Restoration

One of the most important management standards of the Improvement Act is a provision directing the Secretary of the Interior to "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans" (ecological integrity provision). With the exception of the Refuge System mission, the ecological integrity provision is the most important and pervasive provision of the Improvement Act. Maintaining the biological integrity, diversity, and environmental health of protected lands is a fundamental concept widely recognized as basic to modern scientific resource management, and by virtue of the Improvement Act, the Service now has a fundamental legal duty to do so.

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The short-eared owl is a focal grassland species.

This objective focuses on restoration and maintenance of the floristic composition on tracts identified as high priority on the basis of criteria used to determine their restoration potential.

A fundamental assumption is that, with continued management focused on vertical structure over other prairie qualities and values, native herbaceous flora would continue to decline and disappear on native prairie tracts. Native Prairie Restoration Objective 1 would improve the chances that some native prairie would be restored on high-priority tracts by applying frequent and precisely timed disturbance.

Over the last several decades, rest (that is, lack of grazing, haying, and prescribed fire) was emphasized as a management approach to increase densities of duck nests in uplands on WPAs in the Dakotas. In the short term (2–20 years), greater vertical structure may be maintained in northern grasslands that are rested. The structure of such idle vegetation is believed to be more important than plant species composition when the management goal is waterfowl production, in part because the density and survival of nests of prairie ducks are believed to be greatest on rested grasslands (Naugle et al. 2000, Schranck 1972).

However, a management approach for upland-nesting duck habitat that emphasizes rest has long-term implications that are often overlooked in short-term management studies, because continuous idling without periodic defoliation disturbance fails to promote long-term grassland health (Naugle et al. 2000). With extended rest, introduced grasses, especially smooth brome and Kentucky bluegrass, may more rapidly

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Prairie habitat on the Slunecka Waterfowl Production Area.

displace native vegetation (Murphy and Grant 2005). Monotypic stands of smooth brome and Kentucky bluegrass are less attractive to upland-nesting ducks than other types of grass-forb cover (Nenneman 2003).

Studies conducted on exotic plant species and habitat quality for grassland birds have shown that grassland bird species richness and/or abundance are lower in grasslands dominated by exotic species than in grasslands containing native species (Bakker and Higgins 2009, Greer 2009, Lloyd and Martin 2005, Pampush and Anthony 1993, Wilson and Belcher 1989). Recent South Dakota research reported that increasing coverage of grasslands by exotic plant species had a negative effect on the occurrence and/or densities of four of South Dakota's species of greatest conservation need—chestnut-collared longspur, western meadowlark, grasshopper sparrow, and lark bunting (Greer 2009). Bakker and Higgins (2009) found that intermediate wheatgrass monotypes and cool-season mixes of exotic species in South Dakota contained 40–60 percent fewer grassland bird species than did native sod prairie. Ribic et al. (2009) found that grasshopper sparrows occurred in higher densities in native prairie remnants with greater native plant coverage than in CRP fields or hay fields containing greater amounts of exotic species. Increased vegetative heterogeneity in tracts of native sod prairie may support more arthropod prey for grassland birds (Hickman et al. 2006, McIntyre and Thompson 2003); arthropod prey diversity is positively associated with grassland bird richness (Hamer et al. 2006).

Losses of plant, bird, and arthropod species diversity are not the only consequences when introduced plants invade northern prairie. The long-term effect of introduced perennials does more than simply determine species composition; it also affects ecosystem processes (Wilson 2002). Ecosystem processes such as nutrient cycling and water-use patterns in prairies dominated by smooth brome and Kentucky bluegrass differ from those in native grasslands (Hunt et al. 1991, Trlica and Biondini 1990). Nutrient pools, energy flows, soil invertebrate and mycorrhizal relationships, and the water cycle can all be altered significantly (Christian and Wilson 1999, Seastedt 1995, Vinton and Goergen 2006, Wilson 2002).

In efforts to emulate these natural regimes that sustained wildlife populations prior to pioneer settlement, land managers must attempt to simulate the ecological processes that maintained the habitat prior to settlement. A strategy to improve competitive advantages of native herbaceous plants should match the types, timing, and frequencies of prescribed disturbances to those under which these plants evolved. Several sources indicate that native grasslands devoid of grazing and fire deteriorate quickly (Anderson et al. 1970, Kirsch and Kruse 1973, Kirsch et al. 1978, Schacht and Stubbendieck 1985). The grasslands function similarly to living organisms in that they respond to activities within the ecosystem. Specifically, the forbs and grasses covering the landscape have developed biological adaptations to thrive in the presence of herbivory and fire. Wildlife managers use various tools—including prescribed fire and prescribed grazing—to emulate the defoliation process with which prairie plants evolved. The frequency of certain activities depends on the particular habitat components. For instance, a pristine native prairie tract may require a burn every 3–5 years and intermittent, prescribed grazing of domestic cattle, whereas areas that are heavily invaded require more frequent management treatments. Prescribed burning, mowing, and herbicide application can reduce the abundance of smooth brome, but without sustained control efforts, the species is remarkably persistent (Willson and Stubbendieck 2000).

In determining restoration actions, vegetation composition is considered along a habitat continuum, where plant communities can be separated by degree of invasion by undesirable plants. A continuum for native prairie in eastern South Dakota (beginning with the least desirable vegetation) could be shown as: noxious weeds (e.g., Canada thistle or leafy spurge) → nonnative, woody species (e.g., Russian olive, Siberian elm) → invasive, volunteer woody species (e.g., eastern red cedar) → smooth brome → Kentucky bluegrass → native low shrubs (e.g., western snowberry) and native herbaceous vegetation. With management, less desirable plant species are replaced by more desirable plant groups. For example, it is acceptable in the short term to increase Kentucky bluegrass in areas where leafy spurge is reduced. Conversely, replacement of Kentucky bluegrass by smooth brome is undesirable.

Therefore, restoration management should focus more on strategies to reduce smooth brome. Smooth brome generally seems more difficult to control than other introduced cool-season grasses (Murphy and Grant 2005). Smooth brome, Kentucky bluegrass, and crested wheatgrass are all "strong invaders" (Ortega

An upland sandpiper surveying its habitat from a convenient vantage point.

and Pearson 2005), able to become community dominants and form nearly monospecific stands. However, smooth brome more significantly alters the quality and structure of native prairie than does Kentucky bluegrass (Blankespoor 1987); may have a competitive advantage over native grasses, particularly in high nitrogen soils (Vinton and Goergen 2006); and can modify soil microbiota to directly facilitate its own invasion and subsequently impede restoration of native communities (Jordan et al. 2008).

A strategy to decrease the competitive abilities of Kentucky bluegrass and smooth brome should focus on the combined use of prescribed fire and prescribed grazing. Kentucky bluegrass responds well to fire, decreasing in abundance as fire frequency increases until it is nearly absent in annually or biannually burned plots in both low-productivity (Knops 2006) and high-productivity prairies (Smith and Knapp 1999, Towne and Owensby 1984). Fire has the greatest negative effect on Kentucky bluegrass during stem elongation or in dry years (Murphy and Grant 2005). Conversely, Kentucky bluegrass tends to increase under prolonged rest or with grazing (Murphy and Grant 2005). 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 (also reviewed in Murphy and Grant 2005). Periodic monitoring will ensure that the appropriate management treatment is applied for the invasive species and severity of the infestation on the given management unit.

Historically, the prairie was a treeless landscape. Trees and tall shrubs can diminish the survival of nests of grassland birds by harboring potential nest predators. They also provide perches from which brown-headed cowbirds can find other species' nests in which to lay eggs. Relatively small areas of tall woody vegetation can effectively fragment grassland habitats and cause many grassland bird species to avoid entire landscapes. Based on these findings, elimination of tall woody cover is a logical strategy for restoration of landscape structure and plant community composition, as well as a means to improve the attractiveness and security of the habitat for a variety of grassland-breeding bird species.

Wildlife Response

Although the focus of this objective is the restoration and maintenance of floristic composition in native prairie, wildlife would also benefit. The contemporary breeding bird community on WPAs in eastern South Dakota is characterized by species that tolerate introduced, cool-season grasses and relatively tall, dense, herbaceous cover. Habitat for a broader array of northern prairie birds (including several endemics and other species characteristic of the historical native prairie community) may be significantly increased by providing frequent disturbance and the resulting increases in early successional stages.

Nevertheless, there are often tradeoffs in wildlife response to consider when reintroducing major habitat disturbances such as fire and grazing; short-term losses should be weighed against net gains over longer periods. For example, management treatments might influence the survival of grassland bird nests—directly by burning nests or through livestock trampling, or indirectly through increased predation or brood parasitism rates—when nest site vegetation is modified by fire or grazing.

Despite declines in densities during the first growing season following a prescribed burn, Murphy et al. (2005) found that most species of breeding grassland birds in northern mixed-grass prairie are adapted to recurring fire (every 4–6 years) by nesting in unburned patches and returning to pre-burn levels of abundance and nest density after the first growing season. Further, the authors found that fire had almost no discernible impact on nest survival for all species of grassland birds examined, with the exception of the Savannah sparrow in the first post-burn growing season.

Murphy et al. (2005) found similar results for waterfowl; duck nest densities were reduced during the first growing season following a fire, but recovered 2–3 years post-fire. Similarly, Kruse and Bowen (1996) found that grazing alone reduced nest densities during the grazing years, but the vegetation and ducks recovered quickly after grazing ended. However, studies of nesting success have reported neutral to positive responses of waterfowl to grazing and prescribed fire. Murphy et al. (2005) found greater nest survival for mallards and gadwalls during the first post-fire growing season than in subsequent years and no fire effects on nest survival in other duck species, regardless of how recently fire had occurred. Kruse and Bowen (1996) found that waterfowl nest success was not influenced by burning and grazing treatments, while several studies have reported greater nesting

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A badger on the move in prairie habitat.

success in grazed grasslands than in other habitats in the Prairie Pothole Region (Barker et al. 1990, Greenwood et al. 1995). Warren et al. (2008) found that nesting females were most successful at sites with above-average vegetation density that are in fields with increased grazing intensity (that is, nesting in clumps of vegetation in areas more generally characterized by low levels of residual cover). Grazed areas may attract fewer predators because of low densities of some types of prey, such as small mammals (Grant et al. 1982, Runge 2005); less cover for concealment; or both. Higher nesting success in grazed fields may occur because predators respond negatively to low prey density (Clark and Nudds 1991, Lariviére and Messier 1998).

Native Prairie Restoration Objective 2

Moderate tracts are managed as high-priority tracts as funding and staff time permits. In years with insufficient budgets or staff resources, moderate tracts are managed as low-priority tracts.

Native Prairie Restoration Objective 3

On low-priority native prairie and smooth brome–dominated tracts, apply disturbance approximately every 4–7 years to remove plant litter, restore plant vigor, reverse woody plant expansion, and provide a mix of structural types that include (1) tall/dense vegetation for species such as mallard, northern harrier, gadwall, and bobolink; (2) vegetation of medium height and density for species such as blue-winged teal, short-eared owl, northern shoveler, northern pintail, and grasshopper sparrow; and (3) relatively short/sparse vegetation for species such as upland sandpiper, willet, marbled godwit, and chestnut-collared longspur.

There is almost no monitoring of vegetation on these tracts except for routine, cursory surveillance for noxious weeds. Nevertheless, knowledge of the relationship between disturbance (that is, any management treatment or natural event that results in the significant removal of vegetative biomass) and the resulting post-disturbance vegetation structure enables land managers to predict the habitat conditions described below. Vegetation should exhibit these characteristics within 15 years of CCP approval.

At least 50 percent of the total acreage of low-priority native prairie is in a condition of 4–7 years post-disturbance, at least 25 percent is in a condition of 2–3 years post-disturbance, and less than 25 percent is in a condition of 0- to 1-year post-disturbance. These characteristics correspond roughly to structural categories, measured as visual obstruction reading (VOR) of at least 7 inches, 4–7 inches, and less than 4 inches (Robel et al. 1970). Such a distribution, or mosaic, of structural conditions is desirable to meet the needs of a wide array of grassland-nesting birds (figure 14).

No invasive, volunteer trees exist on the landscape, whether nonnative (for example, Russian olive, Siberian elm) or native (for example, eastern red cedar). Removal of shelterbelts is not required as it is on high-priority tracts.

Strategies

- Manage tracts or portions of tracts with prescribed fire, grazing, or haying.
- Burn opportunistically at any time, mainly to remove litter and control invasive, volunteer trees. Similarly, utilize livestock grazing with wide latitude on timing, intensity, and duration, mainly to remove litter and promote tillering (sending forth new shoots that sprout from the base of a grass) to improve plant vigor.
- Experiment on low-priority tracts with new or high-risk restoration methods, including seeding or "interseeding" of native grasses and forbs, mainly to help develop effective restoration approaches for high-priority units.
- Periodically survey for noxious weeds. Use herbicides, mechanical treatment, or biological control as needed, especially along boundaries with private lands.
- Avoid herbicides that are unnecessarily detrimental to native forbs. Stay abreast of advancements in chemical herbicides that increasingly do a better job of targeting State-listed noxious species while leaving desirable native forbs unharmed.
- Remove invasive, volunteer trees with a chainsaw, roller chopper, or other effective method of mechanical removal. Individual volunteer trees should be checked for the presence of migratory birds nests before removal. All tree removal activities will be conducted in accordance with the September 23, 2010, policy and guidance (appendix J).

Rationale

By 2 years after CCP approval, district staff would have identified high-priority native prairie tracts to manage for biological integrity, ecological diversity,

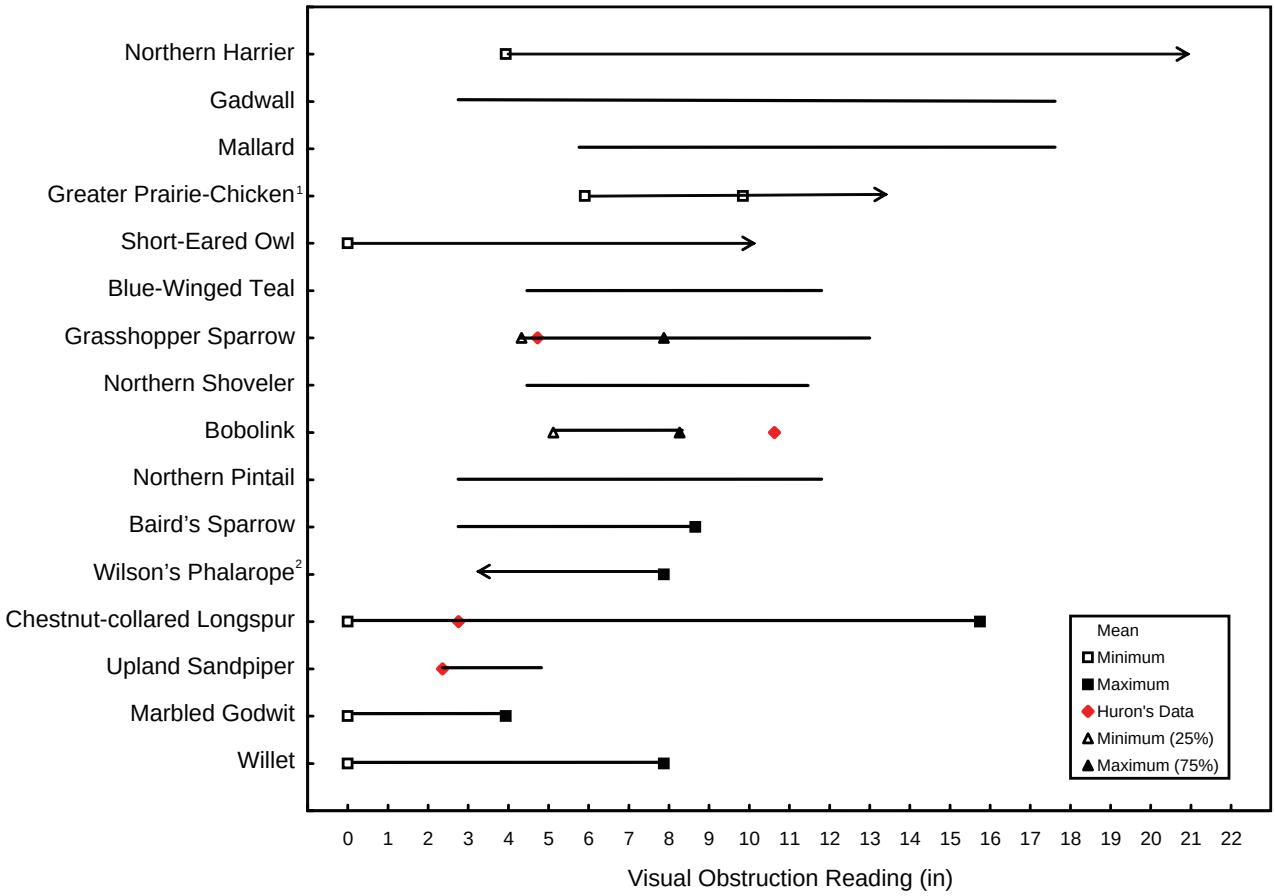

Figure 14. Quantitative measurements of visual obstruction readings of upland-nesting species.
Source: Laubhan et al. 2006, except [1]Svedarsky et al. 2003 and [2]Dechant et al. 1999.

and environmental health. This would improve the chances of restoring at least some native prairie by more intensively managing these areas. It is likely that low-priority native prairie tracts have already passed a threshold—in other words, restoration of a modestly diverse, native herbaceous flora in such areas is an unrealistic and impractical goal. However, with modest effort, the prevalent, introduced cool-season grasses can be managed to provide structural diversity, emphasizing structure that is tall/dense to medium for nesting waterfowl and apposite grassland-dependent birds.

Structural habitat preferences of bird species vary widely. It is assumed that the needs of all species would not be met on a single tract or management unit, but rather the needs of various species groups would be met by providing a mosaic of vegetative structures (tall/dense, medium, and short/sparse) across many tracts in the districts. Because WPAs are "waterfowl first" lands, it is appropriate to manage for a high percentage of tall/dense and medium VOR acres (at least 50 percent and at least 25 percent, respectively) and low percentage of short/sparse VOR acres (less than 25 percent). South Dakota's five most abundant species of upland-nesting ducks (gadwall, mallard, blue-winged teal, northern shoveler, and northern pintail) prefer vegetation structure (as defined by VORs) in the medium (4–7 inches) and high (more than 7 inches) categories (Laubhan et al. 2006).

Management of low-priority units for taller, denser vegetation (see Planted Grassland Objectives) can increase grassland habitat diversity across WPAs by providing a tallgrass prairie component for waterfowl. This may be increasingly important as vegetation height and density are reduced on much of the high-priority units. Such reduction results from the frequent and intensive management treatments to effectively restore native prairie and address the needs of a broader suite of grassland birds.

Dakota Skipper

The Madison and Sand Lake WMDs contain habitat suitable for Dakota skipper; occurrences are documented in Edmunds County in the Sand Lake WMD and Hamlin and Deuel counties in the Madison WMD (figure 15). Dakota skipper is likely to occur only in scattered remnants of high-quality native prairie across a vast area of grassland in the north-central United States and south-central Canada. The most significant remaining populations occur in western Minnesota, northeastern South Dakota, north-central

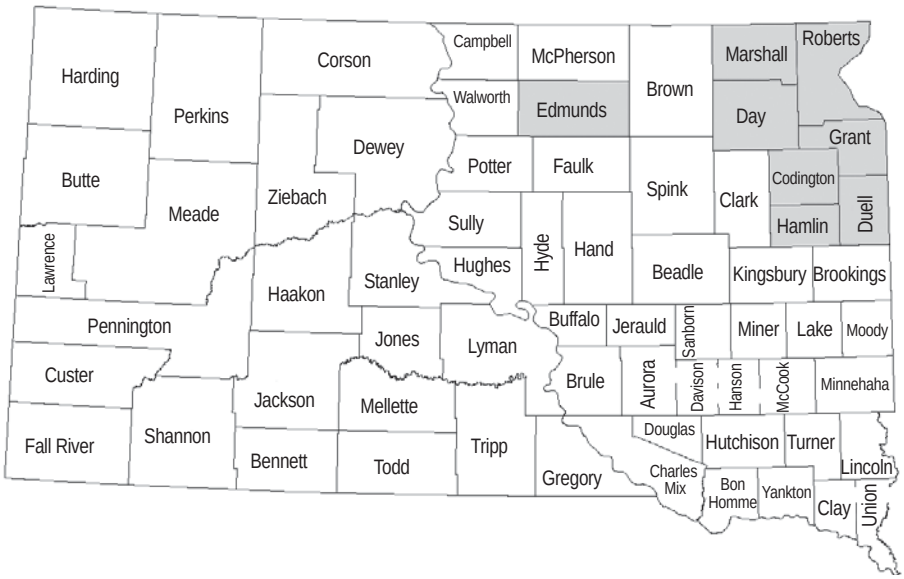

Figure 15. Known Dakota skipper locations (shaded) in South Dakota by county. *Source: USFWS 2002b.*

North Dakota, and southern Manitoba. The species' current distribution straddles the border between tallgrass and mixed-grass prairie; it occurs in two types of habitat (USFWS 2002a):

- Flat, moist, native bluestem prairie in which three species of wildflowers are usually present—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 coneflower, upright coneflower, and blanketflower.

