

Chapter 4: Future Management Direction

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4.1 Introduction

The Environmental Assessment in Appendix A describes and analyzes four management alternatives for Neal Smith National Wildlife Refuge (NWR, Refuge). The U.S. Fish and Wildlife Service (FWS, Service) identifies one as its preferred alternative, and it is described in this chapter as the proposed management direction, defined by a series of goals, objectives, and strategies.

Goals are broad descriptive statements of desired future conditions. There are three goals for Neal Smith NWR. Each goal is followed by a series of objectives, which are specific statements describing management intent. Beneath each objective is a list of strategies—the specific actions, tools, and techniques needed to meet the objective. Finally, rationale statements describe background, history, assumptions, and/or technical details of the objectives and strategies. Unless otherwise noted, the Service intends to meet these objectives within the next 15 years.

4.2 Goals, Objectives, Strategies, and Rationales

4.2.1 Habitat

Goal: The Refuge will actively protect, restore, reconstruct, and manage diverse native communities of tallgrass prairie, oak savanna, sedge meadow, and aquatic ecosystems and the natural processes essential to these ecosystems to enhance the vitality and health of the natural prairie environment.

Objective 1-1: Agriculture

Within five years, plant all remaining agricultural fields (540 acres) with diverse native prairie or savanna seed mix to include no more than 20 percent warm season grass seed, at least 30 percent cool season grass and sedge seed, and approximately 50 percent forb seed (by seeds/ft²). Initiate restoration of newly-acquired agricultural lands within three years of acquisition. Maintain all sites for continued dominance of at least 75 percent native species.

Strategies

- Remove all terraces, fencelines, and woody vegetation; and re-contour if necessary prior to planting.
- Evaluate whether removing, breaking, or blocking drain tiles is desirable in each management unit and if so, implement actions prior to planting.
- Use local ecotype seed mix appropriate to soil type and hydrology of each site.
- Plant appropriate buffer strips on farm sites to reduce erosion if not converted to prairie within one year of acquisition.
- Mow as necessary during early establishment to prevent competition from early successional weedy species.

- After plantings have been established for three to five years, conduct prescribed burns on a variable schedule every one to five years and within different seasons, if feasible, to invigorate natural communities, limit woody plants, and suppress invasive species.
- Use Integrated Pest Management (IPM) measures including physical, mechanical, grazing, prescribed fire, and/or chemical treatments to reduce, control, or eliminate high-priority invasive plants.
- Experiment with oak tree planting in appropriate areas. Plant acorns directly in the ground in oak savanna reconstruction areas and grow seedlings for future planting in these areas.
- Ensure that all Refuge farming is consistent with FWS Region 3 policy, including limits on the use of genetically-modified crops.

Rationale

Tallgrass prairie and savanna have been reduced to less than one percent of their former presence east of the Missouri River and less than 0.1 percent in Iowa making them critically endangered ecosystems. According to 1846 General Land Office (GLO) survey records, the land cover of the current Neal Smith NWR was primarily prairie and oak savanna at the time of European settlement, but most has been converted to agriculture. Reconstructing prairie or savanna on agricultural fields serves to reverse that statistic, buffers prairie and savanna remnants, and creates habitat for indigenous plant and animal species. Increasing the expanse of prairie and savanna not only benefits wildlife but also creates a more resilient landscape that can persist through perturbations such as climate change.

The acquisition of farmland provides an opportunity to reverse the trend of prairie and savanna loss in Iowa and the Midwest. The Refuge continues farming each site for a period of three to five years from acquisition while the treatment of tile systems, terraces, or other site-related problems are addressed. The ability to meet planting schedules is dependent upon seed availability from vendors, funding to purchase seed, and Refuge harvest.

In many areas, failing to remove drain tiles could increase erosion and have undesirable effects on native vegetation. In some cases, breaking, plugging, or complete removal of tile lines could have undesired effects, so careful evaluation of each site is important. Plugs might create overly wet conditions in adjacent areas as water continues to discharge above the plug, breaking tiles could allow some continued drainage and potential headcutting at break points, and full removal has the potential to increase erosion in some areas.