Dakota skipper is a candidate for listing under the Endangered Species Act. Candidates are species for which the Service has information to support the listing of this species, but other species have higher priority for listing. Dakota skipper received a priority of 11 on a scale of 1–12.

Dakota Skipper Objective

At 5-year intervals, reevaluate native prairie areas larger than 80 acres in WPAs for suitability as Dakota skipper habitat on the basis of new species composition data. Manage sites deemed suitable for Dakota skipper (tier 2, after Murphy 2005) in accordance with its habitat needs, according to "The Conservation Strategy & Guidelines for Dakota Skippers on Service Lands in the Dakotas." Within 5 years of classification, survey sites one or more times to document Dakota skipper presence or absence.

Strategies

- Use vegetation data 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 agricultural and other uses, leaving 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, and invasive plant species.

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 farther east than western Minnesota, and scientists presume that the species has been extirpated in Illinois and Iowa.

The Madison and Sand Lake WMDs contain habitat capable of supporting Dakota skippers; these lands need to be systematically surveyed in an attempt to document the presence or absence of the species. Periodic reevaluation (every 5 years) of native prairie WPAs must be performed to capture changes in species composition that occur over time as a result of management, climatic changes, and other factors (such as new infestations by invasive plants).

Upland Management

Upland Management Objective

Enhance grassland systems in an ecosystem management context through the use of prescribed fire and grazing, applied scientifically under selected weather and environmental conditions. The use of fire should increase by 25 percent above levels in the 2006–2008 field seasons to accomplish habitat management objectives. Grazing and fire will be symbiotically incorporated into grassland management to maximize management efficacy.

Strategies

The strategies listed below are applicable to all habitats in the three districts based on the priority system.

- Use prescribed fire and grazing to maintain grassland health in restoration areas (stimulating native plant growth, increasing seed germination, supporting nutrient cycling, and reducing organic litter accumulation).
- Apply fire and grazing at various times (spring–fall) to benefit phenology of native plant species (cool- and warm-season species).
- Implement a patch-dynamic approach to grassland management to improve ecosystem function.
- Use fire to prevent encroachment of woody-stemmed plants and invasive tree species.
- Use fire to combat the invasion of cool-season exotic grasses (smooth brome and Kentucky bluegrass) and thus maintain the integrity of grassland restorations.

Rationale

The prairie evolved through the interactions of a drying climate, herbivory, and fire (Anderson 1990; Axelrod 1985; Pyne 1982, 1986; Sauer 1950; Webb 1983; Wells 1970). Grasslands are disturbance-dependent systems that are significantly affected by the presence or absence of these disturbances. Without disturbance, grassland systems degrade and lose functionality.

The accumulation of plant litter adversely affects the system functions of a grassland. According to Knapp and Seastedt (1986), plant litter limits available light energy input into the system; alters the microclimate and physiology of emerging shoots such that CO_2 uptake is reduced; limits intake of inorganic nitrogen from rainwater as well as nitrogen fixing by free-living microbes and blue-green algae; and reduces soil temperature. These conditions diminish root productivity as well as invertebrate and microbial activities. Gibson and Hulbert (1987) determined that in tallgrass prairie, the diversity and percent cover of warm-season grasses decreases as time increases since fire occurrence. Briggs and Gibson (1992) determined that tree invasion is a function of the burning regime, dispersal vectors, habitat availability, and reproductive mode.

Historically, fires were intermittent, occurring throughout the year (Jackson 1965). The timing of fire application affects the vegetation response. The greatest response to fire is observed in species that are approaching the initiation of spring growth when the treatment occurs (Towne and Owensby 1984). Treating grasslands with fire at different times in the seasonal cycle facilitates the manipulation of species composition. Additionally, the application of fire in the spring and fall negatively affects woody seedlings or saplings while increasing the productivity of many prairie forbs and grasses (Collins 1987; Collins and Wallace 1990; Hill and Platt 1975; Hulbert 1969, 1986; Knapp 1984, 1985; Knapp and Seastedt 1986; Old 1969; Peterson 1983). Grassland integrity and health cannot be achieved without restoring fire to the landscape.

Herbivory can change plant species composition. Selective foraging, which decreases the presence of preferred forage species while increasing the presence of those not selected (Howe 1994), can affect the occurrence of individual species and determine species dominance in grasslands. The species of herbivore and the timing and density of prescribed grazing determines the magnitude and specific effect on the target area.

The interaction of grazing and fire affects community structure differently than either alone (Collins and Barber 1985, Collins and Uno 1983). Grazing and fire affect the nitrogen cycling process that occurs belowground, creating a shifting mosaic of vegetation (Johnson and Matchett 2001). The interaction of grazing and fire can be maximized using a patch-dynamic approach. Fuhlendorf and Engle (2004) determined that the "patch-burn-graze" approach created a shifting mosaic of vegetation across the landscape and Vermeire et al. (2004) described the ability of a "patch-burn-graze" system to create vegetative structural heterogeneity. A holistic approach to grassland management should include both forms of disturbance. The timing, frequency, intensity, and interaction of these ecological processes shape the community structure and species composition.

Invasive and Planted Woody Vegetation on WPAs

Historically, the northern Great Plains was a grassland-dominated ecosystem where fire and grazing restricted natural tree growth to riparian floodplains, wooded draws, islands in lakes, and small patches along leeward wetland edges (Higgins 1986). These patches and corridors of trees and shrubs were the only woodland features in the prairie landscape (Rumble et al. 1998).

The prevalence of fire in the presettlement prairie created an environment inhospitable to trees (Higgins 1986, Severson and Sieg 2006). The growing points of most grassland species are usually protected at the base of the plant. In contrast, woody vegetation possesses 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 tallgrass and mixed-grass prairie types that cover South Dakota produce large quantities of fuel that dry quickly and burn easily (Steuter and McPherson 1995). Specifically, bluestem prairies recover quickly post-fire and can even provide enough fuel for multiple burns in a single growing season (Bragg 1982).

Climate also played a pivotal role in the development of grasslands—particularly the limiting effect of periodic drought on the growth and expansion of trees (Weaver and Albertson 1936). Herbivory and hoof action of grazing animals also constrained the establishment and expansion of woody vegetation. The effects of ungulates, fire, and drought combined to inhibit tree growth and expansion across the grasslands of South Dakota.

Presently, however, grassland fragmentation is escalating at an alarming rate. During 2008, in eastern South Dakota, the USDA and County Conservation Districts planted 255 miles of trees, covering 2,801 acres of land with 1,115,780 trees (G. Yapp, USDA, personal communication, 2009).

The response of grassland birds to unnatural tree conditions has received recent research emphasis. Grant et al. (2004) determined that the probability of occurrence of breeding grassland birds decreased notably for 11 species as the percentage of woody vegetation increased. Further, negative effects on grassland bird communities increased as the height of woody plants increased (that is, brush giving way to tall shrubs giving way to trees). By most accounts, the grasslands became unsuitable for nine species of grassland birds as woodland cover exceeded 25 percent (Grant et al. 2004b). A recent study in the Dakotas determined that bobolink, Savannah sparrow, and sedge wren specifically avoided tree plantings; however, these species would utilize the same areas after tree-belts were removed (Naugle and Quamen 2007).

Nest predators and nest parasite species increase near woody habitat edges (Burger et al. 1994, Johnson and Temple 1990); in other words, planting woody vegetation in previously treeless grasslands exacerbates these problems. Tree plantings in grasslands create den and foraging sites for predators historically uncommon to grasslands (Kuehl and Clark 2002, Pedlar et al. 1997, Sargeant 1972, Sargeant et al. 1987). Gazda et al. (2002) indicated that duck nest success decreases near planted woodlands as a result of increased predation by mammal and bird species associated with trees and shrubs. Waterfowl and waterbirds have been shown to avoid wetlands where trees and shrubs occur along wetland margins, presumably to evade predation (Rumble and Flake 1983, Shutler et al. 2000). Johnson and Temple (1990) determined that nest predation rates were lower for five species of grassland songbirds in areas where nests were more than 148 feet from woody vegetation.

Brown-headed cowbird is a nest parasite whose population has increased in recent decades to the detriment of other birds (Shaffer et al. 2003). Cowbirds lay eggs in the nest of other birds, and the host birds act as foster parents to the cowbird young, thus reducing survival of the host bird's young (Lorenzana and Sealy 1999). Studies in mixed-grass prairie and tallgrass 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 farther away (Johnson and Temple 1990, Patten et al. 2006, Romig and Crawford 1995). Shaffer et al. (2003) documented that brown-headed cowbirds parasitize 24 of the 36 North American grassland bird species.

Service-owned lands in South Dakota are part of this historically grassland-dominated ecosystem, where fire, grazing, and drought restricted natural tree growth to limited areas (Higgins 1986). Now, planted or volunteer trees and shrubs occur in many WPAs. Although most woody plantings existed before Service ownership of these lands, the Service did establish tree planting after acquisition in attempts to improve wildlife habitat. Volunteer trees are prevalent primarily due to lack of fire. Planted trees and shrubs such as green ash, cottonwood, and buffaloberry are native to North America; however, many others, such as caragana, Russian olive, and Siberian elm, are nonnative species. The most troublesome species planted in South Dakota is eastern red cedar. The species' extreme adaptability has enhanced the spread of these trees into areas where they were formerly rare or absent. Additional increases in their spread are due to tree plantings and the selection of the most aggressive cultivars (Ortman et al. 1996). Most of these plantings are considered unnatural components of the historical habitat. Additionally, nonnative species such as Russian olive and Siberian elm are invasive and also readily spread from both Service-owned and non-Service-owned plantings into new areas.

Preventing the encroachment and planting of woody vegetation into grassland ecosystems contributes significantly to the recovery of grassland bird populations (Herkert 1994). Recent research indicates that the elimination and reduction of invasive and planted woody vegetation will benefit most grassland-dependent bird species (Bakker 2003, Grant et al. 2004b, Johnson and Temple 1990, Naugle and Quamen 2007, Patten 2006 et al., Shaffer et al. 2003, Sovada et al. 2005). Although many woodland bird species might nest in planted woodlands, few are of management concern (Kelsey et al. 2006), suggesting that the loss of planted woodlands will have negligible effects on woodland bird species whose populations are stable or expanding.

Bridgette Flanders-Wanner/USFWS

Invasive nonnative plants, such as this Russian olive tree, can degrade prairie habitat if they remain unchecked.

In view of the research that has highlighted the deleterious effects of woody vegetation on prairie ecosystems, systematic removal of invasive and planted woody vegetation from Service lands is critical to the improvement of habitat for grassland-dependent birds. Sites for tree removal on WPAs are prioritized on the basis of landscape characteristics; the majority of removal is targeted in areas with the largest blocks of grassland, with emphasis on native prairie tracts and areas to be restored to planted native vegetation. Reducing fragmentation in these core areas has the potential to provide the most benefits to grassland-dependent birds. In addition, the removal of woody species more than 3.28 feet (1 meter) tall should target the removal of the larger shrubs and trees that pose the greatest ecological threat to grassland ecosystems on Service lands, rather than on small native shrubs, such as prairie rose, leadplant, and western snowberry, which are an important component of grassland ecosystems.

Invasive and Planted Woody Vegetation Objective

Over a 15-year period, remove invasive or planted woody vegetation on a minimum of two sites per year on priority units (based on the ability to remove woody vegetation across the landscape such that doing so will create larger blocks of habitat for grassland birds).

Strategies

- Cut standing trees and shrubs and remove belowground woody material (stumps and roots) using chainsaws and a variety of heavy equipment. Where removal of stumps and roots is not viable, herbicide treatment may be necessary for control.
- Apply herbicides in situations where suckering occurs or is anticipated.
- Pile and burn downed 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).
- Plan and conduct tree removal to minimize the impacts on nesting migratory birds. If it is determined that these activities will be conducted during the nesting season, they will be limited to sites where improvements to the ecological integrity of the site will outweigh the short-term losses of individual birds.
- Restore bare areas resulting from woody vegetation removal to perennial grass cover.
- Due to the potential controversial nature of this management strategy, conduct outreach and appropriate education to the relevant local communities, politicians, media, and other interested parties.
- Use appropriate bird survey methods to monitor bird response to removal of woody vegetation.

Rationale

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

Although numerous patches of native woodlands still exist in the northern Great Plains, today, large expanses of once nearly treeless prairie are now intermixed with cropland and scattered small (less than 5 acres) linear and block-shaped tree plantings (also commonly referred to as windbreaks, shelterbelts, and tree belts). Baer (1989) estimated that these plantings cover 3 percent of the landscape in the State. Tree plantings are designed to reduce soil erosion from croplands (Baer 1989) and to provide shelter for farm sites and livestock, and are viewed by many as striking landscape features that symbolize settlement of the western United States. However, they also further fragment remaining grasslands by creating abrupt boundaries that exacerbate edge effects (O'Leary and Nyberg 2000, Ribic and Sample 2001, Winter et al. 2000). 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 (Herkert 1995, Samson and Knopf 1994). Research indicates that native grassland birds need large, contiguous tracts of treeless grasslands to maintain populations (Bakker et al. 2002, Herkert 1994, Winter et al. 1999). The literature overwhelmingly indicates that invasive and planted trees in prairie landscapes often adversely affect a variety of bird groups (Bakker 2003). Specifically, trees on the prairie are correlated with adverse consequences for ducks (Rumble and Flake 1983), wetland birds other than ducks (Naugle et al. 1999), prairie grouse (Hanowski et al. 2000, Niemuth 2000), grassland songbirds (Grant et al. 2004b, Winter et al. 2000), and ring-necked pheasant (Schmitz and Clark 1999, Snyder 1984).

PLANTED GRASSLANDS GOAL

Manage planted grasslands to contribute to the production and growth of continental waterfowl populations, other migratory birds, threatened and endangered species, and other wildlife.

Prioritization

Planted Grasslands Prioritization Objective

Implement the standardized, science-based prioritization decision tree developed for the CCP (figure 16) so that limited funding and management resources are objectively allocated to planted grasslands according to the potential for that tract to benefit waterfowl and grassland birds. Allocate limited resources to planted grasslands as outlined in the Planted Grasslands Management Objectives below. Allow each district to further refine the prioritization system as additional biological information becomes available; reevaluate the prioritization system 15 years after CCP approval.

Strategies

- Apply multiple selection criteria for prioritizing planted grassland tracts according to the decision tree (figure 16) and as summarized below.
  - Primary Criterion—Duck Pairs per Square Mile. This criterion is divided into four levels of priority—at least 60, at least 40, at least 25, and fewer than 25 duck pairs per square mile—that match the Service's Grassland Easement Priority Zones (Ron Reynolds, USFWS, HAPET, personal communication, 2010).
  - Secondary Criterion—Percent Grass on the Landscape. The surrounding landscape is categorized as high or low grass composition—at least 40 percent or less than 40 percent grass. This criterion coincides with requirements for maintenance levels of waterfowl nesting success (Reynolds et al. 2001).
  - Tertiary Criterion—Native Floristic Composition. This criterion is divided into three levels that characterize the percentage of native species in the vegetation community: 25–65, 66–100, and 0–24 percent). Vegetation is characterized by mean frequency (percentage occurrence) of South Dakota Upland Plant Associations (Belt Transect Categories; see appendix I) as described in Grant et al. 2004a.

  The result of objectively applying these three criteria using a decision tree (figure 16) is the assignment of a priority level for each tract of planted vegetation in the three districts (table 9). In all, there are 40 priority levels from Priority 1A to Priority 4J. This provides each district with a range of flexibility in applying the standardized decision tree. Each district is permitted to individually identify high-priority, moderate-priority, and low-priority levels as outlined in the Planted Grasslands Management Objectives below.

Rationale

In attempt to restore the prairie lost to conversion to agriculture, Service personnel have planted various types of vegetation to restore the functions of a grassland ecosystem on Service lands. This discussion examines previous grassland restoration activities and considers future efforts.

The prairie was once the most common ecosystem in North America, but the modern loss of prairie habitats exceeds that of most other major ecosystems in North America (Noss et al. 1995, Samson and Knopf 1994). Consequently, grassland birds have experienced steeper, more consistent, and more widespread population declines than any other group of North American birds (Herkert 1995, Igl and Johnson 1997, Peterjohn and Sauer 1999). Breeding Bird Survey data from 1966–1996 indicates that populations of 13 species of North

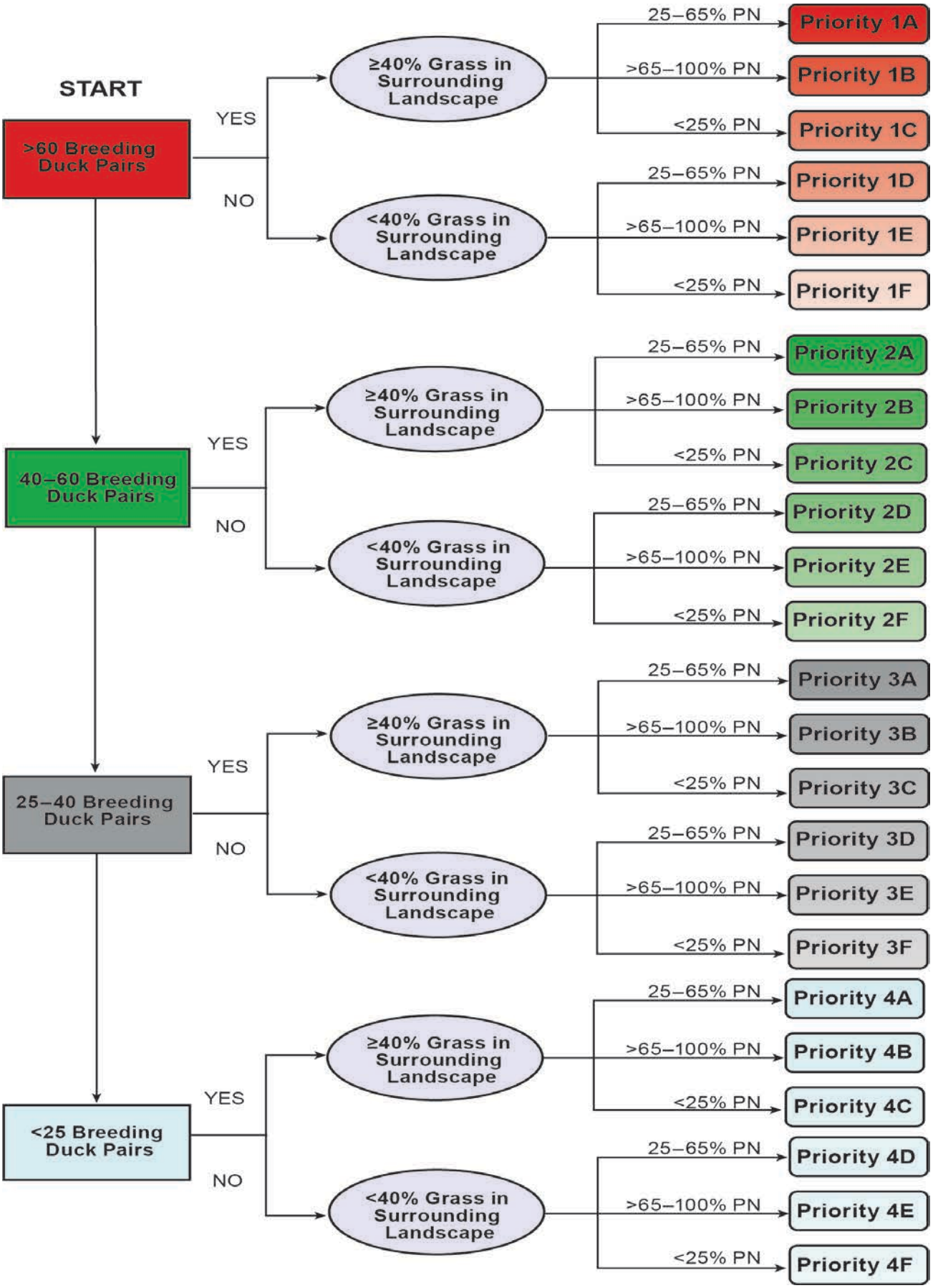

Figure 16. Decision tree for prioritizing management of planted grasslands.