Prescribed burning is a critical management tool for all habitat reconstruction and restoration objectives in this Comprehensive Conservation Plan (CCP). Tallgrass prairie, oak savanna, and sedge meadow systems all evolved with and adapted to frequent fire. Some fires were caused by lightning, while most were ignited by Native Americans to ease travel, provide safety from wildfires, and provide forage for game species. Fire stimulates growth of many native plants and eliminates competition from species not adapted to fire, and in some species fire is required to break seed dormancy.

Prior to European settlement, prairie and savanna fires occurred primarily during the fall. Spring burns are most effective at controlling cool season invasive species but can have detrimental effects on native cool season species. Variability in timing of fires promotes plant diversity. Decisions about which areas to burn each year and timing of the burn are based on the condition of the prairie, time since last burn, presence of certain invasive species, management or research activities, available resources, and weather conditions. Practically speaking, spring offers the most opportunities for prescribed burning on the Refuge because of weather and fuel conditions.

IPM is “a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks” (U.S. Code Title 7 Section 136r-1). It is a long-standing, science-based, decision-making process that identifies and reduces risks from pests and pest management related strategies. Steps in the IPM process include monitoring and identifying organisms that require action, setting thresholds for action, and managing land and water in a way that prevents organisms from becoming a threat. If preventive measures are not working and the IPM process indicates that pest control is required, then effective less-risky controls are chosen first. Broadcast spraying of non-specific pesticides is a last resort. High-priority invasive plants that require action on Neal Smith NWR will be determined in a step-down management plan following approval of the CCP.

Oak savanna reconstruction will be initiated on some agricultural lands near existing oak savanna remnants. Soil types, historic land cover maps, and field observation will be used to determine other suitable locations. In those sites, a less aggressive seed mix of species commonly found in savanna understory will be planted that will not compete with oak and hickory seedling recruitment. These plantings will be allowed to establish themselves for several years before tree planting begins. Oak savanna reconstruction has not been attempted at Neal Smith NWR, and few attempts have been made at other sites, so this approach will be experimental to determine the best techniques.

Figure 4-1 shows the pattern of prairie and savanna distribution in the early 1800s. The long-term vision for the Refuge over the next 50 to 100 years includes restoration of prairie and savanna as nearly as possible to this historic pattern, given the dramatic changes that have occurred on the landscape since then.

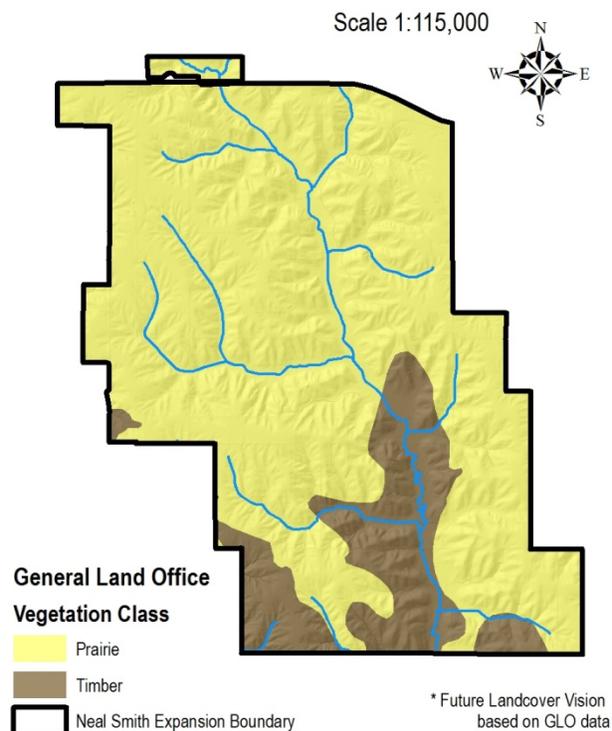
Objective 1-2: Tallgrass Prairie Remnants

Restore vegetation on all prairie remnants (90 acres) to the following conditions: greater than 70 percent canopy cover of native species, less than 20 percent canopy cover of woody vegetation, and combined Floristic Quality Index (FQI) of 35 or higher.