Table 9. Assigned priority levels according to the decision tree for prioritizing management of planted native vegetation.

County	*WPA*	*Management unit*	*Priority code*
Huron WMD			
Beadle	Schull		1A
Beadle	Weaver		1C
Beadle	Wipf		2A
Beadle	Kahre		1B
Beadle	Rogers		1C
Beadle	Thesenvitz		1B
Beadle	South Weaver		1B
Beadle	Yauney		1B
Beadle	Weiting		1B
Beadle	Kleinsasser		1A
Beadle	Cain Creek		1B
Beadle	LeClaire	Unit 4&5	1B
Beadle	LeClaire	Unit 6A	1B
Beadle	LeClaire	Unit 6&3	1C
Beadle	Clouser	Unit 1B	1B
Beadle	Clouser	Unit 2	1B
Beadle	Ingle	Unit 3	1B
Beadle	Ingle	Unit 1&2	1B
Beadle	Maga-Ta-Hohpi	Unit 5	1A
Beadle	Maga-Ta-Hohpi	Unit 12,13&8	1B
Beadle	Maga-Ta-Hohpi	Unit 7	N/A*
Beadle	Maga-Ta-Hohpi	Unit 3&4	1B
Beadle	Bauer	Unit 4C	1B
Beadle	Bauer	Unit 2	1B
Beadle	Bauer	Unit 4A	1B
Beadle	Bauer	Unit 3	1B
Buffalo	Mills	Unit 5	1B
Buffalo	Mills	Unit 4	N/A*
Hand	Slunecka	Unit 2A&2C	1B
Hand	Slunecka	Unit 1	1B
Jerauld	Freudenburg		1B
Jerauld	Winter		1B
Madison WMD			
Brookings	Brush Lake		2A
Brookings	Gerdink		2A
Brookings	Eriksrud		3B
Brookings	Bjornlie		2B
Brookings	Kenneth Nelson		2A
Deuel	Schafer		1C
Deuel	Bunde		2C
Deuel	Coteau Prairie		1C
Deuel	Fox Lake		2E
Deuel	Stoltenburg		2C
Deuel	Johnson I (W)		3F
Hamlin	Juntunen		2E
Hamlin	LaClair		1E
Kingsbury	Albrecht		2E
Kingsbury	Duffy		2E
Kingsbury	Easland		2D
Kingsbury	Hoyer		2B
Kingsbury	Kattke		2F
Kingsbury	Kopperud		2C
Kingsbury	Plum Lake		2A
Kingsbury	R.S. Anderson		1C
Kingsbury	Warne		3E
Kingsbury	Williams		2E
Kingsbury	Silver Lake		1A
Kingsbury	Johnson		2B
Kingsbury	Sterr		2B
Lake	Hart		3D
Lake	Gerry		3D
Lake	Lentsch		2F
Lake	Krug		2E
Lake	Habeger		2E
Lake	Hansen		3D
Lake	Alquire		2C
Lake	Fischer		2E
Lake	Kattke	West	2D
Lake	Kattke	East	3D
Lake	Lake Henry	North	3E
Lake	Lake Henry	South	3D
McCook	Garrett		2F
McCook	Gottlob		1B
McCook	Schimmel		1A
McCook	Lions Lake		1C
McCook	Sabers		1D
McCook	Holm		2F
McCook	DeNeui		3D
Miner	Corbin		1C
Miner	Eyekamp		3E
Minnehaha	Johnson		3A
Minnehaha	Fensterman		3A
Minnehaha	Wise/Becker		3A
Minnehaha	Island Lake		3C
Minnehaha	Jordan		1F

Table 9. Assigned priority levels according to the decision tree for prioritizing management of planted native vegetation.

County	*WPA*	*Management unit*	*Priority code*
Minnehaha	Buffalo Lake	West	N/A*
Minnehaha	Buffalo Lake	East	3D
Minnehaha	Kindt/Munce	North	3A
Minnehaha	Kindt/Munce	Middle	3B
Minnehaha	Kindt/Munce	South	N/A*
Moody	Reaves		2F
Moody	Dobbs		3E
Moody	Long		2B
Moody	Benson		2E
Moody	Bothwell	East	2E
Moody	Lee	Northwest	3E
Moody	Lee	Southeast	2E
Moody	Bothwell	West	3E
Moody	Anderson	North	3E
Moody	Anderson	South	N/A*
Sand Lake WMD			
Edmunds	Tang		1A
Brown	Hayes		1A
Brown	Hecla		1B
Brown	Ryman		2B
Spink	Einspahr		1A
Spink	Stroschein		2E
Spink	Jessen		1A
McPherson	Helfenstein-Opp		1C
McPherson	Kary		1C
McPherson	Haerter		1A
McPherson	Bauer-Fischer		1A
McPherson	Schell		1C
McPherson	Stuglemayer		1C
McPherson	Rath		1C
McPherson	Heyd Lake		1C
Edmunds	Bieber-Buechler		1C
Edmunds	Feiock		1C
Edmunds	Grismer		1C

**Species composition data not available*

American grassland birds declined significantly, while populations of only 2 species increased (Peterjohn and Sauer 1999). Declines are attributed to severe habitat loss (e.g., Herkert 1994) and degradation of remaining prairie remnants (Herkert et al. 2003).

The conversion of native prairie to cropland has directly affected wetland and grassland birds by reducing and fragmenting available breeding habitat (Batt et al. 1989, Sugden and Beyersbergen 1984). In addition, encroachment of woody vegetation has fragmented grasslands and created suitable habitat for predators and forest-edge bird species. As a result, birds considered grassland obligates have been displaced and are less productive (Johnson 2006b, Naugle and Quamen 2007). Moreover, many avian species occurring in the Great Plains are grassland and wetland obligates (Igl and Johnson 1995), whereas birds associated with woody vegetation are habitat generalists with wider distributions across the continent (Johnson et al. 1994, Kelsey et al. 2006).

Current grazing regimes often do not emulate the historical processes under which grasslands evolved, resulting in altered grassland communities. In addition, some areas of native sod have remained idle for extended periods—a condition that is advantageous to invasive plant species such as smooth brome and Kentucky bluegrass. These invasive species tend to dominate and displace 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 affect wildlife species richness.

Planted Grasslands Management

Native prairies typically exhibit a diversity of plant forms that includes short, rhizomatous grasses; taller bunchgrasses; a low shrub component; and a variety of forbs, depending on management and location. In comparison, structural diversity in tamegrass fields—which are dominated by introduced vegetation such as smooth brome and Kentucky bluegrass, and invasive species such as Canada thistle, wormwood, and leafy spurge—is usually lower, exhibiting a more homogeneous height across a field (Wilson and Belcher 1989). Grassland-dependent birds have adapted to the diverse structure of native prairie, whereas dense nesting cover (DNC)–type mixtures limit this structural diversity and likely attract only bird species that key in on this tall, dense cover.

Restoration efforts will focus on converting tamegrass grasslands to planted native grasslands. These areas will be restored using a diversity of native vegetation that, with active management, will be relatively resistant to infestation by invasive plant species and noxious weeds (Davis and Pelsor 2001, Dukes 2001, Tilman et al. 1996). This approach will

benefit grassland and wetland birds by providing vegetative structure that resembles historical conditions, thereby expanding and improving habitat for grassland-obligate wildlife species. Howell (1988) suggested that attempting to recreate the elements found in native communities may promote desirable species interactions and allow for natural selection. For 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). Moreover, according to Stewart (1975) and Kantrud and Higgins (1992), marbled godwit and willet typically select native grass cover over tamegrass cover.

Planted native grasslands are meant to mimic the diversity of native prairie areas. Tilman (1997) stated that biological diversity is dependent on the functionality and sustainability of the ecosystem, supporting the premise that grassland restoration actions should use diverse seed mixtures. Inclusion of forbs in native mixtures appears to be necessary in attempts to restore system functions such as nutrient cycling and energy flow (Pokorny et al. 2005). Sheley and Half (2006) indicated 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 also be important because forb germination can vary by species in response to the yearly variation in weather conditions (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. 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). It is suggested that planting a species-rich seed mixture will lead to the establishment of highly diversified native vegetation that is more resilient to infestation by invasive plants in restored grasslands (Biondini 2007, Blumenthal et al. 2003, Carpinelli 2001, Pokorny 2002, Pokorny et al. 2005, Sheley and Half 2006, Tilman 1997). Diverse plant communities may use resources more completely, leaving fewer resources available for potential invaders (Case 1990, Jacobs and Sheley 1999). The dominant theory in the literature indicates that planting a diverse seed mixture increases the inclusion of various functional groups among plant species and increases the ability of the grassland to maintain integrity. Moreover, in theory, native seed mixtures should persist into perpetuity under appropriate management, which entails disturbances that mimic the natural regimes that sustained wildlife populations before human interventions. Habitat management on district lands typically involves various strategies—especially prescribed fire and rotational grazing—to emulate the defoliation agents with which prairie plants evolved. The prescription of management treatments depends on the particular vegetative components that determine the quality of the habitat (species and structure).

With extremely limited data on the reestablishment of native flora mixtures, there is a need to begin long-term research in this area. Ensuring science-based management for reseeding these areas is paramount to the perpetuation of the grassland resources.

The districts' focus on using native plants to restore WPAs 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).

Planted Grasslands Management Objective 1

On high-priority planted native units, apply appropriate management practices to maintain vegetation at the specified standards within 15 years of CCP approval.

Strategies

- At 5-year intervals, increase or maintain native plants as the dominant vegetation cover, monitored using qualitative estimation in the Sand Lake WMD and quantitative estimation in the Huron and Madison WMDs.
- At 5-year intervals, maintain or decrease smooth brome and Kentucky bluegrass levels.
- No planted shelterbelts or volunteer nonnative trees (such as Russian olive or Siberian elm) exist on the landscape.
- Increase the diversity of native species by interseeding a mixture of native forbs. The mixture of native forbs should include species that are competitive across the topographic gradient and varying soils of the unit, as well as including species of the successional gradient (that is, pioneer to conservative species. Pioneer species are the early successional, frequently weedy, species that quickly colonize open spaces. Conservative species are the climax species that establish permanently and maintain site stability). The diversification process may also include the integration (through interseeding) of more native grass species over time as funding or availability allows.
- Develop a management plan for maintaining grasslands at the established levels.
- Careful consideration of the type of treatment used will depend on vegetation composition and succession status of the site (Gillen et al. 1987), timing of spring burning (Towne and Owensby 1984), and proper application time of chemicals (Rehm 1984).

The Savannah sparrow is a South Dakota Priority Species.

Rationale

Certain "established" native grass plantings may lack a diversity of native forbs—perhaps as a result of cultivation, herbicide use, or lack of management (that is, disturbance). Native forbs are an important habitat component for prairie-obligate wildlife species. Dakota skippers utilize the nectar (Cochrane and Delphey 2002), while grassland birds benefit from the invertebrate community (Hickman et al. 2006) associated with the native forb component.

Seed mixes that contain a larger percent of forbs (50–60 percent by weight) tend to produce more diverse prairie communities of both grasses and forbs (Diboll 1997). Furthermore, establishing native forbs during restoration is critical for invasive species management because indigenous forbs improve community sustainability and resist invasion by exotic plants (Carpinelli 2001, Pokorny et al. 2004, Sheley and Half 2006). Ultimately, planting a mixture of forbs compared to a single forb species will help to mitigate seasonal, annual, or local conditions that can impair the success of forb establishment (Sheley and Half 2006).

Planted native sites need to be appropriately managed to ensure grassland health. Management treatments such as fire, grazing, and haying are critical to restoration success. The site-specific timing, frequency, and type of management treatment will be based on monitoring information.

Planted Grasslands Management Objective 2

Moderate units are managed as high-priority units as funding and staff time permits. In years with insufficient funding or staff resources, moderate units are left idle.

Planted Grasslands Management Objective 3

On low-priority units, apply disturbance every 5–8 years to remove plant litter, restore plant vigor, reverse woody plant expansion, and provide a mix of structural types that include (1) relatively short/sparse vegetation for species such as upland sandpiper, marbled godwit, northern pintail, and chestnut-collared longspur; (2) moderately short vegetation for species such as blue-winged teal, short-eared owl, northern shoveler, and grasshopper sparrow; and (3) tall/dense vegetation for species such as mallard, northern harrier, gadwall, and bobolink.

There is almost no monitoring of vegetation on these WPAs except for routine, cursory surveillance for noxious weeds. Nevertheless, knowledge of the relationship between fire frequency and the resulting post-fire vegetation structure enables land managers to predict the habitat conditions described below. Vegetation should exhibit these characteristics within 15 years of CCP approval.

Strategies

- One-fourth of the total acreage of low-priority planted native grassland is in a condition of 0–1 year post-disturbance, one-fourth is in a condition of 2–3 years post-disturbance, and one-half is in a condition of 4–6+ years post-disturbance. These characteristics correspond roughly to VOR categories of 6 inches or less, 6–14 inches, and more than 14 inches, respectively (Robel et al. 1970). Such a distribution, or mosaic, of structural conditions is desirable to meet the needs of a wide array of grassland-nesting birds.
- Target volunteer and nonnative trees (such as Russian olive or Siberian elm) for removal (this does not require removal of shelterbelts as in high-priority units).

Rationale

Under the native floristic composition criterion for prioritizing, planted vegetation with native floristic composition of 0–24 percent is considered highly degraded and is the lowest priority. In the northern Great Plains, fire and other control methods, such as herbicide applications, depend heavily for their success on the presence of a minimum of 20 percent of native species in the matrix (Dill et al. 1986, Willson and Stubbendieck 2000). A grass matrix dominated by a few introduced species inhibits the germination, establishment, and persistence of most native species. Willson and Stubbendieck (2000) suggested that, at sites dominated by smooth brome and supporting less than 20 percent native species, alternative methods for prairie restoration should be tried. Because restoration of highly degraded prairies is not likely to be successful using traditional methods such as grazing and prescribed fire, these tracts are of low management priority. Further, these tracts are likely to be approached as tamegrass tracts, where the most appropriate action is to completely restore the area to planted vegetation through preparation of the seedbed and reseeding.

Tamegrass Grassland

"Tamegrass grassland" is a term used to identify uplands with a farming history that are dominated by cool-season exotic species such as smooth brome and Kentucky bluegrass. Some tamegrass grasslands were acquired during the establishment of wetland management districts when grasslands enrolled in the CRP were purchased for the benefit of wildlife as part of a WPA. CRP grasslands were typically tame grasses (such as smooth brome) designed to stabilize highly erodible land. Additionally, during the procurement of property for WPAs, cropland was purchased and reseeded to DNC. Although DNC is beneficial on multiple levels, this mixture requires intensive inputs to maintain over the long term. Oftentimes, fields are not reseeded at the prescribed frequencies; this allows cool-season invasive species to outcompete, and results in tamegrass grasslands.

Tamegrass Objective 1

Over a 15-year period, annually seed a minimum of 200 acres of old cropland in high-priority WPAs to a native grass mix to develop grassland communities of varied structure as appropriate to the site. By 5 years post-establishment, these areas should be characterized by native plants as the dominant vegetation cover, as determined by qualitative estimation in the Sand Lake WMD and quantitative estimation in the Huron and Madison WMDs.

- Special Note: For this objective, planning team members used their knowledge and expertise to develop an acreage objective. This objective was deemed to be achievable under the funding and staff levels specified in the draft CCP.

Strategies

- Use appropriate site preparation techniques to ensure a weed-free seedbed. These may include a combination of cropping and chemical treatment using a glyphosate-based herbicide.
- Develop a seed mixture with equal parts by weight of grass and forbs. The grass component should contain both cool- and warm-season species. The forb component should contain both early and late-flowering species. Both grass and forb species should be selected to span the gradients associated with site topography, successional stages (that is, early pioneer to conservative plants), and soil types.
- Use a variety of tools in post-seeding management, including clipping, prescribed fire, prescribed grazing, and appropriate 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 dataset, within 15 years of CCP approval, develop a decision matrix to help with selecting optimal species to use in grassland restoration projects.
- 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

The establishment of native-dominated perennial herbaceous cover, in concert with prescribed application of periodic fire and grazing, resists the encroachment and establishment of invasive species. Sources in the literature suggest that species-rich seed mixtures may reduce weed invasion on native seeded grasslands (Blumenthal et al. 2003, Carpinelli 2001, Pokorny 2002, Sheley and Half 2006, Tilman et al. 1996). In a study by Pokorny et al. (2005), the investigators determined that indigenous forbs resisted invasion by spotted knapweed better than grasses did. The overall theory in the literature indicates that seeding a species-rich seed mixture increases the inclusion of various functional groups among plant species. The more species included in a mixture, the higher the probability of providing competition to resist invasion by nonnative plants.

Moreover, native vegetation is preferred over nonnative vegetation by a number of grassland birds (Bakker and Higgins 2009). Mark Sherfy of USGS found that ducks nesting in CRP fields in North Dakota and South Dakota showed no significant preference for tamegrass-seeded (that is, DNC) fields over native seeded fields. In addition, nest success was slightly higher in native seedings than in tamegrass seedings. According to Klett et al. (1984), nest initiation rates for mallard, gadwall, and blue-winged teal in the Dakotas were as high or higher in native-seeded fields than in seeded fields that lacked natives. Similarly, nest success was not significantly different in native-seeded than in tamegrass-seeded study fields (Klett et al. 1984).

Ultimately, restoration success (habitat improvement) is dependent on monitoring and management efforts. Monitoring determines the nature and the appropriate timing of the management action. Effective management (prescribed fire, grazing, mowing, or chemical treatment) of restoration sites is critical for establishment, productivity, and longevity of the grassland stands.

The districts' focus on using native plants to restore WPAs is consistent 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).

Tamegrass Objective 2

Over a 15-year period, continue to maintain perennial grass cover (DNC, tamegrass) on tracts that have not yet been seeded to native grass or begun the seedbank preparation process (for example, multiple years of row cropping) for eventual reseeding.

Strategy

- Use various combinations of management actions (chemical application, mowing, haying, grazing, and burning) to maintain grassland vigor and treat infestations.

Rationale

Tamegrass fields that have not yet entered into the seedbed preparation process generally consist of a predominance of introduced cool-season grass species. Prior to initiating seedbed preparation management for eventual seeding to native grass, these sites are of relatively low priority. Management efforts can be better directed toward higher priority upland areas (specifically native prairie, tracts already reseeded to native grass, and tracts being actively prepared for native reseeding). Despite their substantial degree of degradation in the context of floristic diversity, perennial grass cover will likely support multiple plant species and generalist birds, including upland nesting ducks, northern harriers, and sedge wrens, and is also important for maintaining soil organic matter (McLauchlan et al. 2006), a condition that is critical for future restoration potential.

Dense Nesting Cover

Certain upland areas were seeded back to an herbaceous cover of introduced vegetation known as DNC. Traditionally, these seed mixtures comprised cool-season introduced grasses and legumes (intermediate wheatgrass, tall wheatgrass, alfalfa, and sweetclover) that establish well under a wide variety of soil, moisture, and climatic conditions that exist across the Prairie Pothole Region. 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 6–8 years after seeding and up to 15 years with proper management (Duebbert and Frank 1984, Higgins and Barker 1982, Lokemoen 1984).

Ideally, the majority of these tracts planted to DNC will be seeded back to a native mixture; however, certain situations may limit the opportunity to do so. If a DNC mixture is used, intermediate wheatgrass and tall wheatgrass are viable grasses to select, and alfalfa is 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 life cycle of the planting. Especially in cropland-dominated areas, invasive plant threats will persist and will require appropriate treatments to control. Management methods such as grazing and fire may be used to stimulate the height and density of DNC mixtures. Mechanical methods such as haying may also benefit plantings 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). Before a tract is planted back to DNC, the Service's Integrity Policy and the sustainability of native grasslands should be considered.

Dense Nesting Cover Objective

During the life of the CCP, manage habitat blocks of DNC to sustain a composition of approximately 25 percent legumes.

Strategies

- Use appropriate site preparation techniques to ensure weed-free seedbeds.
- Use farming activities to provide an appropriate seedbed for seeding.
- Manage this habitat using varying tools such as fire, haying, grazing, and idling. Reseed introduced DNC species mixes every 10–15 years.

Rationale

Tamegrass grassland tracts that have not begun the seedbed preparation process will be maintained in an idle state that generally consists of 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. According to Mark Sherfy of USGS, there is evidence that, despite the presence of introduced cool-season perennial grass cover, DNC likely supports multiple plant species and generalist birds, including upland-nesting ducks.

Noxious Weeds

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

Noxious Weeds Objective 1

After CCP approval, maintain the current IPM plan, following stated guidelines for the use of chemical, mechanical, and biological control of priority invasive plants.

Strategies

- Review and update the IPM plan every 5 years.
- Prepare annual progress reports in the Pesticide Use Proposal Database.
- Hold annual meetings to share current treatment techniques and results, including information on successful and unsuccessful treatment protocols, future plans, and new problematic species.

Rationale

Each district has developed an IPM plan specific to its needs. These plans detail strategies for (1) inventory and mapping of invasive plants, including noxious weeds; (2) prevention and control of new infestations; and (3) control of current known infestations. An integrated approach to pest management will be used to treat infestations of invasive plants on Service lands. The IPM plans identify the statewide distribution of species of concern and suitable control methods. A surveillance program will be designed and carried out to document the current infestations and document the introduction and spread of new invasive plants. The implementation of an early detection and rapid response system requires annual coordination with the South Dakota Department of Agriculture; county weed boards; and other Federal, State, and local partners. All parties will share information and discuss the most effective, economical, and environmentally appropriate control strategies for priority invasive plant species.

Noxious Weeds Objective 2

The Huron and Madison WMDs will maintain an inventory of all noxious weeds on Service lands.

Strategies

- Utilize Refuge Land Geographic Information System (RLGIS) to ensure standardized mapping format.
- Repeat inventories at a minimum of 2-year intervals.
- The Sand Lake WMD has initiated an RLGIS inventory of noxious weeds on Service lands.

Rationale

Noxious weeds are a major threat to native ecosystems in the United States. Invasions of natural ecosystems by nonnative species now rank second to habitat loss as the major threat to biodiversity (ISSG 2001, Wilcove et al. 1998:607, Wilson 1992:253). Infestations of noxious weeds have a direct effect on the ability of the districts to fulfill their wildlife conservation mission—particularly species recovery and the maintenance and restoration of biological diversity, integrity, and ecological health. The utilization of RLGIS to inventory and maintain noxious weed information will provide managers with a starting point in ranking areas to be treated.

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

The Service, the State of South Dakota, and other partners have not yet developed and universally adopted criteria for mapping noxious weeds. Regional invasive species experts and IPM coordinators in Region 6 are in the process of drafting protocols for field mapping noxious weeds for entry and storage in the RLGIS. These protocols will provide guidelines for (1) mapping new and old infestations, (2) minimum mapping units, and (3) the use of point data versus polygons and canopy cover. The guidelines will incorporate the minimum standards outlined in "The North American Invasive Plant Mapping Standards" (North American Weed Management Association 2002). Once a baseline inventory has been completed for Service lands in South Dakota, the focus will shift to more scientific surveys to provide quantifiable data.

Noxious Weeds Objective 3

Carry out measures to reduce and control 20 percent of targeted noxious weeds on priority WPAs by 15 years after CCP approval.

Strategies

- Conduct a surveillance program for new infestations of noxious weeds.
- Apply early detection, rapid response strategies to attack new infestations before they become large and costly to treat.
- Respond promptly to all landowner or other public complaints.
- Monitor infestation rates and effectiveness of control efforts.
- Map sites of invasive plant treatments in the RLGIS.
- Use GIS to predict areas at greatest risk of new infestations.
- Monitor change over time by collecting RLGIS cover-type data for all invasive plant species. Share GIS layers of invasive plant infestations with partners.
- Obtain help with noxious weeds (treatments 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 noxious weeds on Service-owned lands, using IPM strategies.
- Use only certified weed-free seed to restore habitat.
- Avoid purchasing seed from sources known to have violated the weed-free seed regulation.
- Focus restoration activities on high-diversity mixes of native grasses and forbs in order to develop habitat that will be more resistant to invasion by noxious weeds.

Rationale

In 2008, an estimated 2 million acres of Canada thistle (1,600,989 acres) and leafy spurge (307,558 acres) infested South Dakota's pastures, cropland, and wildlife areas (Moechnig et al. 2009). Using IPM methods to control State-listed noxious weeds is a Service priority. These problem plants can displace native vegetation over large areas and have the ability to form nearly monotypic stands in the absence of management; therefore, these plants threaten native biodiversity (Bedunah 1992, Hutchison 1992, Svedarsky and Van Amburg 1996, Trammell and Butler 1995, Watson 1985). Due to the extent of infestation, these species have been the priority noxious weeds on Service lands in South Dakota.

The first step in control programs is to prevent the introduction, reproduction, and spread of noxious weeds. Many of the newer invasive plants and "watch" species were introduced by seed imported from States and countries that have noxious weeds. Wherever possible, all grass seed should be bought from seed grown in South Dakota to minimize the introduction or spread of new invasive plant species.

The conversion of tamegrass areas to plantings of native grasses and forbs is a form of grassland restoration utilized to improve habitat. This restoration process targets invasive cool-season grasses (smooth brome and Kentucky bluegrass); however, the same process also addresses noxious weeds. The grassland restoration process often incorporates a cropland phase, which may include the use of genetically modified (Roundup® ready) varieties of corn or soybeans that are treated with glyphosate, a nonselective herbicide. The utilization of genetically modified organisms (specifically crops) has been approved for each station

Mason Sieges/ USFWS

Control of Canada thistle is one objective of upland management on the districts.

by the assistant regional director, National Wildlife Refuge System based on the authority and process identified in "Guidance and Approval for the Use of Genetically Modified Crops on the Nation Wildlife Refuge System," memo and attached exhibits, issued January of 2008.

Maintaining these fields in crop production for several years helps prepare the seedbed for planting and restoration by significantly depleting the percentage of viable invasive plant seed in the upper soil layer, thereby reducing germination potential. The cropland phase of the restoration process is more critical when areas are heavily infested with Canada thistle or other noxious weeds. Such fields will be replanted to a grass and forb mixture designed to meet habitat objectives for individual tracts.

Mowing or haying may be used to remove the aboveground growth of noxious weeds before flowering and seed production in areas where other treatments may not be available or practical. 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 noxious weeds are (1) excessively rough and uneven ground, usually due to pocket gopher activity; and (2) potential to spread the noxious weeds in hay transported off Service lands to private lands. 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. Prescribed fire and grazing may also be used as a pretreatment to prepare for herbicide application.

Biological control may be the most cost-effective and long-term solution to controlling large areas of leafy spurge. Flea beetles have been used successfully to reduce root density, stem density, biomass, and number of roots buds (Kirby et al. 2000). Significant results are usually detectable in root biomass within 2–3 years and aboveground after 5 years post-release (Kirby et al. 2000). Researchers from North Dakota, South Dakota, Montana, and Wyoming have

documented that approximately 85 percent of all release sites are established by releasing 1,000–6,000 flea beetles (Anderson et al. 2003). They also detected an average rate of control of approximately 1.6 acres per release site per year. These flea beetles tend to grow and decline exponentially depending on the amount of forage that is available for them to consume. The use of other biological controls for other invasive plant species needs to be investigated. Releases of Canada thistle stem mining weevil, seed head weevil, and stem gall fly have shown mixed results for control of Canada thistle. Biocontrol is commercially available for musk thistle, yellow and Dalmatian toadflax, yellow star-thistle, knapweeds, and purple loosestrife.

WETLANDS GOAL

Protect, restore, and enhance prairie pothole wetlands to support diverse plant communities and provide habitat to waterfowl, shorebirds, wading birds, and associated wetland-dependent wildlife.

Natural Wetlands on WPAs

Service-owned wetlands in the three districts consist of a wide variety of wetland sizes and regimes (temporary, seasonal, semipermanent, and permanent) (Stewart and Kantrud 1971). Wetland clusters of these diverse types constitute wetland complexes (Weller 1988).

The majority of wetlands on Service lands are natural wetlands (that is, they are not influenced by water level management features or activities). Natural wetlands are dynamic systems: some—temporary and seasonal wetlands—are influenced only by spring runoff and rainfall. Others—semipermanent and permanent wetlands—are also influenced by ground water interaction. However, in all these types, natural processes guide temporal fluctuations in water levels, abiotic conditions such as salinity, and biotic conditions such as plant and invertebrate communities. All these conditions drive the nutrient and vegetation cycles that shape the dynamic character of these wetlands.

The drought and deluge frequencies associated with a given climate determine the speed of the nutrient and vegetation cycles (Murkin et al. 2000, Weller and Spatcher 1965). Prolonged high water produces a "lake" wetland with little emergent cover and few nutrients in detritus, whereas persistent low water produces heavy emergent cover and high nutrient sequestering in plant material. The occurrence of these extremes during weather cycles causes plant population turnover (maintaining biological diversity) and nutrient mobilization. Euliss et al. (2004) stressed the need to consider the changes these prairie wetland systems undergo as a result of normal climatic variation when evaluating biological wetland data or wetland conditions (for example, dry, devoid of emergent vegetation, or choked with emergent vegetation).

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An American bittern enjoying the bounty of its wetland habitat.

Wetland ecologists have recognized the contribution of the Prairie Pothole Region wetland complexes to ecosystem goods and services at the landscape scale (Brown and Dinsmore 1986, Fairbairn and Dinsmore 2001, Swanson et al. 2003). Five key wetland functions provide important services: flood abatement, water quality improvement, biodiversity enhancement, carbon management, and aquifer recharge (Gleason et al. 2008). However, provision of wildlife habitat and the sustainability of waterfowl and other water-dependent populations have traditionally received the most attention.

Although the Prairie Pothole Region occupies only 10 percent of North America's waterfowl breeding range, it produces approximately 50 percent of the continental waterfowl population (Kantrud 1983). While semipermanent and permanent wetlands provide brood-rearing and migratory stopover habitat, temporary and seasonal wetlands draw breeding duck pairs to South Dakota and other parts of the Prairie Pothole Region. Complexes of depressional, palustrine wetlands scattered throughout eastern South Dakota attract breeding duck pairs, support nesting and renesting intensity, and provide brood habitat (Kantrud et al. 1989). According to Ron Reynolds of the Service's Habitat and Population Evaluation Team (HAPET), it is estimated that every ten 1-acre wetlands can predictably support 20 duck pairs; in contrast, one 10-acre wetland likely supports only seven duck pairs; hence, the availability of wetlands is a major factor driving duck breeding in the Prairie Pothole Region. Meeting the objectives for natural wetlands requires habitat management activities such as restoration and protection against wetland degradation (such as sedimentation, invasive plant infestation, drainage, filling, and contamination).

Natural Wetlands Management Objective

Over a 15-year period, wetlands will be managed along with the uplands in which they are embedded

The Canadian toad is a denizen of the Prairie Pothole Region.

according to the priority systems developed for upland vegetation. A minimum of 10 degraded (drained, filled, leveled, invasive-choked, and contaminated) wetlands will be restored for improved wetland function in each district.

Strategies

- Initiate restoration actions on wetlands as the need for restoration is identified (for example, discovery of an old drainage ditch would trigger restoration actions).
- On selected wetlands, control the invasion of hybrid cattail and reed canarygrass.

Rationale

Wetland managers have been restoring prairie wetlands since the 1960s (Dornfeld 1988). Most wetland restorations are accomplished by plugging ditches with simple clay-core dams and seeding the surrounding upland to perennial grassland cover (Knutsen and Euliss 2001). Fill and sediment may be removed to restore hydrologic function.

It has generally been concluded that, whenever possible, restoration efforts in the Prairie Pothole Region should focus on restoring wetland complexes rather than individual basins. Wetlands in a single complex, even if widely separated, are often hydrologically connected by surface or ground water (Murkin et al. 2000, Winter and Rosenberry 1995). The biodiversity and productivity of wetland complexes are affected by exogenous forces, such as climate, and endogenous forces, such as the mix of permanence types, surficial geology, water regimes, wetland juxtaposition, and vegetation (Swanson et al. 2003; van der Valk 2005; Weller 1994, 1999; Weller and Fredrickson 1974).

Organisms move among components of the wetland complex seeking food, water, and cover (Naugle et al. 2001). Because of the variability of water conditions over seasons and years, wetland complexes are more likely to have at least some wetlands in a water and plant regime favorable to a given species, thus ensuring diverse species representation in wetland landscapes (Weller 1999). Waterbirds often build their local habitat units around a wetland complex that provides various needs and that may also act as a backup in the event of catastrophic change (Weller 1999). Knutsen and Euliss (2001) suggested that targeting large blocks of wetlands for restoration would increase the chances for the successful return of all wetland characteristics, including wildlife.

Wetlands with Water Control Structures on WPAs

Wetlands with water control structures or other capability for managers to manipulate water levels are generally managed impoundments. Their relatively shallow depths and periodic flooding and drying regimes support highly productive systems with respect to invertebrates and wetland vegetation. Corresponding bird use is generally quite diverse.

Meeting objectives for developed wetlands would require that water level management actions are carried out in a timely and appropriate manner. Ideally, impoundments should provide a mosaic of wetland habitat types to a wide variety of wetland-dependent birds such as waterfowl, shorebirds, and wading birds.

Wetlands with Water Control Structures Objective

Throughout the life of the CCP, manage the developed wetlands as dynamic wetland systems that cycle between drawdown and flood events to provide quality habitat for waterfowl, shorebirds, and wading birds. During periods between drawdowns, manage developed wetlands to provide 30–70 percent emergent vegetation and annual species.

Strategies

- In high-priority wetlands, implement periodic disturbance using water control structures to provide the full spectrum of wetland conditions—dry marsh, densely vegetated marsh (regenerative phase), hemi-marsh, open marsh (degenerative phase), and open water—to benefit wetland-dependent species of wildlife.
- Review all water management structures for improvements or repairs that would enhance management capability and seek funding necessary to carry out the improvements or repairs.

Rationale

Periodic drought may hasten full or partial drawdowns in some units. Although such drawdowns maximize the long-term viability of wetlands, the availability of wetlands with water is reduced during drought. In contrast, some past management approaches emphasized retaining as much water as possible to offset landscape-level drought effects on migratory birds at

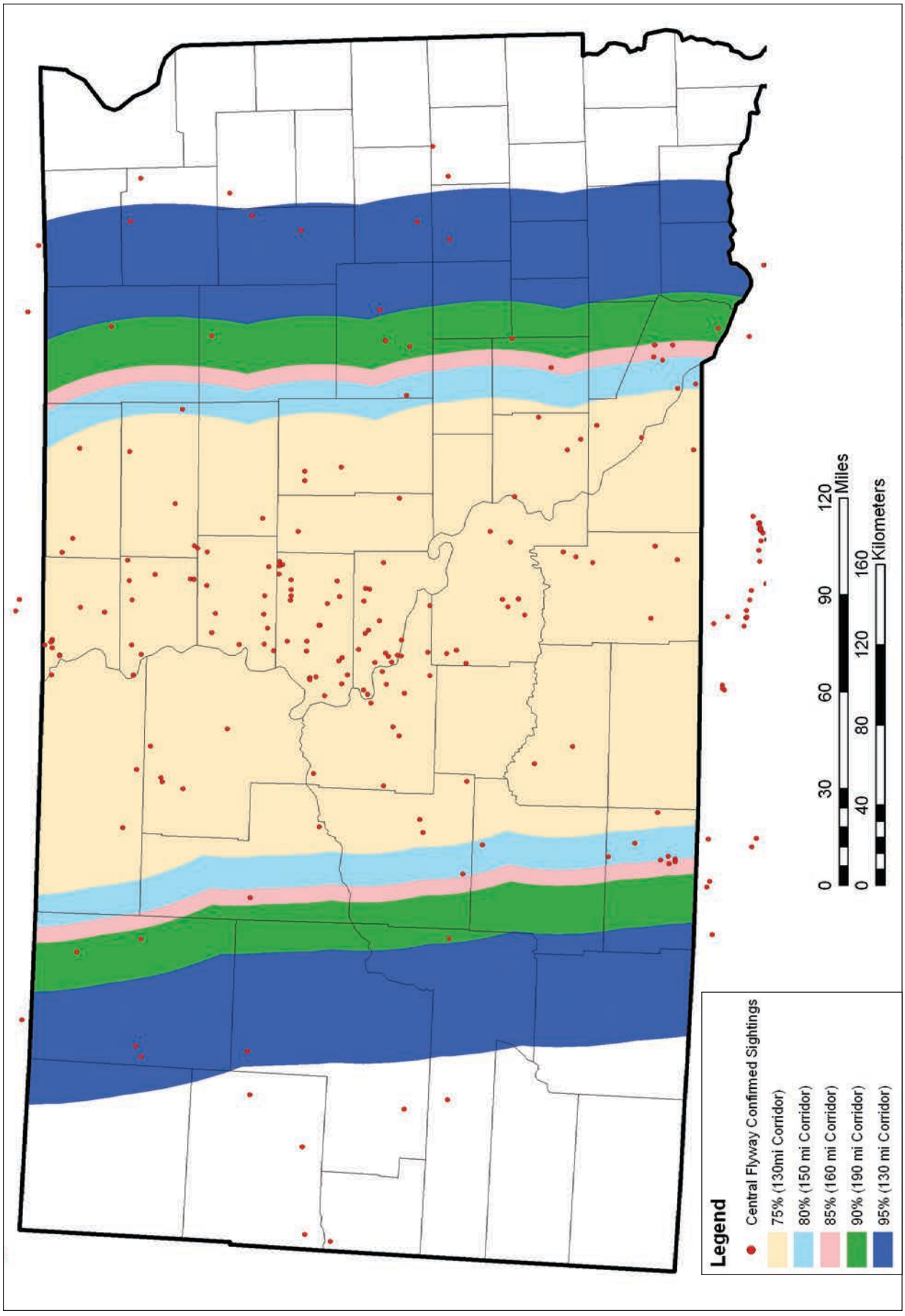

Figure 17. Whooping crane sightings throughout South Dakota.

the expense of long-term capacity to sustain wetland productivity. The speed of the cover cycle (return time) and the number of switches between cover-cycle stages over a period of time are strongly correlated to wetland productivity and biodiversity (Swanson et al. 2003, van der Valk and Davis 1978). Long return times or extended periods without switches produce wetlands "stuck" in either the lake stage or the dry stage with stable but relatively unproductive conditions. Weller and Fredrickson (1974) noted that stable water levels produce ornithologically "dead" marshes characterized by a centrally open marsh with a perimeter of dense emergent vegetation.