Strategies

- Conduct prescribed burns on a variable schedule every one to five years and within different seasons to invigorate natural communities, limit woody plants, and suppress invasive species. If necessary, plant graminoids (grasses and sedges) to provide a fine-fuel matrix to carry fire through the remnant.
- Remove fire-intolerant woody vegetation using physical (e.g., hand removal), chemical, or mechanical methods to facilitate the use of prescribed fire and increase exposure of prairie plants to sunlight.

Figure 4-1: Neal Smith NWR Generalized Future Land Cover



- Use IPM measures including physical, mechanical, and/or chemical treatment to reduce, control, or eliminate high-priority invasive plants.
- If tiles, ditches, or terraces are present in areas adjacent to remnants, evaluate whether removing, breaking, or blocking drain tiles; or removing ditches or terraces is necessary, and if so, implement necessary actions.

Rationale

According to 1846 GLO survey records, the land cover of the current Neal Smith NWR was primarily prairie and oak savanna at the time of European settlement. Although much of this area has been in agricultural production since that time, there are still patches of degraded prairie and oak savanna remnants throughout the Refuge. Many of these remnants still hold high potential for restoration but they could be lost to invasive species and woody vegetation if not restored soon. Each is unique in species composition and other characteristics and, when taken together, they could provide important seed sources and valuable genetic diversity adapted to local conditions. Conservative species are present in some of the remnants that have not been established elsewhere on the Refuge.

Prescribed burning is critical to restoration of tallgrass prairie remnants. It promotes native plant diversity, which benefits grassland birds, invertebrates and other wildlife. Prairie plants and wildlife are adapted to the open sunny conditions maintained by frequent fire. Since European settlement of the Midwest, fire has been suppressed, allowing woody vegetation to grow in areas where it wouldn't be present under a natural fire regime. Woody vegetation inhibits growth of native prairie plants and degrades wildlife habitat. Removal of trees from prairie remnants can immediately improve habitat for grassland birds by creating larger areas of grassland and increasing distance to the nearest tree edge. Grassland bird abundance and nest density is lower near woody edges, and grassland birds experience lower nest success near woody edges (Askins et al., 2007).

The FQI is a standardized method to objectively assess the quality of a natural area based on its plant community. It can be used to compare a site to other sites or to determine changes in the same site through time. Intact natural communities have higher FQI scores than disturbed areas. Areas with little ecological value have an FQI of less than 20, areas rating more than 35 are important ecologically, and areas with an FQI in the 50s are extremely important (Wilhelm and Ladd, 1988; Swink and Wilhelm, 1994; Appendix E: Floristic Quality Assessment). Increasing the FQI also is expected to increase the structural diversity of a prairie, providing habitat for a variety of grassland birds and other prairie-dependent species.

Reconstructed Tallgrass Prairie

Objective 1-3

Manage 2,500 acres classified on the 2010 land cover map as *Warm Season (Planted)* vegetation and 675 acres classified as *Cool/Warm Season* vegetation toward the following conditions: at least 70 percent overall native species comprised of approximately 10 percent cool season grasses, 60 percent warm season grasses, 30 percent forbs, and less than 20 percent woody vegetation.

Objective 1-4

Manage 700 acres classified as *Brome (Cool Season)* vegetation to contain at least 40 percent overall cover of native grasses and forbs.

Objective 1-5

Manage reconstructed tallgrass prairie vegetation throughout the Refuge so that in any given year approximately 20 percent will be low stature (less than two-feet tall), 20 percent mid stature (two to four feet), and 60 percent tall stature (greater than four feet) achieved through management strategies to benefit grassland birds and other prairie-dependent wildlife.