This objective purposely includes broad ranges, as water levels are intended to vary like those in natural wetlands. Previous research has indicated that wetlands with an approximate 50:50 ratio of open water to emergent vegetation (such as cattails and bulrushes) resulting from a combination of regenerating and degenerating states (that is, hemi-marshes) attract the highest densities and diversities of wetland birds (Weller and Spatcher 1965). Open water to emergent vegetation ratios should be close to the 50:50 ratio (that is, between a ratio of 30:70 and 70:30) in most developed wetlands, as recommended by Weller and Spatcher (1965), in most years (approximately 11 of 15), through targeted water level management.

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

Drawdowns and, more specifically, drawdown intervals can influence plant species composition, structure, and seed production (Fredrickson 1991). Periodic, growing-season drawdowns stimulate production of seed-bearing annual plants, increase invertebrate biomass, and stimulate establishment and expansion of emergent and submergent plant species. 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).

Whooping Crane

Each spring and fall, endangered whooping cranes use wetlands and agricultural fields, primarily along the Missouri River, as migratory stopover areas en route to their summer and winter grounds (figure 17, Austin and Richert 2001). In the absence of any historical records of whooping cranes nesting in South Dakota (Tallman et al. 2002), the CCP planning team deemed management actions directed at the occasional sighting of migrating or dispersing individuals most appropriate.

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Dragonflies in a prairie wetland.

Whooping Crane Objective

Over a 15-year period, annually inform the public of migrant whooping cranes stopping in the districts in an effort to reduce the risk of accidental shootings 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, when 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 monitor their whereabouts and inform the public of their presence.
- On a case-by-case basis for each occurrence of a whooping crane, consider the merits of a possible voluntary hunting closure on private lands where whooping crane use is regularly occurring. If this is deemed appropriate, contact the landowner(s) to discuss a possible voluntary closure in accordance with the "Contingency Plan for the State-Federal Protection of Whooping Cranes" (USFWS 2001b).

Rationale

Known as one of the most endangered birds in North America, whooping crane was listed as endangered in 1967 (Federal Register, March 11, 1967). The wild, migratory population of whooping cranes in the Central Flyway (Aransas–Wood Buffalo population) is expected to reach 290 individuals in fall 2010 (Tom Stehn, USFWS, personal communication). Adults stand 4–5 feet tall with a wingspan of 7.5 feet; adult plumage is described as snow white with contrasting black wing tips and red facial skin. Because of their

often close interaction with sandhill cranes and their use of similar habitats, potential exists for whooping cranes to be mistaken for sandhill cranes. With sandhill cranes being a relatively popular game species in South Dakota, the Service hopes that by informing and educating area hunters about whooping cranes' use of district lands, it can greatly reduce any risk of an accidental shooting. The Service will consult the "Contingency Plan for the State-Federal Protection of Whooping Cranes" (USFWS 2001b) for appropriate actions when dealing with migrant whooping cranes that show potential for remaining in the district for multiple days.

Research and monitoring goal

Provide a learning platform that uses science, monitoring, applied research, and adaptive management to advance understanding of the Prairie Pothole region and management of these areas.

Research and Monitoring

Most of the baseline inventories and monitoring of Service lands in the three districts is recent (2003 to present), corresponding with the appointment of wildlife biologists to the districts. While progress has been made in accruing baseline biological data, habitat goals and objectives should form the basis for future monitoring and research priorities for district lands. Goals and objectives emphasize management of vegetation communities as habitat for wildlife. Monitoring and research should be used to predict and validate wildlife response to management. It is the Service's policy to encourage and support management studies in order to provide scientific data upon which decisions may be based. The Service's "Wildlife Refuges Manual" (1957) states, "Managers who analyze and test wildlife management concepts and report results accurately will be operating in a more challenging, effective manner." According to the Service's "Fulfilling the Promise" document (1999), "Habitat monitoring is critical. If we are to lead the world in habitat conservation, management, and monitoring, it must be by example…,." 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.

Research and Monitoring Objective 1

Within 10 years of CCP approval, Sand Lake WMD will establish a vegetation inventory (that is, a habitat cover map) of upland habitats on all fee-title properties.

Strategy

- Use the National Vegetation Classification System mapping standards in the RLGIS.

Rationale

Most factors that contribute to the dynamics of wildlife populations, especially those of migratory birds, may not be directly influenced at the individual district or WPA level, but can be indirectly influenced through appropriate or inappropriate management of habitat. A basic inventory of habitats is the first step in developing detailed objectives describing the desired future vegetation conditions. While maps of the upland habitats have been completed for the Huron and Madison WMDs, a map is needed to establish a baseline of current upland habitats in the Sand Lake WMD.

Research and Monitoring Objective 2

Within 2–5 years of completion of the habitat cover map, develop and complete a habitat management plan and inventory and monitoring plan for the districts.

Strategies

- Develop specific habitat goals and objects for priority management units based on data from baseline surveys.
- Ensure that all elements of the monitoring protocol are documented:
  - question
  - sampling design
  - methodology
  - anticipated analysis and analytic tools
  - data management and reporting strategy
  - schedule
- Use supporting processes as needed (for example, conducting a station biological review, requesting a biological assessment, developing annual habitat work plans, completing a wildlife and habitat review handbook [USFWS 2008b]).
- Complete detailed and accurate plans within the allowed timeframes.

Rationale

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 stepdown plans such as inventory and monitoring plans and habitat management plans are produced. The purpose of stepdown 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. However, completion of vegetation inventories is recommended before starting this process. Upon completion of essential surveys, such as the habitat cover map, managers will be able to thoroughly assess the biological integrity, diversity, and ecological health of the upland and wetland habitats they manage.

A white-tailed buck easily clears a livestock fence.

The habitat management plans would identify specific habitat objectives for each district. Each plan would 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). An inventory and monitoring plan outlines proposed activities for habitat and wildlife data collection and provides detailed information on methodology and analysis.

Research and Monitoring Objective 3

Over a 15-year period, focus priority inventory, monitoring, and research efforts on information needs outlined in the biological objectives set forth in the CCP.

Strategies

- Continually update and refine the list of priority research needs using the annual meeting of South Dakota biologists as a platform for discussion.
- Share annual progress on current monitoring and research, results to date, and future projects during the annual South Dakota biologists meeting. Include information on the success or failure of particular treatment protocols in achieving stated objectives and include plans for future treatments.
- Use initial inventories as baseline data to assess past and future changes in plant and animal community composition.
- Use periodic surveys (for example, every 5 years) to assess vegetation composition of high-priority district habitats.
- Strive to ensure that all data and information derived from inventory and monitoring are well documented, maintained, and archived and that they are open and accessible both internally and externally, unless otherwise stated. Report results in a format and schedule that are usable, understandable, and responsive to the user.
- Whenever feasible, use and build on existing monitoring and data management efforts, both internal and external. When appropriate, strive to design and link local and regional monitoring efforts to support national assessments (that is, integrate the data across scales).
- Design and conduct issue-driven research unlikely to be reliably addressed using long-term monitoring. Develop predictive models for habitat management and restoration.
- Focus wildlife population research on assessments of species-habitat relationships. Develop models that predict wildlife responses to habitat management or restoration.
- Promote research and science priorities within the broader scientific community. Ensure that cooperative research addresses information needs identified in habitat management goals and objectives.
- According to WH-14 of "Fulfilling the Promise," "Use adaptive management to evaluate effectiveness of wildlife conservation programs and periodically evaluate programs to determine if [district] goals and objectives are being achieved." Support research that inherently integrates science with management, such as adaptive management studies.
- Encourage efficient and productive cross-station collaboration on common interests by participating in large-scale monitoring and research projects. Contributions to this effective strategy for addressing priority research needs may include providing on-the-ground study plots, equipment or staff for data collection, technical assistance, consultation, or other forms of support and collaboration.
- Host a North Dakota–South Dakota Workshop to develop an initial set of Dakota-wide research priorities for the next 10–15 years.
- Huron-specific strategy: Evaluate biological information needs identified in Huron WMD's Biological Assessment, supplementary to those addressed in the CCP's biological objectives, to determine which deserve consideration as secondary priority needs.

Rationale

Applied Research and Adaptive Management

Knowledge gaps regarding natural resources are many and varied. Research needs include information about treatment tools, response to various treatments, and wildlife response to management treatments and habitat changes. Investigations must be adequately designed, funded, and conducted to reliably address proposed hypotheses or questions. Partnerships would 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 would be supported with shared funding, lodging, vehicles, equipment, knowledge, and expertise. All research needs would need to be prioritized because

resources (funding, staff, and equipment) are always limited and often insufficient. According to Platt (1964), "Biology, with its vast informational detail and complexity, is a 'high-information' field, where years and decades can easily be wasted on the usual type of 'low-information' observations or experiments if one does not think carefully in advance about what the most important and conclusive experiments would be."

The following are examples of ongoing partnership and cooperative research across Service lands:

- In 2005, the Dakota Working Group's Grassland Monitoring Team conducted a survey to assess management issues and threats to Service lands. Survey results identified 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 Native Prairie Adaptive Management (NPAM) project was initiated. The NPAM project is a large-scale investigation of the efficacy of various management treatments used to promote recolonization by native species on prairie that has never been broken and cropped. The NPAM project has been widely adopted and broadly supported as a strategy for effectively addressing management issues that are common to all Service lands in the Prairie Pothole Region. The project's 2009 pilot year involved all Service stations in North Dakota and South Dakota. This project serves as a model of collaboration to efficiently address priority research needs in the future within the context of adaptive management. Like the NPAM project, future multi-station research and adaptive management endeavors should incorporate study designs that enable vegetation response to multiple treatments to be measured over time and across gradients in landscape characteristics (such as soils and precipitation). Permanent research plots should be established so that research is not terminated before the synergy of complementary treatments can be fully assessed.
- Another adaptive management research project focused on an invasive species is the Reed Canary Grass Adaptive Management project. Begun in 2007, this project involves participants from 10 refuges in 2 regions (Regions 3 and 6). Its purpose is to ensure that efforts to control reed canary grass are well informed and are improved upon over time through the use of predictive models and a feedback monitoring design. This learning process is the best approach to employ when management outcomes are uncertain.

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

- Gain a better understanding on the hydrology of prairie pothole wetlands.
- Commit to participate in large-scale, collaborative adaptive management projects, such as the NPAM project, throughout the life of this CCP to address these identified research needs:
  - Efficacy of various management treatments (specifically grazing, prescribed fire, graze-burn combination treatments, haying, and rest) in controlling introduced cool-season grasses on native prairie.
  - Frequency and intensity of management treatments for restoring native prairie:
    - Are there optimal treatment intervals that will maximize progress toward restoration of native herbaceous plants on native prairie without otherwise adversely affecting the biological integrity, diversity, and ecological health of the prairie ecosystem?
  - Threshold levels for infestation of native prairie by introduced cool-season grasses:
    - Is there a level of invasion beyond which the restoration of native prairie to a modestly diverse, native herbaceous flora is an unrealistic goal?
    - Are there biological indicators of a native prairie that is "too far gone" to be successfully restored without unreasonably excessive or expensive intervention?
  - The efficacy of herbicide treatment for toadflax:
    - What is the best timing for spraying toadflax for optimal control while minimizing adverse effects on native herbaceous plants?
    - Evaluate spot spraying versus blanket spraying in native prairie—will native grasses and forbs recover if widespread spraying is used to aggressively treat the toadflax threat?
    - The role of fire in controlling toadflax and Canada thistle.
- In addition to vegetation sampling and bird surveys, investigate other indicators of biological diversity, integrity, and ecological health that can be easily measured in the field to assess overall health of a prairie ecosystem or to monitor progress towards restoration.
- Investigate effects of climate change on prairie potholes, including the identification of indicator species to monitor in assessing such effects.
- Identify or develop indices reflecting relationships between precipitation-evaporation rates and soil moisture measurements as a means to link vegetation performance with long-term moisture regimes. Such indicators could be used to guide restoration efforts, vary seed mixtures, or adjust stocking rates for grazing management.

- Evaluate grassland bird response to native prairie restoration:
  - When management treatments prove successful in increasing the native herbaceous cover and suppressing introduced cool-season grasses on a tract of native prairie, do the desired changes in vegetation structure and plant species diversity exert the anticipated positive influence on grassland bird species richness or abundance?
  - Apply modern technology and scientific resources to grassland restoration efforts:
  - Conduct or evaluate research focused on establishing high-diversity stands of native grasses and forbs.
  - Evaluate effectiveness of native seed mixes containing grasses and forbs, and conduct research on wildlife response, focusing on Lepidoptera and grassland-dependent migratory birds (i.e., waterfowl, shorebirds, and songbirds), within 10 years of the CCP's approval.

Inventory and Monitoring

Unlike research, monitoring should not be viewed as a clean experiment, but rather as the collection and subsequent application of limited data that have utility in improving management practices. For instance, if we are 75 percent certain that a particular management treatment will result in a desired effect, it is probably wiser to proceed with the assumption that such is the case than to wait until more certain information is available. Monitoring enhances our ability to manage our resources wisely in full knowledge of inevitable uncertainty.

In specific situations, baseline inventory is necessary to improve the biological understanding on which management decisions are based. Aside from such baseline inventory, monitoring should not be viewed as a standalone activity, but rather as a targeted component of a larger process of science-based management (Nichols and Williams 2006). Monitoring data are not gathered with a vague hope that somehow they will prove useful for conservation. Instead, monitoring focuses on precisely the information needed to make management decisions. The important issue is efficiency, given the Service's limited resources for monitoring. The power of monitoring is to detect change, or the lack of it, and to define the direction of changes that are good or bad for conservation goals (Doak et al. 2009).

Wildlife Disease

As of 2006, each of the three districts has a current wildlife disease contingency plan in place (USFWS 2006). Annual reviews and updates by district staff will be conducted as new disease information becomes available. With emerging disease threats, Service staff can no longer rely on past, often informal, disease protocols.

Wildlife Disease Objective

Annually review and update Disease Contingency Plans.

Strategies

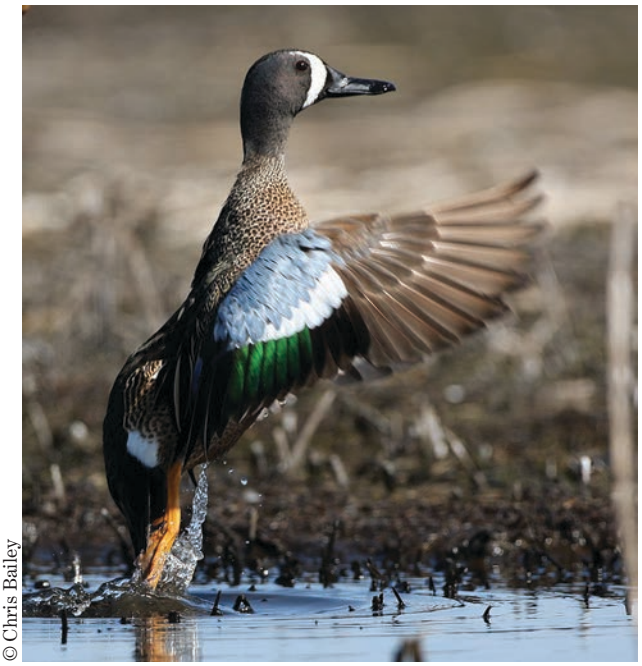
- Follow the monitoring and response protocols outlined in Disease Contingency Plans.
- Maintain a supply of personnel protective equipment on hand for emergency cleanup operations.
- Cooperate with USDA Animal and Plant Health Inspection Service (APHIS) Wildlife Services and SDGFP for response to highly pathogenic avian influenza [HPAI], or bird flu), where possible.
- Continue to support SDGFP with chronic wasting disease (CWD) surveillance.

Rationale

Bird disease response is a readily evolving process. Prior to 2006, districts dealt primarily with two diseases in the avian communities: West Nile virus (WNV) and avian botulism. WNV is a flavivirus with an enzootic cycle that involves primarily mosquitoes and birds. It was introduced into the Prairie Pothole Region in 2002. By 2003, WNV had been shown to affect 162 species of birds. The ecology of the northern prairie seems to offer favorable conditions for its continued enzootic transmission (Centers for Disease Control and Prevention 2003).

Avian botulism is a disease that affects the peripheral nerves and results in paralysis of voluntary muscles. It is contracted when a bird ingests toxin produced by the bacterium *Clostridium botulinum*. Outbreaks of avian botulism have occurred in the United States since at least the beginning of the 20th century. Botulism outbreaks are often characterized by lines of carcasses on wetland peripheries during the summer when ambient temperatures are high and water levels are receding. Filter-feeding and dabbling waterfowl and probing shorebirds appear to be among the species at greatest risk (Friend and Franson 1999). With safe handling practices, birds affected by botulism and WNV pose a relatively minor threat to the health of individuals directly handling the infected individuals (Domek 1998, Friend and Franson 1999).

With each new disease presenting itself as a threat to Service staff and the general public (for example, the highly pathogenic H5N1 strain of HPAI), concurrent disease responses are developed to coincide with each threat. HPAI 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 and, like human influenza, some forms of avian influenza are worse than others (USGS 2006). Recently, the H5N1 strain of HPAI has been found in



A blue-winged teal taking wing.

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: (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).

Avian cholera is widely distributed and poses a constant threat to migratory bird populations, especially where dense concentrations of birds occur. Avian cholera epizootics (diseases affecting large numbers of animals) were found to be inversely related to densities of semipermanent wetland basins. It is not known with certainty what environmental or physiological factors trigger an outbreak, but it appears to be associated with physiologically stressed birds that are concentrated on a limited number of wetlands (Smith and Higgins 1990).

CWD is a disease of the nervous system in deer and elk that results in distinctive brain lesions. It was first discovered in South Dakota in a captive elk herd in McPherson County during the winter of 1997–98. McPherson County is within the Sand Lake WMD. From 1999 through 2003, more than 300 hunter-harvested deer were tested, but no positive samples were found. The infected herd was traced back to captive elk herds adjacent to the Black Hills. In South Dakota, CWD has only been detected in free-roaming wildlife in Lawrence, Pennington, Custer, and Fall River Counties and Wind Cave National Park (as of July 2008) (SDGFP 2010). None of these areas is within the boundaries of the three districts. There is potential for CWD to be present but undetected, or eventually to infect deer in the districts. Service staff will adhere to protocols in the "Chronic Wasting Disease Plan for U.S. Fish and Wildlife Service Lands in the Dakotas" (USFWS 2004b) for all CWD-related work. This plan acknowledges SDGFP as the lead in all CWD efforts in the State and describes the Service as a supporting partner. If the threat of CWD increases, refuge staff will cooperate with SDGFP to assess the impact on district populations of white-tailed deer. The districts will continue to make use of the most current information to stay informed of current wildlife disease threats.

Consumptive Uses Goal

Provide visitors with quality opportunities to enjoy hunting, fishing, and trapping in waterfowl production areas and expand their knowledge and appreciation of the prairie landscape and the National Wildlife Refuge System.

Hunting

The Improvement Act identifies six wildlife-dependent recreational (priority) 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 districts. Hunting is one of the consumptive uses provided for in the Improvement Act.

Hunting Objective

Throughout the life of the CCP, maintain or enhance hunting opportunities on WPAs. Continue to provide information about public opportunities for hunting in accordance with State and Federal regulations.

Strategies

- Ensure that all WPAs have the most recent version of boundary signage in accordance with current policy.
- Participate in updating the WPA Mapper initiative, which provides electronic information on location and features.
- Explore options to develop or improve infrastructure to support hunting opportunities.
- Explore opportunities for development of universally accessible facilities and locations for hunters with mobility impairments. Work with partners to help fund such facility development.
- Establish criteria for eligibility to use privileges for hunters with mobility impairments, such as drive-in access.
- Keep data current to allow the State to incorporate district information into the SDGFP hunting guide.

Rationale

Hunting ring-necked pheasant, prairie grouse, deer, waterfowl, and other migratory gamebirds on WPAs in the districts is very popular. The major hunting seasons for all species are during October through December. A light goose Conservation Order hunting season provides hunters an opportunity to harvest snow geese during the spring migration.