Strategies (for objectives 1-3, 1-4, and 1-5)

- Conduct prescribed burns on a variable schedule every one to five years and within different seasons to invigorate natural plant communities, provide diverse habitat for grassland birds and other wildlife, and limit undesirable vegetation.
- Use bison and elk grazing within the enclosure to meet habitat objectives. If fire or grazing by native herbivores cannot meet wildlife and habitat objectives, implement grazing with cattle, sheep, and/or goats in selected units outside the enclosure. Evaluate success of grazing program and modify if necessary, including changes to the bison and elk enclosure size and herd size.
- Evaluate whether removing, breaking, or blocking drain tiles or removing terraces or ditches is necessary in each management unit and, if so, implement necessary actions. Reconfigure enclosure fence away from highly erodible stream sites to reduce degradation of riparian areas.
- Use IPM measures including physical, mechanical, and/or chemical treatment to reduce, control, or eliminate high-priority invasive plants.
- Increase diversity of native plants, including cool season and other conservative species, by interseeding or planting plugs in select areas.
- Work with Inventory and Monitoring Program biologists to develop a simple and effective monitoring protocol and database. Use this protocol and database to collect and enter baseline data on a representative sample of reconstructed prairie units within two years of CCP approval.
- Develop Habitat Management Plan further detailing the activities described.

Rationale

Prairie reconstructions on the Refuge are of varying quality, from very diverse to those dominated by warm season grasses having low plant diversity, and therefore little structural diversity (lower quality). Although the long-term vision is to develop all reconstructions into highly diverse prairies with varying species composition and structure, the short-term objectives (15 years) are more limited because reconstructed sites take time to develop and mature. The 2010 land cover map (figure 3-6) defines the three general vegetation classes based on aerial photography:

Warm Season (Planted): Dominated by native warm season grasses (big bluestem, Indian grass, little bluestem, etc.) and native forbs; may contain greater than 25 percent relative cover of cool season grasses (mostly non-native smooth brome) and non-native forbs.

Cool/Warm Season: Also planted with native warm season grasses, but still has greater than 50 percent relative cover of non-native cool season grasses (mostly non-native smooth brome). This category is typical of younger plantings and areas that have been grazed or mowed so that cool season grasses are expressed.

Brome (Cool Season): Dominated by greater than 50 percent relative cover of smooth brome and other non-native cool season grasses (timothy, Kentucky bluegrass, etc.); also usually contains non-native forbs, such as clover and wild parsnip; relative cover of native grasses and forbs is less than ten percent. Most of these units were planted for pasture or through the Conservation Reserve Program (CRP) prior to Refuge ownership. This vegetation class provides low-stature vegetation on the Refuge.

Reconstruction of some of these areas to native tallgrass prairie will be conducted using low-growing species to contribute to this habitat type.

The interaction of fire and grazing was important in the evolution of the tallgrass prairie ecosystem. Both dramatically reduced vegetative cover in tallgrass prairie, but the effects were temporary, allowing plant species to adapt to the periodic disturbance. Grazing by bison and elk are essential to the control of woody or tree species on the prairie. Removal of dead plant material through burning and grazing increases primary productivity in prairie (Knapp et al., 1999). Both of these management tools, as well as mowing, are used on the Refuge to mimic disturbance regimes that maintained the historic tallgrass prairie ecosystem.

Burning in the spring for several consecutive years will reduce cool season invasive plants including reed canarygrass and smooth brome. Fall burning promotes forbs and cool season species. Native cool season grasses and forbs are extremely under-represented in prairie plantings on the Refuge. Increasing the cover of cool season natives will make these sites more resistant to cool season invasives such as smooth brome and Canada thistle and will increase floristic quality. Planting additional cool season plants also will provide better habitat for native pollinators by providing an increased season of bloom.