WPAs are open to hunting as authorized by 50 CFR part 32.1. This provision states that WPAs shall annually be open to the hunting of migratory game birds, upland game, and big game subject to the provisions of State law and regulations.

Because the popularity of hunting on WPAs is increasing, 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 as game is dispersed.

Pressure for hunting is intensifying on Service lands. The number of nonresident hunters is increasing. In addition, the extent of private property off limits to hunting is increasing, while CRP grassland acres on private lands are decreasing.

To ensure a high-quality hunting experience, it is 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 mobility impairments, such as wheelchair-bound hunters. Hunting by young people is already taking place, because the WPAs are managed in accordance with State regulations that include hunt days for youths.

Fishing

Fishing is another consumptive use allowed for in the Improvement Act.

Fishing Objective

Throughout the life of the CCP, maintain and/or enhance fishing opportunities on WPAs. Continue to provide information about public opportunities for fishing in accordance with State and Federal regulations.

Strategies

- Ensure that all WPAs have the most recent version of boundary signage in accordance with current policy.
- Participate in updating the WPA Mapper initiative, which provides electronic information on location and features.
- Keep data current to allow the State to incorporate district information into the SDGFP fishing guide.
- The Madison WMD will continue to work with the State to maintain healthy fish populations through the Natural PONDS Program by special use permit).

USFWS

South Dakota Game, Fish and Parks supports youth hunting through a variety of programs.

Rationale

A few of the more permanent lakes in the districts provide fishing for northern pike, perch, walleye, and a few other species during high precipitation years. Parts of these lakes may be on WPAs. Fishing in districts is available summer and winter. Winter ice fishing is far more popular than fishing during warmer weather. These areas are open to fishing according to State regulations and special refuge regulations. SDGFP's Natural PONDS fisheries program is permitted on 11 wetlands in the Madison WMD. Fry and adult crappies, perch, bluegills, and walleyes are stocked in the spring and then retrapped as fingerlings and adults and stocked into local lakes that can support a fishery.

Trapping

Trapping is a consumptive use allowed for in the Improvement Act.

Trapping Objective

Throughout the life of the CCP, maintain or enhance trapping opportunities on WPAs. Continue to provide information about public opportunities for trapping in accordance with State and Federal regulations.

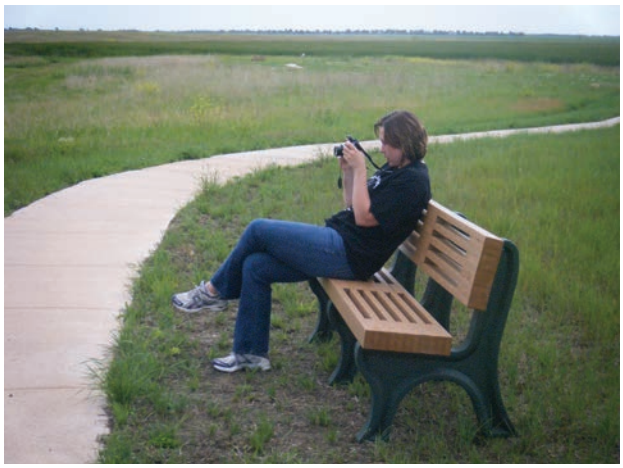
Strategies

- Ensure that all WPAs have the most recent boundary signage in accordance with current policy.
- Participate in updating the WPA Mapper initiative, which provides electronic information on location and features.
- Keep data current to allow the State to incorporate district information into the SDGFP hunting guide.

Rationale

WPAs are open to trapping as authorized by 50 CFR part 31.16. This provision states that WPAs shall be open to public trapping without Federal permit, and that each person trapping shall possess the required State license or permit and shall comply with the provisions of State laws and regulations.

The great blue heron is an iconic symbol of wetlands across the country.



A photographer on Vaillancourt-Schneck Memorial Natural Trail.

NONCONSUMPTIVE USES GOAL

Provide visitors with quality opportunities to enjoy, observe, photograph, and appreciate the prairie ecosystem while expanding their knowledge of and support for the National Wildlife Refuge System.

Photography and Wildlife Observation

Among the six priority uses identified in the Improvement Act, several are consumptive and several are nonconsumptive. Photography and wildlife observation constitute a nonconsumptive use.

Photography and Wildlife Observation Objective

Throughout the life of the CCP, develop, maintain, and enhance visitor opportunities for wildlife observation and photography.

Strategies

- Within 3 years of CCP approval, the Huron WMD will develop a new general brochure.
- Within 1 year of CCP approval, the Madison WMD will develop a new general brochure.
- Ensure that the public is aware of wildlife observation and photography opportunities at the districts and identify observation areas open to the public through signage, publications, and maps.
- Incorporate district lands into the regional birding trail pamphlets by promoting WPAs as stops. Seek out partners to establish and promote birding trails.
- Provide checklists to inform visitors of seasonal wildlife presence and abundance.
- Each district will host a bird identification event annually.
- Develop website-based observation materials such as bird lists and information, locations of observation blinds, maps, and web cams.
- Where feasible, develop a simple map for each district's visitor center or contact station 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).
- The Huron WMD will prepare a feasibility study for the establishment of an observation blind for prairie chickens on the Harter WPA within 2 years of CCP approval.
- The Huron WMD will pursue the development of a birding trail for visitors with visual impairments.

Rationale

WPAs provide visitors with tremendous opportunities for viewing and photographing wildlife species that make the prairies and wetlands of the Prairie Pothole Region their home. Excellent opportunities can be found in all three districts, which together reach from the Minnesota/South Dakota border west across the Missouri River. Spring is an especially good time to visit WPAs and see a wide variety of abundant migratory birds as they migrate north to their summer breeding grounds. Remote prairie potholes with wildflowers displaying their colors on tracts of native prairie can provide beautiful and inspiring vistas that are preserved for the enjoyment of future generations.

Appendix A contains the compatibility determination for wildlife observation and photography.

Wildlife observation and photography are both wildlife-dependent recreational (priority) uses listed in the Improvement Act. In fiscal year 2008, wildlife photography alone accounted for more than 3,000 visits to the three districts. Facilities that support these activities include visitor centers, interpretive displays, auto routes, overlooks and observation platforms, and informational kiosks.

Operations and Administration Goal

Through effective communication and innovative partnerships, secure and efficiently utilize funding, staffing, and volunteer programs for the benefit of all natural resources in the districts.

Land Protection

The Huron, Madison, and Sand Lake WMDs are three of 37 districts throughout the Prairie Pothole Region. They were established by the legislation that authorized the Small Wetlands Acquisition Program to save wetlands from various threats, particularly draining. The passage of Public Law 85-585 in August 1958 amended the Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) of 1934, allowing for the acquisition of WPAs and "Easements for Waterfowl Management Rights" (easements). The nation's first WPA was acquired in the Waubay study area (now known as the Waubay WMD) when the 160-acre McCarlson WPA in Day County was purchased from Arnold McCarlson on January 19, 1959. The Wetlands Loan Act (P.L. 87-383), passed on October 4, 1961, allowed for the advancement of funds against future revenues from Duck Stamp sales. As a result, the first wetland management districts were created in 1962.

Wetland Easement Objective

Throughout the life of the CCP, each district will secure perpetual conservation easements on 1–5 percent of remaining unprotected, high-priority wetland acres.

Strategies

- Continue to focus the protection of wetlands using conservation easements in areas where the Service is also protecting priority grasslands. Because of the administrative process involved in calculating values (using the assessed value of the land and a multiplier derived from the relationship between the sales price of similar properties and the assessed values of those properties), it is most efficient for the Service's Division of Realty to focus acquisition efforts in specific areas (for example, counties) before moving on to other areas. Focusing on specific areas and making multiple offers to many landowners reduces the administrative burden of purchasing conservation easements, thereby increasing the number of acres that can be protected.
- Use mass mailings to prospective sellers in targeted areas with information about the conservation easement program.
- Maintain and update the wetland easement program brochure.
- Maintain lists of willing sellers, some of whom have been waiting several years for an easement offer. Continue to process these offers, based on habitat potential and funding, to protect the highest priority areas.
- Continue to "piggyback" on the Partners for Fish and Wildlife Program as a way to inform prospective sellers of the Service's conservation easement program. Oftentimes, staff of the Partners for Fish and Wildlife Program is the first point of contact for many landowners who might not otherwise be aware of the conservation programs available to them.
- Continue to use the Service's strong partnership with SDGFP and NGOs that support the Service's easement acquisition programs. These NGOs provide a critical link to many sources of funding that can be leveraged to provide additional funds for easement purchases. Notable supporters include Ducks Unlimited, North American Wetlands Conservation Act (NAWCA), The Nature Conservancy, Pheasants Forever, and many other conservation organizations that generate non–Duck Stamp funding to buy conservation easements.

Rationale

Given a constant acquisition budget over the next 15 years (and using an average acquisition target based on 2008 Division of Realty figures), it is projected that more than 40,000 wetland acres can be protected with conservation easements within the three districts. HAPET has identified those wetlands that are especially at risk—temporary and seasonal wetlands, often less than 1 acre in size, that are totally or partially embedded in cropland. The pressure to drain and fill these wetlands to support tillage agriculture puts these basins at higher risk of conversion than those in grasslands. At the same time, these wetlands have important value for waterfowl. Based on predictive models developed by HAPET, the Service has prioritized conservation easement acquisitions to focus on the following:

- wetlands that are not protected
- wetlands capable of supporting more than 25 breeding duck pairs per square mile
- wetlands embedded in cropland, where the risk of degradation is especially high
- wetlands at greatest risk of degradation (from drainage and filling): seasonal and temporary basins
- semipermanent and permanent wetlands less than 1 acre in size

According to HAPET, waterfowl pairs in the PPJV are supported on 7.33 million wetland acres, of which 1.49 million acres are currently protected by wetland easements or WPAs. An estimated 1.15 million duck pairs reside in these wetlands, leaving the majority of pairs (3.10 million, or 73 percent) dependent on wetlands that are currently unprotected except through the "Swampbuster" provision of the Farm Bill. Using the criteria above, HAPET identified 1.4 million acres of priority wetlands within the area encompassed by


USFWS

Partnerships between the Service and area ranchers are powerful tools to manage wildlife habitat.

the PPJV that are in greatest need of protection; these wetlands would support 1.5 million duck pairs (figure 18). This number has been adopted as a protection goal by both the Dakota Working Group (a team consisting of refuge managers and project leaders from refuges and districts in South Dakota and North Dakota) and the PPJV (Ringelman 2005).

Securing protected status on 40,000 priority wetland acres in the next 15 years would help the Service advance toward the Dakota Working Group and PPJV goal. Protection of priority wetlands with conservation easements would not only benefit waterfowl, but would also have benefits for other migratory waterbirds. Niemuth et al. (2006) presented results demonstrating the importance of temporary and seasonal wetlands embedded in agricultural landscapes for migrant shorebirds in the Prairie Pothole Region. Specifically, they found that temporary wetlands were selected by migrant shorebirds, but pointed out that presence of water and lack of drainage activity were also strong predictors of shorebird presence.

Grassland Easement Objective

Throughout the life of the CCP, each district will secure perpetual conservation easements on 1–5 percent of remaining unprotected, high-priority grassland acres.

Strategies

- Continue to focus the protection of grasslands with conservation easements in areas where the Service is also protecting priority wetlands. Because of the administrative process involved in calculating values (using the assessed value of the land and a multiplier derived from the relationship between the sales price of similar properties and the assessed values of those properties), it is most efficient for the Service's Division of Realty to focus acquisition efforts in specific areas (for example, counties) before moving to other areas. Focusing on specific areas and making multiple offers to many landowners reduces the administrative burden of purchasing conservation easements, thereby increasing the number of acres that can be protected.
- Use mass mailings to prospective sellers with information about the conservation easement program in targeted areas.
- Maintain and update the grassland easement program brochure.
- Maintain lists of willing sellers, some of whom have been waiting several years for an easement offer. Continue to process these offers, based on habitat potential and funding, to protect the highest priority areas.
- Continue to "piggyback" on the Partners for Fish and Wildlife Program as a way to inform prospective sellers of the Service's conservation easement program. Often, staff of the Partners for Fish and Wildlife Program is the first point of contact for many landowners who might not otherwise be aware of the conservation programs available to them.
- Continue to use the Service's strong partnership with SDGFP and NGOs that support the Service's easement acquisition programs. These NGOs provide a critical link to many sources of funding that can be leveraged to provide additional funds for easement purchases. Notable supporters include Ducks Unlimited, NAWCA, The Nature Conservancy, Pheasants Forever, and many other conservation organizations that generate non–Duck Stamp funding to buy conservation easements.

Rationale

The initial focus of the Small Wetland Acquisition Program was primarily the protection of wetlands through purchasing land in fee title and acquiring perpetual wetland easements. However, data also revealed the importance of upland grasslands to successful nesting of waterfowl. With the continued conversion of grassland to cropland and consistent declines in the populations of grassland-dependent birds, the need to protect adjacent grassland habitats became evident. The Service received authorization and began to acquire grassland easements in South Dakota in 1989.

Like a wetland easement, a grassland easement transfers limited perpetual rights to the Service for a one-time, lump-sum payment. The purpose of a grassland easement is to prevent the conversion of grassland to cropland, while minimally restricting existing agricultural practices.

More specifically, the purposes of a grassland easement are:

- to improve the water quality of wetlands by reducing soil erosion and the use of chemicals and fertilizers on surrounding uplands;

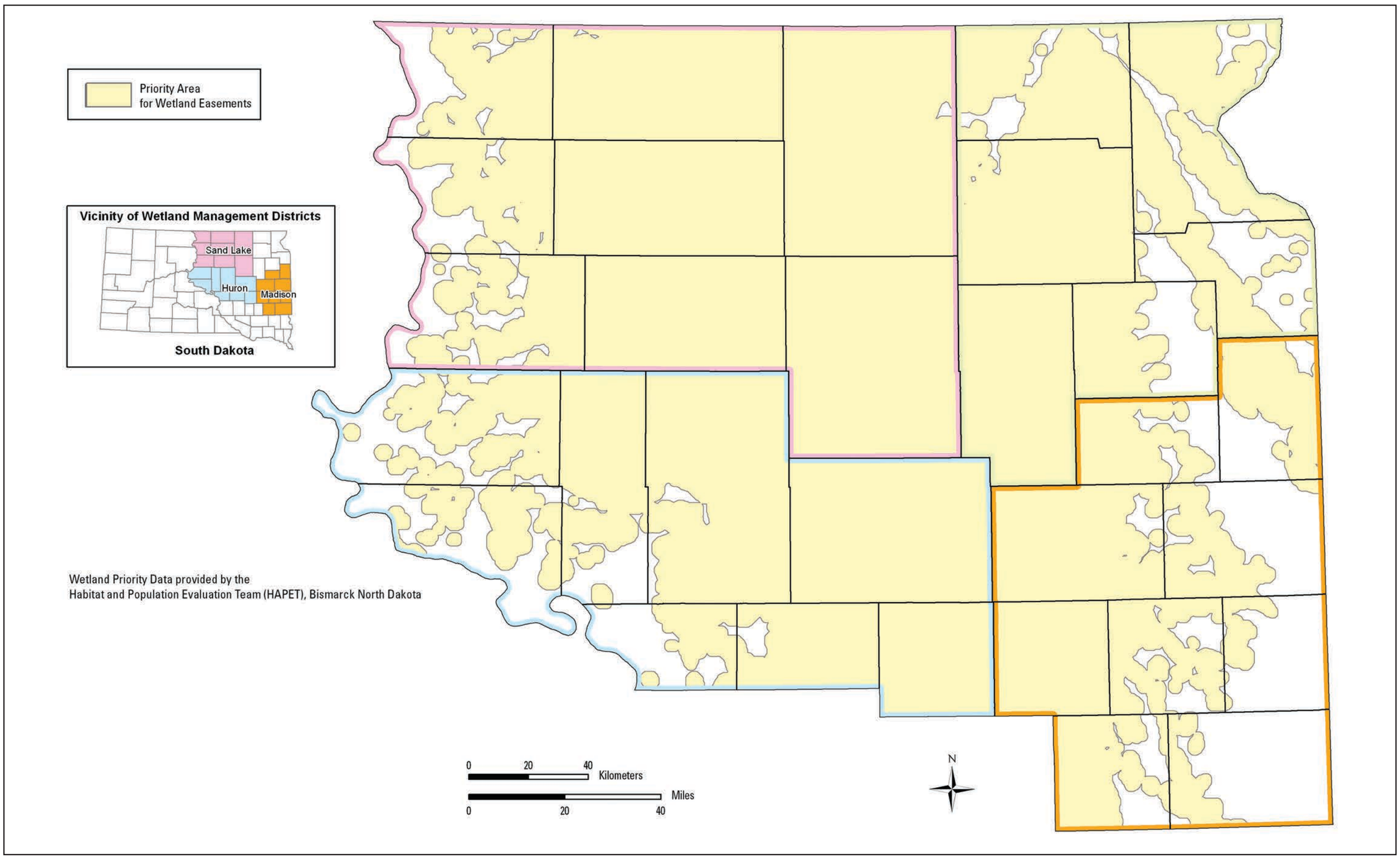


Figure 18. Priority wetlands.

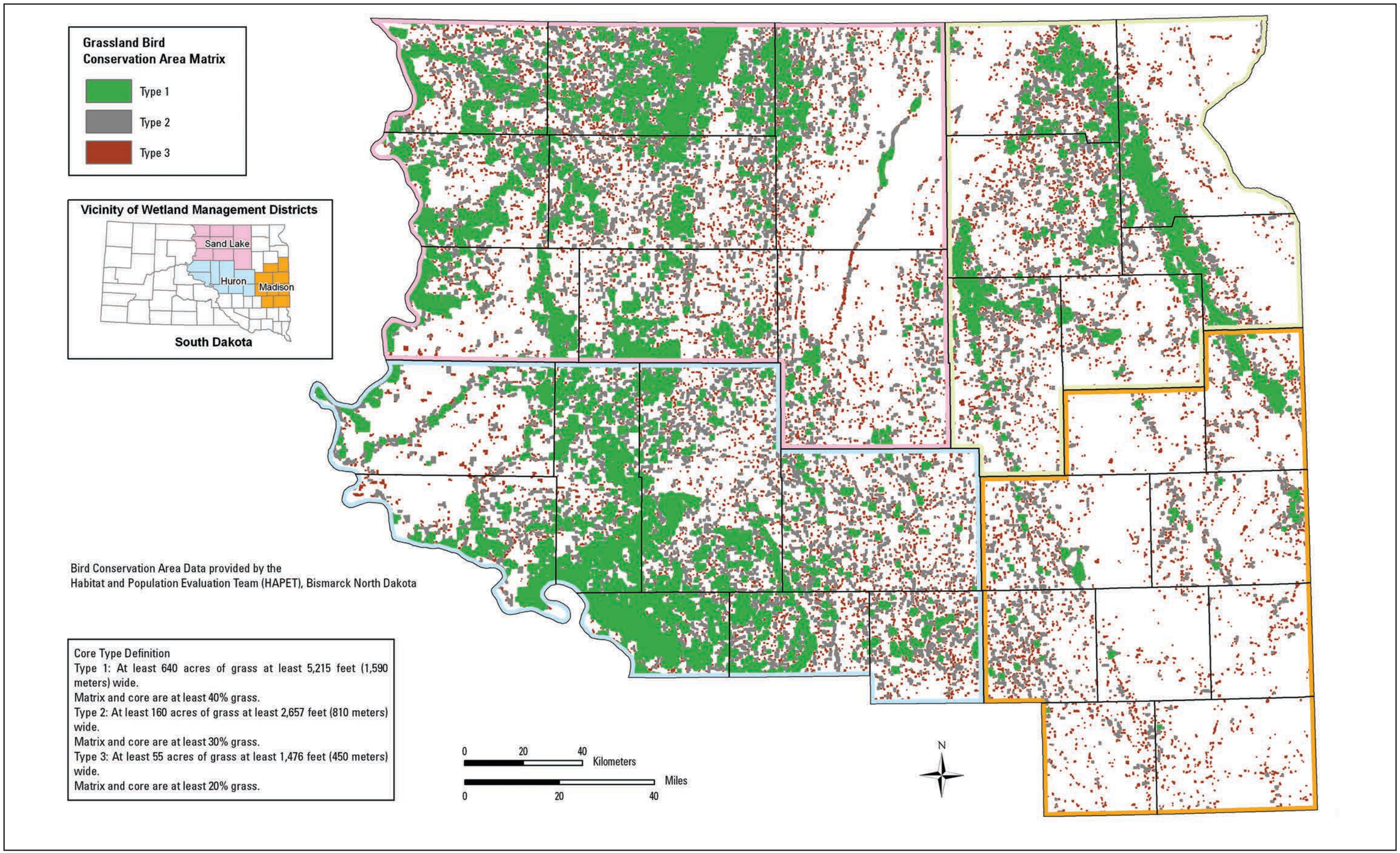


Figure 19. Distribution of priority grasslands.

- to improve upland nesting habitat for all ground-nesting birds, especially waterfowl, and enhance nesting success on private lands;
- to perpetuate grassland cover established by other Federal programs (for example, CRP);
- to provide an alternative to the purchase of uplands in fee title, thus maintaining lands in private ownership.

Grassland easements restrict the landowner from altering the grass by digging, plowing, disking, or otherwise destroying the vegetative cover. Haying, mowing, and seed harvest are restricted until after July 15 of each year. The landowner can graze without restriction (appendix A).

Considering the strong and ongoing partnership with Ducks Unlimited and the consistent success of using their non-Federal money to help acquire NAWCA grants, it is likely the Service's grassland easement program will enjoy stable, if not increasing, funding over the next 15 years. Under these circumstances and using an average acquisition target based on 2008 Division of Realty data, the Service would secure protected status for more than 500,000 grassland acres in South Dakota.

HAPET has developed a model that shows the distribution of priority grassland patches (at least 55 acres) in relation to breeding duck pairs (at least 25 per square mile) (figure 19) and predicts that for every 1 percent decline of priority grassland in the Prairie Pothole Region, there will be 25,000 fewer ducks in the fall. Protection of priority grassland patches not only benefits waterfowl, but also a wide variety of grassland-dependent migratory birds such as western meadowlark (Johnson and Igl 2001).

HAPET identified 11.56 million acres in the PPJV area of North Dakota, South Dakota, and eastern Montana that meet the above criteria. By subtracting grasslands already protected on WPAs or grassland easements, HAPET identified 10.4 million grassland acres in need of protection. The Dakota Working Group and the PPJV (Ringelman 2005) have adopted this figure as a protection goal. Securing protected status on 500,000 acres of priority grassland in the next 15 years would help the Service advance toward meeting this goal.

Additionally, the HAPET model has identified larger grassland areas with respect to area-dependent grassland-nesting birds such as northern harrier, upland sandpiper, and grasshopper sparrow (Johnson and Igl 2001). These areas consist of contiguous grass cover encompassing at least 640 acres with at least 30 percent of the area comprising permanent or semipermanent wetlands. Protection of these large, contiguous blocks of grass within a larger, grassland-dominated landscape should provide adequate protection for a wide range of grassland-dependent migratory bird species that are of management concern (Estey 2007).

Fee Interest Objective

On average, each district will annually strive to purchase additional land in fee title (WPAs) at a rate of 1 percent over the existing land base.

Strategies

- Purchase standalone or roundout properties with habitat values equal to or greater than existing high-priority WPAs.
- Standalone properties could be purchased ahead of a roundout property or any easement.
- Continue to use the Service's strong partnership with others to acquire WPAs through purchase and donation.
- Consider exchange proposals with other conservation organizations with the goal of improving management capability.
- Survey boundaries on all newly acquired and existing WPAs as needed.

Rationale

WPAs are public lands purchased by the Federal Government for increasing the production of migratory birds, especially waterfowl. The purchase of land—or ownership in fee title—entails the Federal Government holding ownership of land on behalf of the American public. Money to buy WPA lands generally comes from the public purchase of Federal Duck Stamps. This important program aims to ensure the long-term protection of waterfowl and other migratory bird breeding habitat—primarily in the Prairie Pothole Region of the northern Great Plains. WPAs are open to the public for hunting, fishing, bird watching, trapping, hiking, and most other nonmotorized and noncommercial outdoor recreation.

The majority of WPAs in the Madison, Huron, and Sand Lake WMDs were purchased in the 1960s. Historically, acquisition of WPAs focused on larger semipermanent wetlands; often, very little associated upland was included in the tract. As grassland cover was converted to cropland, the Service recognized the importance of purchasing uplands adjacent to wetlands for waterfowl production. When considering a WPA purchase from willing sellers, the Service ranks sites with native prairie, rare wildlife and plant species, a diversity of temporary and semipermanent wetlands, and areas near or adjacent another WPA as higher priorities for acquisition. Currently, the Service purchases on average one WPA in each district every 3 years.

Funding and Staffing

Goals, objectives, and strategies described in this chapter are based on full, adequate funding and staff. Current policy for Region 6 refuge operations requires that each station is allocated a base budget comprising no more than 75 percent fixed cost and 25 percent management capability (flexible) funding. Districts

will construct and/or maintain buildings, roads, and other infrastructure at or above Service standards (see Facilities Objective). In addition, districts will purchase new equipment and maintain and replace equipment and vehicles at or above Service standards. Other sources provide additional funding for fire management, law enforcement, volunteers, challenge cost share, biological inventory and monitoring, land acquisition, and deferred maintenance.

The Service's current approved staffing model was used to determine each district's needed staff (appendix K). A national team of Refuge System professionals developed a new 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 used 15 factors to drive workload including the following: number of acres, number of easement contracts, number of acres actively managed, level of invasive species infestations, endangered species, biological management and monitoring, wilderness management, visitor services, and maintenance needs. Data for the model were drawn from the Service's "Annual Report of Lands," "Refuge Annual Performance Plan," "Real Property Inventory," and other Service data sources.

The new staffing model recommends additional staff of 19.5 FTEs for the Sand Lake WMD, 14.5 FTEs for the Huron WMD, and 11 FTEs for the Madison WMD over the next 15 years. During the life of the CCP, it is anticipated that staffing increases will comprise five FTEs for the Sand Lake WMD, four for the Huron WMD, and three for the Madison WMD.

Potential New District Objective

Within 2 years of CCP approval, the Sand Lake WMD will evaluate the feasibility of establishing a standalone wetland management district.

Strategies

- Identify a WPA capable of supporting a complete wetland management district headquarters complex consisting of an office–visitor center, operations and maintenance facilities, equipment storage facilities, staff and visitor parking areas, and interpretation areas.
- Prioritize the building and maintenance schedule based on funding projects in the Service Asset Maintenance Management System. Identify an office–visitor center as the top priority construction project.
- Schedule equipment and vehicle replacements to achieve industry standards when normal life expectancy is reached.
- Work with partners and the regional office to obtain funding to fill four additional positions: outdoor recreation planner, law enforcement officer (park ranger), maintenance worker, and refuge operations specialist.
- Prepare a socioeconomic fact sheet of area businesses, schools, and services for personnel recruitment purposes.

Rationale

The Sand Lake WMD is the largest district in the Refuge System, encompassing 692,132 acres of fee-title land and perpetual conservation easements in 10 counties of north-central South Dakota. All personnel, equipment, and facilities are based at the Sand Lake National Wildlife Refuge in extreme northeastern Brown County and are shared with the refuge. While this location adequately serves the refuge, it does not efficiently serve the district. Wetland management districts that share management and facilities with national wildlife refuges suffer a multitude of negative consequences under this organizational structure. In addition to shortfalls in deleted adequate staffing and funding for the district, the mere location of the current Sand Lake Refuge Complex office results in management inefficiencies for adequate land management and biological monitoring. Figure 7 illustrates the distances from the Sand Lake Refuge headquarters to district fee-title properties and resources. Clearly, this arrangement results in extended travel times, resulting in less management and monitoring, increased fuel costs, and inefficient response times to various district needs. Biological monitoring has been lacking for many years, largely as a result of staff shortages and this geographic arrangement.

Establishing a district headquarters location in western Edmunds County would greatly enhance all facets of district management. Such a site would be centrally located for the majority of land resources in six counties of the current district. U.S. Highway 12, a primary travel artery through South Dakota, bisects the county from east to west and can provide an increase in visitor services and interpretative contacts for the public. Two small communities—Roscoe and Bowdle—in the western half of Edmunds County offer a variety of services. Three WPAs of suitable size, space, and habitats to provide adequate sites for a district headquarters facility are located on State Highway 47 north of Bowdle.

Properties along U.S. 12 will be investigated for possible acquisition and development of district facilities. Temporary quarters for researchers, seasonal staff, and volunteers would be included in the proposed facilities. These facilities would streamline the logistics required to house fire crew and other personnel supporting interagency cooperative land management and research agreements. In addition, biological monitoring personnel could utilize the facilities for continued research.

Two counties—Brown and Spink—would remain with the Sand Lake Refuge Complex for complete management purposes. These two counties combined encompass approximately 97,015 acres of fee-title land and conservation easements and can be efficiently managed by refuge staff. The remaining eight counties—McPherson, Edmunds, Faulk, Campbell, Walworth, Potter, Corson, and Dewey—encompass 590,289 acres of fee and conservation easements. The new district—comprising 8 counties rather than 10—would remain the largest district in the Refuge System.

Cultural Resources

Cultural Resources Objective

Throughout the life of the CCP, integrate the process for section 106 of the National Historic Preservation Act (NHPA) into all applicable district 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. Avoid or, when necessary, mitigate adverse effects on significant cultural resources.

Strategies

- Incorporate the NHPA section 106 review process into project development as early as possible and complete the process, as applicable.
- Complete a programmatic agreement with the State Historic Preservation Officer to expedite project review.
- Continue cultural resource review of the districts' projects to identify concerns.

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.

Law Enforcement

Law Enforcement Objective 1

Throughout the life of the CCP, protect all wetland and grassland areas under perpetual easement through active monitoring and law enforcement in accordance with the provisions of the conservation easement contracts.

Strategies

- Following the guidelines contained in the "Easement Manual" for enforcement procedures, conduct annual surveillance flights to detect potential conservation easement violations and promptly follow up with needed enforcement action.
- If personnel and funds are available, annually send letters to new landowners informing them of existing conservation easements on their property, including associated easement provisions.
- Proactively map pre-1976 wetland easements and provide maps to landowners along with a copy of the easement contract containing provisions.
- Proactively provide to county USDA offices a map of Service interests showing WPAs and easements. USDA personnel will use maps to identify Service easements prior to granting any wetland drainage requests. Annually update these maps.
- Conduct aerial flights to obtain digital photography of all wetland easements.
- If personnel and funds are available, annually contact the county road supervisors to see if they have any federally funded road projects that might affect easement wetlands or unprotected wetlands and provide advice to minimize impacts.
- Seek assistance from HAPET for spatial data requests on the locations of Service interests in the pre-planning of wind generator farms, fuel pipelines, overhead distribution power lines, or other large-scale commercial developments.
- Complete a workforce analysis to identify law enforcement staff needs and strengthen these areas through position management, new staff, or both. This will prevent protected wetlands from being lost through violations as a result of insufficient law enforcement staff.

Rationale

When the Small Wetlands Acquisition Program was initiated more than 50 years ago, the Service believed that conservation easements would require little to no maintenance or enforcement efforts. However, it soon became evident that in order to protect the government's interest in these easements, a systematic approach was necessary for easement administration and enforcement.

"Swampbuster" provisions of the Farm Bill (which prohibit conversion of wetlands for the production of commodity crops by Farm Bill participants) notwithstanding, pressures to drain and fill wetlands have continued to intensify. As farm implements such as drills, sprayers, and tractors become larger, landowners increasingly view small isolated wetlands as nuisance spots because they are tired of working around them. Other Farm Bill programs can also unintentionally increase pressure to violate wetland easement provisions. One such program, "prevented planting," provides compensation to a landowner for acres that cannot be seeded to a crop. To qualify for payment, the operator must only make an attempt to farm the acres (oftentimes, these are wetland acres). Simply plowing the ground once in the fall, when wetlands are naturally dry, can constitute an attempt. To facilitate plowing, landowners often burn off the wetland vegetation. It is common for these burns to occur on conservation easement–protected wetlands without

the required permit from the administering district, which is a violation of the easement provisions.

In the absence of active and effective enforcement, the Service's conservation easement interests could be lost forever, in contrast to resources that the government owns outright. A 15-year hiatus in enforcement action would likely result in irreparable harm to the Service's easement interests and permanent loss of habitat.

Because most grassland easements protect native prairie, the major enforcement concern is cultivation. While violations involving the conversion of native prairie to cropland are extremely rare, full restoration is arguably impossible (although restoration of grassland is possible to regain compliance with grassland easement provisions, which do not specify native prairie). Accordingly, enforcement is essential to the protection of these habitats. Haying, mowing, or harvesting seed before July 15, in violation of the conservation easement provision, could cause direct losses of grassland-nesting birds, including waterfowl. Haying is not common on native prairie, but it is more likely to occur on tamegrass grasslands. Enforcing early hay violations affords another opportunity to meet and visit with landowners and operators. These contacts may serve to remind landowners and operators of the conservation easement provisions and hopefully prevent more serious violations in the future. Like any law enforcement action, the ultimate goal is voluntary compliance.

Law Enforcement Objective 2

Throughout the life of the CCP, the districts will protect natural and cultural resources pursuant to all relevant laws, executive orders, regulations, and policies. The districts will provide law enforcement for all consumptive and nonconsumptive public uses on Service lands.

Strategies

Provide adequate law enforcement coverage of all hunting, fishing, and trapping seasons to ensure compliance with laws and regulations while providing for public safety and welfare.

- Develop extensive methods for signage, to facilitate information transfer, and to address communication needs through the use of kiosks, public use leaflets, and tear sheets explaining regulations and prohibited activities.
- Develop, coordinate, and maintain working relationships with State and local law enforcement authorities and fire departments to protect district properties and Federal trust species.
- Continue to work cooperatively and share information with SDGFP to conduct law enforcement patrols to ensure compliance with regulations.
- Conduct an active migratory bird law enforcement program throughout the districts.

Rationale

For management purposes, WPAs and permanent conservation easements are organized into wetland management districts. District staff use managed grazing, haying, and prescribed burning to enhance the habitats found on WPAs. WPAs are open to hunting, fishing, trapping, wildlife observation, wildlife photography, environmental education, and interpretation. All other activities are prohibited.

Wildland Fire Management

Wildland Fire Management Program Objective

Throughout the life of the CCP, provide adequate collaboration and teamwork between the fire program and refuge program to ensure that the objectives of DOI fire policies and other Federal policies are met. At the same time, the program will attain the following objectives:

- safely suppressing all wildfires within the districts and maintaining an initial attack success rate of 95 percent or higher on wildfires occurring on Service lands
  - ➢ Prior to European settlement, wildfires had the ability to burn vast areas. Today, large fires (more than 300 acres) are still possible, but the likelihood has been reduced primarily as a result of habitat fragmentation. Nevertheless, there is still a high probability of wildfires damaging neighboring property. Due to the small size of Service lands, rapid rates of spread in grass fuels, and potential for wildfire to cross onto neighboring lands, the districts have chosen to suppress all wildfires to reduce potential threats to neighboring private land.
  - ➢ Region 6 has identified fire management districts throughout the region. Under this approach, the level of fire management staffing would be determined by established modeling systems based on workload. Data used to determine the workload are based on historical wildfire suppression activities as well as on historical and planned fuel treatments.
  - ➢ Realizing that fire management staff and equipment may be placed anywhere within the fire management district, utilizing local refuge staff as well as other Federal and non-Federal partners to assist in wildfire suppression is a priority. The districts will attempt to maintain and encourage fire qualifications for refuge staff. In addition, local agreements between Federal and non-Federal partners will be pursued and/or maintained.

- utilizing Burned Area Emergency Response (BAER) or Burned Area Rehabilitation (BAR) funding as needed following wildfires
  - Wildfires can damage natural and cultural resources and improvements. BAER treatments are intended to protect public safety and stabilize and prevent further degradation of natural and cultural resources. These treatments are considered emergencies and are conducted within 1 year of wildfire containment. BAR treatments are nonemergency efforts conducted within 3 years of wildfire containment to improve fire-damaged lands that are unlikely to recover to management-approved conditions, or to repair or replace minor facilities damaged by wildfire. For example, BAR funding can be used to repair or replace fences damaged by wildfire or to treat burned areas to prevent the spread of invasive plants. The use of BAER and BAR funding will follow National and regional policy and guidance.
  - It is anticipated that BAR funding has the greatest potential to be used in the districts.
- completing an updated fire management plan (FMP) that reflects the goals and other objectives identified in this CCP
  - Service policy requires that every unit containing burnable vegetation have an FMP. The FMP is a stepdown plan from the CCP and provides guidance in how the fire management program will be instituted to meet National, regional, and refuge goals and objectives. An approved FMP allows the manager to consider a wide range of suppression alternatives and to conduct prescribed fires.
  - The FMP is intended to be dynamic and reflect current policies and situations; therefore, an FMP is periodically reviewed and revised. Required updates and revisions will follow National and regional policy and guidance.
- implementing and monitoring a rotational prescribed burn program over the life of the CCP that supports the fire-dependent communities within the districts
  - Fire is an important natural component in the maintenance and restoration of nearly all the habitats in the districts. The frequency and magnitude of prescribed fires can have a profound impact on a habitat's successional state and the transition from one habitat type to another. Following European settlement, wildfire suppression disrupted the natural disturbance cycle, leading to habitat succession into different seral stages or into different habitat types altogether.
  - Prescribed burning is an effective tool for restoring plant communities to historic benchmark conditions, recycling nutrients, reducing hazardous fuels, reducing the threat of fires at the wildland-urban Interface, reducing or eliminating nonnative vegetation, increasing the growth and production of native plants, reducing woody encroachment, and reducing the risk of catastrophic wildfire. The Improvement Act states that the Service must "ensure that the biological integrity, diversity, and environmental health of the System are maintained." By definition, these include "…the natural biological processes that shape genomes, organisms, and communities…" such as fire.
- implementing and monitoring prescribed fire, chemical, or mechanical treatments, that are conducted to reduce hazardous fuels throughout the districts
- over the life of the CCP, treating 20 percent of the Service lands adjacent to the South Dakota communities at risk and South Dakota communities of interest (table 10)
  - Hazardous fuels treatments are conducted to reduce the threat of catastrophic wildfire to values at risk. Values at risk may include sensitive habitats and species, cultural resources, Federal and private infrastructure and facilities, and nearby local communities. Fire management and refuge staff will collaborate with affected parties (such as the State of South Dakota Wildland Fire Division and local communities) in developing Community Wildfire Protection Plans and hazardous fuels reduction treatments, as well as adding or removing communities at risk or of interest. Table 10 identifies the communities at risk and communities of interest within the districts.

The Healthy Forests Initiative (HFI) and the Healthy Forests Restoration Act have equipped land managers with additional tools to achieve long-term objectives in reducing hazardous fuels protecting wildland-urban interface areas and restoring fire-adapted ecosystems. The HFI calls for reducing hazardous fuels that feed wildfires and improving forest and rangeland management. The HFI also requires that communities within the wildland-urban interface create "community wildfire protection plans," designating areas adjacent to communities that should receive fuel treatments to prevent wildland fires from burning directly into communities.

The goal is to provide for firefighter and public safety, reduce the potential for wildfires by reducing hazardous fuels on district lands, protect homes in the wildland-urban interface, and accomplish habitat management objectives. To achieve these interconnected goals, fire program staff will collaborate with refuge

Table 10. Wildland-urban interface communities on Federal communities at risk and South Dakota communities of interest lists.