Bison and elk graze freely within the 700-acre fenced enclosure. Patch burn grazing encourages the bison to concentrate in different areas of the enclosure each season, creating a mosaic of vegetation structure. Burning is used to stimulate native vegetation and reduce non-native invasives and residual standing dry matter. This encourages bison to graze these areas, creating areas with short vegetation. Unburned areas are grazed less frequently, resulting in taller vegetation and greater litter depth. Together these areas create more diversity in vegetation structure. By rotating the burns throughout the enclosure, the areas that are grazed most frequently also rotate. Each area is allowed periods of “rest” where it receives little grazing, and the residual standing dry matter is able to build up, facilitating prescribed fire. The cycle is then repeated. It is intended that some areas are allowed to grow rank. Expansion of the enclosure area would increase management capabilities to manipulate grazing with bison and elk to best meet wildlife and habitat objectives.

Cattle, sheep, and/or goats can provide grazing disturbance outside the enclosure if it is necessary to meet wildlife or habitat objectives. Cows and sheep can reduce vegetation height or density in prairie reconstructions. Goats can be used in both prairie and savanna sites to target woody plant species. These animals would need to be confined using temporary fencing that can be moved from place to place, and measures would need to be taken to minimize the introduction of new invasive species via grazers onto the Refuge.

Vegetation structure significantly affects habitat suitability for grassland birds. For example, Henslow’s Sparrow, Le Conte’s Sparrow, and Sedge Wren prefer tall vegetation with high litter layers. Dickcissels, Bobolinks, and Eastern Meadowlarks use medium to tall vegetation. Upland Sandpiper, Grasshopper Sparrow, and Western Meadowlark prefer areas with shorter vegetation. Northern Harrier and Short-eared Owl require large areas that may include a mix of vegetation heights. Most species prefer areas with little to no woody vegetation and at least low to moderate forb cover, which provides habitat components such as song perches and above-ground nesting substrates.

Restoring a high FQI on tallgrass prairie remnants and reconstructions will provide appropriate habitat diversity for grassland birds but will require many years to accomplish over large areas of the Refuge. In the shorter term, strategic use of mowing, haying, grazing, or burning on reconstructed prairie units can

provide varied habitat by creating shorter vegetation and removing litter even where the number of different native plant species is low. This provides better habitat for certain species such as Grasshopper Sparrow. These actions can also be used along with interseeding and herbicides to promote native plant diversity. Mowing, haying, or burning during the growing season will keep vegetation short, but will also destroy nests of grassland birds. These measures would provide benefits to some grassland birds but will reduce habitat suitability for others. The Refuge will play an important role in ensuring that grassland birds and other prairie wildlife have the varied habitat structure necessary to meet their life cycle needs while minimizing damage to nests.

Objective 1-6: Oak Savanna Remnants

Restore vegetation on all oak savanna remnants (150 acres) to the following conditions: canopy cover of 10 to 80 percent and stem density of 1 to 25 trees per acre, less than 30 percent cover of fire-intolerant trees, 70 percent cover of native savanna understory species, and an FQI of 35 or greater.

Strategies

- Remove fire intolerant woody vegetation using methods including physical (e.g., hand removal), chemical (herbicide), mechanical, or livestock browsing to facilitate the use of prescribed fire and increase exposure of savanna understory plants to sunlight.
- Conduct prescribed burns to stimulate growth of native savanna plants, remove litter, and reduce fire-intolerant woody vegetation and invasive species. Burning should be conducted annually for the first ten years if resources allow. If necessary, plant graminoids to provide a fine-fuel matrix.
- Use IPM measures including physical and mechanical treatments, herbicide application, and prescribed fire to reduce, control, or eliminate high-priority invasive plants.
- If tiles, terraces, or ditches are present in areas adjacent to remnants, evaluate whether removing, breaking, or blocking drain tiles or removing terraces or ditches is necessary, and if so, implement actions.