County	*Community*	*Federal list*	*South Dakota list*
Beadle	Broadland	X	—
Beadle	Cain Creek Subdivision	X	—
Beadle	Lake Byron Subdivision	X	—
Beadle	Maga-Ta-Hohpi Complex	X	—
Beadle	Virgil	X	—
Brookings	Lake Poinsett	X	—
Brookings	Sinai	X	—
Brown	Hecla	X	—
Buffalo	—	—	—
Campbell	Pollock	X	—
Clark	—	—	—
Codington	—	—	—
Day	Enemy Swim	X	—
Day	Waubay Complex	X	—
Deuel	Astoria	X	—
Deuel	Lake Cochrane	X	—
Edmunds	Bowdle	X	—
Faulk	—	—	—
Grant	—	—	—
Hamlin	Bryant	X	—
Hand	—	—	—
Hughes	Green Grass Subdivision	—	X
Hughes	Pheasant Run Subdivision	—	X
Hyde	—	—	—
Jerauld	Wessington Springs	—	X
Kingsbury	DeSmet	—	X
Lake	Chester	—	X
Lake	Madison	—	X
Lake	Nunda	—	X
Lake	Peninsula Point Subdivision	X	—
Lake	Ramona	—	X
Lake	Sunset Harbor Subdivision	X	—
Lake	Wentworth	—	X
Marshall	Lake City	X	—
Marshall	Red Iron	X	—
McCook	—	—	—
McPherson	Eureka	X	—
McPherson	Long Lake	X	—
Miner	—	—	—
Minnehaha	Buffalo Lake	—	X
Moody	—	—	—
Potter	—	—	—
Roberts	Big Coulee	X	—
Roberts	New Effington	X	—

Table 10. Wildland-urban interface communities on Federal communities at risk and South Dakota communities of interest lists.

County	*Community*	*Federal list*	*South Dakota list*
Roberts	Long Hollow	X	—
Roberts	Summit	X	—
Sandborn	—	—	—
Spink	—	—	—
Sully	—	—	—
Walworth	—	—	—

personnel and seek additional supplemental support (when available) for desired subsequent prescribed burns to manage habitat on unqualified priority units.

Fire management and habitat management are separable processes; accordingly, the strategies for prescribed fire and wildfire were developed to support the achievement of meeting the goals of the National Fire Plan (NFP) while adhering to Federal policy and habitat objectives for uplands, river bottoms, riparian areas, wetlands, and shorelines.

Strategies

- Fire program managers will work together with management and biological staff to find ways to prioritize and rank the most valuable treatment units in the districts and ensure that Federal fire policies are included in the process if hazardous fuels reduction funds or wildland urban interface funds are to be used.
- Upon completion of the CCP, the FMPs will be revised using the most current information. The FMPs will be updated as determined by policy. The Huron Fire District and the Mid Dakota District FMPs are stepdown plans from the CCP.
- As new lands are acquired and new housing developments are built adjacent to Service lands, both fire program managers will be responsible for identifying these new communities at risk and working with the State of South Dakota Wildland Fire Division to have them added to the State list of communities at risk or communities of interest.
- Treat 20 percent of the Service lands adjacent to the South Dakota communities at risk and the South Dakota communities of interest (table 10).
- Utilize a Department of Interior Fuels Prioritization Process and in cooperation with local and private cooperators carry out fuel reduction projects on Service lands adjacent to the Federal Register list of communities at risk and communities of interest in South Dakota (table 10).
- The three districts encompass 445 WPAs totaling approximately 101,094 acres. To obtain an average fire return interval of 5 years across all the lands, the Service would need to burn roughly 20 percent, or 20,018 acres, per year to maintain grasslands, hazardous fuel loadings, and wildland urban interface fuels at the appropriate level. This approach would assist with the suppression of unwanted wildfires and help to keep the lands in a more natural condition based on historical records. However, current staffing and budget levels do not support this level of prescribed burning. At a minimum, the districts should attempt to burn 10,100 acres annually; this level would approach the 10-year interval. Other treatments are available to produce similar landscape effects.
- Use a combination of treatments, including prescribed fire, mechanical treatment, and chemical treatment, for the reduction of hazardous fuels and wildland-urban interface fuels. This will assist with the suppression of unwanted wildfires and will help the land return to a more natural condition. Mechanical treatments include the following:
  - Chainsaw work to cut down trees and shrubs in an attempt to remove woody biomass.
  - Heavy equipment, such as bulldozers, can be utilized to remove trees and shrubs.
  - Tractors with mulching heads or masticators that will grind the woody biomass into mulch could be used to reduce hazardous fuels.
  - Haying could be used to reduce the heavy thatch that builds up in upland areas when fire and grazing are not applied as a management tool.
- Make excess biomass from mechanical fuels treatments available for public utilization.
- Support communities in acquiring community assistance grants for mechanical treatment of the wildland-urban interface and collaborate with rural fire departments, emergency managers, and the public in hazardous fuel reduction projects.
- Maintain necessary firefighting resources and personnel to ensure they are available to respond to wildfire that threatens lives and property and other values at risk.
- Fire management staff will work with county emergency managers to encourage both counties and individual communities to complete Community

Wildfire Protection Plans; these plans will identify mitigation actions that can be taken to assist in protecting communities from catastrophic wildfires.

- When identified treatments for habitat management or maintenance burns do not meet the priorities of national fire policy, project leaders and fire program managers will collaborate and seek additional supplemental support (when available) for desired subsequent prescribed burning needed to meet unqualified refuge habitat management priorities.
- Update and execute cooperative agreements with interagency partners, the counties in the three districts, NGOs, and neighboring landowners for improved collaboration and cooperation.

Rationale

Having long recognized fire as a key process that shapes wildlife habitat structure and function, the Service has managed and used fire extensively for the past 70 years. Guiding principles of fire management in the Service include responsible stewardship, hazardous fuel reduction, wildland-urban interface management, and habitat management strategies based on conserving ecological integrity, meeting the objectives of the NFP, and establishing effective partnerships.

The emphasis of the Service's fire management program has shifted from one of suppression to the use of prescribed fire and wildfire as management tools to achieve national fire policy objectives, habitat objectives, and landscape-level change.

Fuel treatments need to be properly planned using an interagency and interdisciplinary approach when possible and practical, using an integrated approach across different programmatic areas.

The 2010 U.S. Fish and Wildlife Service Fire Management Handbook established a statement of intent: "Fuels treatments should properly be planned on an interdisciplinary basis and be integrated as much as practicable with other resource management activities, and serve to implement the appropriate Comprehensive Conservation Plan. With the guidance from the Service Fire Management Handbook, fire management staff will strive to work closely with all other staff in the district to plan prescribed fire activities in a way that will reduce the risk of wildfires and also have positive results in the area of habitat management."

Other Uses

Other Uses Objective

Over the life of the CCP, districts will apply policy (such as appropriate uses and compatibility determinations) to evaluate other proposed uses.

Partnerships Goal

Promote and develop partnerships with landowners, public and private organizations, and other interested individuals to maintain, restore, and enhance a diverse and productive landscape in the Prairie Pothole Region.

Partnerships Objective

Throughout the life of the plan, create opportunities for new and maintain existing partnerships among Federal, State, and local agencies; Friends groups; organizations; schools; corporations; communities; and private landowners to promote the understanding and conservation of ecosystem and Refuge resources, activities, and management.

Strategies

- The Sand Lake WMD will develop a Friends group within 5 years of CCP approval in combination with Sand Lake National Wildlife Refuge.
- The Huron WMD will expand membership in the Friends of Maga-Ta-Hohpi.
- The Madison WMD will engage existing partners and seek additional staff support.
- All three districts will pursue new partnerships to accomplish mission goals and purposes.

Rationale

Many of the districts' wildlife, habitat, and visitor services programs would not continue without support from partners. Without partners' support and their non-Federal funding, many of the habitat protection, restoration, and enhancement projects would go unfunded. Over time, the diversity of wildlife species would begin to decline as habitat degrades in the absence of adequate management. Partners also lend public support for fee-title acquisitions in front of county commission hearings.

The three districts span much of the South Dakota landscape with fee-title ownership and wetland and grassland easements. The district management activities have the potential to affect neighbors and communities. Effective communication—both through media outlets and on an individual basis—is essential for successful management and fulfillment of the Refuge System mission and goals. Staff participate in local events and activities that maintain and support district programs.

The Service assigns personnel to the Partners for Fish and Wildlife Program, 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, Partners Program personnel work with private landowners interested in perpetual conservation easements held by

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.

Volunteer Programs Objective

Throughout the life of the CCP, recruit volunteers to support annual events; visitor services; and biological, maintenance, and administrative programs.

Strategies

- Districts will develop formal relationships with colleges and universities to access volunteers through internship opportunities.
- Districts will develop formal relationships with secondary schools, individuals, and other organizations (such as Scouts and civic groups) to access volunteers with diverse experience.
- Each station will hire an outdoor recreation planner, one of whose responsibilities will be volunteer coordination.

Rationale

The Volunteer and Community Partnership Enhancement Act (1998) amends the Fish and Wildlife Act of 1956 to promote understanding and conservation of fish, wildlife, and plants and cultural and historical resources of the Refuge System. The purposes of the act are to (1) encourage the use of volunteers to assist in the management of refuges, (2) facilitate partnerships between the refuge and non-Federal entities, (3) promote public awareness of refuge resources and public participation in the conservation of the resources, and (4) encourage donations and other contributions. The Improvement Act authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

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 are also important for conducting biological surveys.

Volunteers for the districts 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;
- students who wish to gain experience to aid with future employment.

Bridgette Flanders-Wanner / USFWS

A volunteer with the Friends of Maga-Ta-Hohpi staffs an interpretive station.

Environmental Education and Interpretation Goal

Provide quality educational opportunities for persons of all abilities to learn about, understand, and appreciate prairie landscapes and the role of the National Wildlife Refuge System.

Programs

Programs Objective

Throughout the life of the CCP, promote public awareness of and support for the Refuge System, an appreciation of district natural and cultural resources, and an understanding of management activities that conserve habitat and wildlife.

Strategies

- Within 2 years of CCP approval, the Madison WMD will install interpretive panels along the Madison WPA auto tour route.
- Within 5 years of CCP approval, the Huron WMD will install interpretive panels and accessible observation platforms along the Maga-Ta-Hohpi WPA hiking trail.
- Within 5 years, the Madison and Sand Lake WMDs will improve and install interpretive exhibits in their visitor contact stations (VCSs).
- Within 3 years, the Huron WMD will design and install new interpretive exhibits in their new office–VCS at Maga-Ta-Hohpi WPA.
- Within 3 years, the Huron WMD will design and install new interpretive exhibits at the Prairie Chicken Observation Area on the Harter WPA.

Sandy Uecker / USFWS

Wildlife biologist Laura Hubers introduces some new friends at Huron Prairie Fest.

- Within 3 years of CCP approval, the Huron WMD will develop a new general brochure.
- Within 1 year of CCP approval, the Madison WMD will develop a new general brochure.
- Develop district-oriented portable displays for staff use at events to educate the public.
- Conduct programs such as teacher and student workshops, waterfowl identification workshops, water festivals, South Dakota outdoor expo, and annual noxious weed awareness workshops.
- Within 5 years of CCP approval, identify the key WPAs in the districts that could support visitor use information such as signage and information kiosks. By 10 years after CCP approval, develop this visitor use infrastructure.
- Keep data current to allow the State to incorporate district lands information in the appropriate State public use guides.
- Work with the South Dakota tourism department to promote the WPAs and their resources.
- The Sand Lake WMD will prepare a feasibility study for the establishment of an outdoor classroom on the Eureka Demo WPA within 2 years of CCP approval. If such an undertaking is considered feasible, develop an outdoor classroom on portions of the Eureka Demo WPA in McPherson County for use by area students (grades K–12). Establish a wide range of project partnerships and sponsors that will support and promote classroom use as well as foster an appreciation of the prairie pothole ecosystem and awareness of the National Wildlife Refuge System (see Facilities Objective).
- Update each district website on a quarterly basis. Upgrade to websites to Service standards and customize for each district. Explore the use of pod- and webcasting and social media.
- Participate in updating the WPA Mapper initiative, which provides electronic information on location and features.
- Conduct information sharing with the media (such as local newspapers), chambers of commerce, congressional contacts, and tourism outlets.
- Disseminate educational materials (for example, wetland and prairie trunks) for use by teachers, Scout leaders, and others to help them educate their students and group members independently.
- Promote programming that incorporates the "Connecting People with Nature" national and State initiatives in both structured and unstructured ways. Encourage family visits to and family awareness of the districts.
- Seek out partnerships to encourage expansion of environmental education programs among local schools. Build on existing relationships with schools for both onsite and offsite programming. Promote education at an early age about natural resources and wetland management districts.
- Develop programs and provide facilities for distance learning opportunities.
- Continue to promote the junior Duck Stamp program.
- Develop slides and DVDs to promote the districts for use in such venues as movie theater intermissions, tourism kiosks, and visitor centers.
- Each station will hire an outdoor recreation planner, one of whose responsibilities will be volunteer coordination.

Rationale

Environmental education and interpretation are two of the six wildlife-dependent recreational (priority) uses listed in the Improvement Act. Parents, educators, and civic groups have been visiting WPAs for educational outdoor experiences for many years. Environmental education is usually conducted onsite with school, Scout, and civic groups when they are touring the districts' headquarters. Offsite programs are conducted by district staff when time is available; these programs are very popular with various groups. Because the districts do not have outdoor recreation planners, they are not able to provide structured, curriculum-based environmental education and have to deny some requests for environmental education programs.

The districts use self-guided exhibits, interpretive panels, and brochures as well as interpretative programming and special events to help foster appreciation, support, and understanding of district-specific topics and the Refuge System. Failure to understand the purpose and mission of the WPAs and the Service can lead to a lack of support and, ultimately, to indifference or opposition to management policies. The Service is often confused with SDGFP; through better educational efforts, the public would understand the Service's mission and how it differs from that of SDGFP. With better understanding, the public can

be better informed about fish and wildlife issues in general and on-the-ground management activities in particular.

As it increases in popularity and accessibility, the internet is an ever more valuable tool for keeping the public informed about district programs and resources.

The three districts received more than 426,000 visitors during fiscal year 2008. Their proximity to urban areas such as Sioux Falls, Aberdeen, and Huron affords the districts excellent opportunities for outreach and education through establishment of new facilities and update of existing facilities. Expanding residential development challenges the districts' habitat and wildlife goals; however, this increased population also presents an opportunity to offer wildlife-dependent recreation to more people, leading to a greater understanding of and appreciation for the natural world and wildlife conservation.

Facilities

The districts are near urban areas such as Sioux Falls, Aberdeen, and Huron. The districts have potential for outreach and education through establishment of new facilities and update of existing facilities.

Few people know about wetland management districts or why they exist. Even fewer students or teachers take advantage of WPAs that may be located near rural schools. This objective would actively promote environmental education opportunities and develop new programs for use either in area schools or on WPAs near schools. Such efforts would provide new opportunities for many rural schools and increase exposure of students to today's environmental challenges, as well as the benefits of protecting our natural resources. Interpretive signage and a birding trail would help reach a wider audience, increase tourism dollars, and build appreciation of Service programs. Photography, environmental education, and interpretation are allowed year-round during daylight hours.

Outdoor learning facilities would provide teachers and students within the district with opportunities for hands-on learning about the biological processes of the prairie ecosystem. Teachers educate students who, in turn, pass on to their families what they have learned about prairie ecosystems and the Service's role in protecting them.

Facilities Objective

Throughout the life of the CCP, enrich visitor experiences by maintaining and/or enhancing existing facilities, as well as identifying locations for additional amenities.

Strategies

- Ensure that all WPAs have the most recent version of boundary signage in accordance with current policy.
- Work with South Dakota Department of Transportation (SDDOT) to install highway directional signage as appropriate.
- Inventory all districts to determine what facilities are in place and where new or updated facilities are needed.
- Design and construct all facilities with sustainable building standards and incorporating alternative energy sources.
- Remove all artificial structures that are no longer functional and revegetate those sites as needed.
- To address safety concerns, identify and plug all nonfunctional wells throughout the districts as appropriate.
- Identify and site parking lots on WPAs to facilitate public use and safety. Construct additional parking lots as needed.

Huron WMD

- Secure funding to design and construct an administrative office and VCS on the Maga-Ta-Hohpi WPA. This facility would include an entrance road and parking facility, entrance sign, kiosk, additional storage building, volunteer trailer pad, interior exhibits, furniture, and audiovisual equipment. It would also house and support the Huron Wetland Acquisition Office. The new construction would take place on a site adjacent to U.S. Highway 14 after a thorough engineering review of potential locations.
- Design and construct a hiking trail from the VCS to the existing interpretive trail.
- Explore the feasibility of an accessible observation deck near the VCS.
- Explore the feasibility of an accessible observation deck on the Maga-Ta-Hohpi WPA.
- Design and construct an informational kiosk at the Harter WPA, incorporating accessible facilities.
- Construct an accessible trail from the Friends Group shelter to the environmental classroom.
- Install a potable water line to the Friends Group shelter and the environmental classroom. This project would include construction of an outdoor drinking fountain and hand washing station.

Madison WMD

- Within 2 years of CCP approval, work with SDDOT to install double yellow no passing zones by the office and rest stop entrances for visitor and staff safety.
- Within 5 years of CCP approval, design and construct office–VCS expansion (including expanded parking lot, furniture, satellite dish, larger screen TV with projector, and interior exhibits).
- Upgrade and maintain the existing headquarters entrance road, kiosk, and parking lot every 5 years through the duration of the CCP.

- Upgrade and maintain the existing asphalt parking lot and entrance road, kiosk, restrooms, and facilities at the Karl Mundt Rest Stop every 5 years through the duration of the CCP.
- Design and construct accessible hiking and biking trails and an observation tower in the Payne WPA in cooperation with the City of Madison within 5 years of CCP approval.
- Design and construct a bunkhouse and two volunteer trailer pads (with water, sewer, and electricity hookups) in the Payne WPA within 5 years of CCP approval.
- Replace, repair, and update kiosks, monuments, and signs on WPAs throughout the district every 5 years through the duration of the CCP.
- Upgrade and maintain roads subject to high levels of public use (such as roads in the Long Lake, Brush Lake, Lake Henry, Madison, Island Lake, Lost Lake, Coteau Prairie, and Payne WPAs) every 2 years for the duration of the CCP.

Sand Lake WMD

- Locate, design, and construct a new district headquarters in western Edmunds County within 6 years of CCP approval to provide an office–VCS, maintenance shop, equipment storage, and housing for researchers, volunteers, and seasonal employees in western Edmunds County. The facility would also include entrance road and parking lot, entrance sign, kiosk, additional storage building(s), interior exhibits, furniture, and audiovisual equipment.
- Design and construct an educational and interpretive outdoor classroom facility that would include a parking lot, restroom, contact station, informational kiosk, entrance sign, accessible interpretive and educational trail, boardwalk to the wetland, observation deck, and other educational features in the Eureka Demo WPA within 6 years of CCP approval.
- Update and expand the VCS at the Sand Lake National Wildlife Refuge headquarters to incorporate interpretive exhibits and kiosk relating to the Sand Lake WMD within 5 years of CCP approval.
- Expand operations and maintenance facilities at the Sand Lake National Wildlife Refuge headquarters to support additional Sand Lake WMD personnel (including equipment storage, office space, and furniture). This strategy would be a contingency only if the new headquarters strategy is not adopted.

Rationale

The rationale for developing a new wetland management district office is presented in the discussion of the "Operations and Administration Goal—Potential New District Objective." The strategies are reiterated here because of their importance to furthering the Service's environmental education and interpretive priorities in the context of the Sand Lake WMD.

Bridgette Flanders-Wanner/USFWS

Service staffer Harris Hoistad builds a shelter.

4.2 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. To apply adaptive management, specific survey, inventory, and monitoring protocols will be adopted for each of the three wetland management districts. 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, the management projects will be altered accordingly. Subsequently, the Service will revise the CCP.

4.3 Plan Amendment and Revision

The Service will review this CCP annually to determine the need for revision. A revision will occur when significant information is available that indicates revision is needed. The CCP will be supported by detailed stepdown management plans to address the completion of specific strategies in support of the wetland management districts' goals and objectives. Revisions to the CCP and the stepdown management plans will be subject to public review and NEPA compliance. At a minimum, the Service will evaluate the CCP every 5 years and revise it after 15 years.