Rationale

At the time of European settlement, oak savannas covered 11 to 13 million acres in the Midwest (Nuzzo, 1985) and about 2.4 million acres in Iowa (Smith, 1998). Only 0.02 percent of midwestern savannas remain, with the rest destroyed or degraded. There are still patches of oak savanna throughout its historic range on the Refuge. These remnants are in varying stages of degradation but still hold potential for restoration. They provide valuable genetic diversity that is adapted to the local conditions, providing the necessary seed sources for restoring savanna within the Refuge boundary. The metrics for canopy cover and tree density described in this objective represent the definition of oak savanna. The cover of fire intolerant species and native species are metrics that will help the Refuge move towards complete savanna restoration. By achieving this target, we will have restored the oak savanna remnants to a level that is low maintenance, requiring only regular prescribed burning and invasive species management. The strategies listed mimic natural ecological processes and will benefit all savanna-adapted species.

Because oak savannas have characteristics of both grasslands and forests, they are used by more bird species than either of these vegetation types. More bird species are found at higher densities in savannas than in grasslands, shrublands, or forests (Grundel and Pavlovic, 2007). These birds are most likely attracted to one or more of the distinctive habitat features of savannas including scattered mature trees, standing dead trees and snags, and presence of both shrubby and grassland vegetation (Davis et al., 2000). Species that have been found to reach higher densities in oak savanna compared to closed-canopy forests included Red-headed Woodpecker (Grundel and Pavlovic, 2007; Brawn, 2006), Northern

Bobwhite, Indigo Bunting, Summer Tanager, and Baltimore Oriole (Brawn, 1998). Rose-breasted Grosbeak, Indigo Bunting, and Blue Jay experienced significantly higher nest success in savannas and woodlands with fire and disturbance compared to closed-canopy forest (Brawn, 1998). Field Sparrow was favored by restoration including fire. Another aspect of oak savanna restoration is that small patches of overgrown, degraded savannas act as sinks for forest bird species. Restoring these oak savannas will provide habitat for source populations of birds adapted to savanna conditions (Brawn, 2006).

Sedge Meadow

Objective 1-7

Manage 330 acres of vegetation classified as *Phalaris (Reed Canarygrass)* to contain at least 25 percent overall cover of native grasses, sedges, and forbs.

Objective 1-8

Within two years of CCP approval, examine soils, topography, slope, aspect, vegetation, and hydrology to identify appropriate sites where wet sedge meadows could be developed or restored. Within five years, develop site-specific plans to create or enhance wet sedge meadows on the Refuge.

Strategies (for objectives 1-7 and 1-8)

- Conduct frequent prescribed burns on sedge meadow sites currently dominated by reed canarygrass to invigorate natural plant communities, limit undesirable vegetation, and provide diverse habitat for sedge meadow birds and other wildlife.
- Increase diversity of native sedge meadow plants by interseeding or planting plugs in select areas.
- Use IPM measures including physical and mechanical treatments, herbicide application, and prescribed fire to reduce, control, or eliminate reed canarygrass and high-priority invasive plants.
- Use 2011 aerial photography, topographic and soils maps, and past vegetation records to identify current and potential sedge meadow sites.
- With regional office assistance, survey each unit to locate sedge meadows or sites where they would have potentially formed before tiling was implemented.
- Determine where removing, breaking, or blocking drain tiles would benefit sedge meadow restoration; implement necessary actions in highest priority locations.
- Establish partnerships with non-profit groups to assist with restoration of sedge meadow sites.

Rationale

A diverse tallgrass prairie ecosystem would necessarily have sedge meadows within the landscape. Sedge meadows occur along a gradient from mesic tallgrass prairie to wet prairie to sedge meadow to wetland. They have hydric soils and require moisture close to the surface for an extended period during the growing season. The plants require full sun and frequent fire. Dominant native plants found in healthy sedge meadows include many species of sedges, prairie cordgrass, rushes, and some forbs. Sedges often form tussocks, creating unique habitat for wildlife. Sedge meadows are a unique mix of aquatic and terrestrial ecosystems.

The Refuge has approximately 370 acres of sedge meadow in mostly poor condition. Much of it has been subject to hydrologic alteration, siltation, and reed canarygrass invasion. Sedge meadows are located in floodplain depressions associated with Walnut Creek and its tributaries as well as in upland

seeps and ravines. The 2010 land cover map (figure 3-6) defines two relevant vegetation classes, based on aerial photography:

- *Phalaris (Reed Canarygrass)*: Invasive reed canarygrass is greater than 75 percent of the relative cover; this category dominates many wet areas that could support sedge meadows (330 acres).
- *Wet Meadow*: Areas with a mix of reed canarygrass, sedges, and forbs, with reed canarygrass normally dominant; typically in wetter settings (40 acres).

In the floodplain, reed canarygrass has become a tenacious competitor due to hydrologic alteration of Walnut Creek and its tributaries. In the uplands, sedge meadows near seeps and ravines often still retain some diversity, although subsurface drain tiles have reduced the level of soil saturation and the quality and diversity of sedge meadows found there. Many ravines probably contained seeps prior to being tiled. Sedges sometimes still survive in these areas, but not all have been located and mapped. One ten-acre sedge meadow near Savanna Trail is the subject of an ongoing reconstruction and research program.

Sedge meadows provide habitat for Service priority wildlife species including Northern Harrier, Short-eared Owl, Sedge Wren, and Bobolink. Waterfowl and other water birds may occur on the Refuge more frequently as habitat conditions in sedge meadows and savannas improve. Sedge meadow restoration also will reduce runoff and erosion by slowing the flow of water across the landscape, allowing it to settle temporarily in wet zones.

Objective 1-9: Habitat Reconstruction and Restoration Research

Develop and implement a Refuge research and monitoring program to evaluate the effects of management actions (grazing, fire, mowing, planting, etc.) on restoring and reconstructing prairies and savannas. Within one year of CCP approval, clearly define three or four of the highest priority management-relevant questions and the data needed to answer them. Within two years, solicit researchers to implement highest priority studies. Meet annually with research team(s) to discuss results, evaluate progress, review priorities, and make plans for the next year.

Strategies

- Continue to collaborate with the Region 3 Prairie Biology Network and other agencies and organizations conducting prairie restoration. Investigate research and monitoring protocols used in other locations to evaluate their potential usefulness at Neal Smith NWR.
- Conduct a structured decision-making workshop with land managers, biologists, researchers, and statisticians with relevant experience from both inside and outside the Service to develop specific science-based management questions and data needs.
- Seek funding assistance for management-relevant studies.
- Incorporate the principles of adaptive management (AM) into all management-related monitoring and research activities.
- Strengthen partnerships with academic institutions to coordinate research needs and activities.

Rationale

Although knowledge of complex ecological systems will always be incomplete, refuges must make management decisions using the best available information to guide their actions. The Service cannot afford to undertake large-scale habitat protection, restoration, or enhancement endeavors only to discover after years of management that actions were ineffective. In the absence of perfect knowledge,

biologists are forced to make assumptions, but they can treat these assumptions as testable hypotheses using an AM approach. AM focuses on deliberately designing management to enhance learning and improve subsequent decision-making (Williams et al., 2007).

Studies should be targeted to provide the highest value to resource management; questions having the greatest impact on management decisions should be the highest priorities. Re-creating the tallgrass prairie ecosystem from scratch on Neal Smith NWR is an experimental process, so problems, questions, and hypotheses are complex and wide-ranging. The effect of the grazing and prescribed fire programs on vegetative composition and structure has been a high-priority topic of interest. Others that have been considered to date include control of invasive plants, altered hydrology in the Walnut Creek watershed, the effects of management on priority wildlife species, and appropriate future vegetation types under a changing climate scenario.

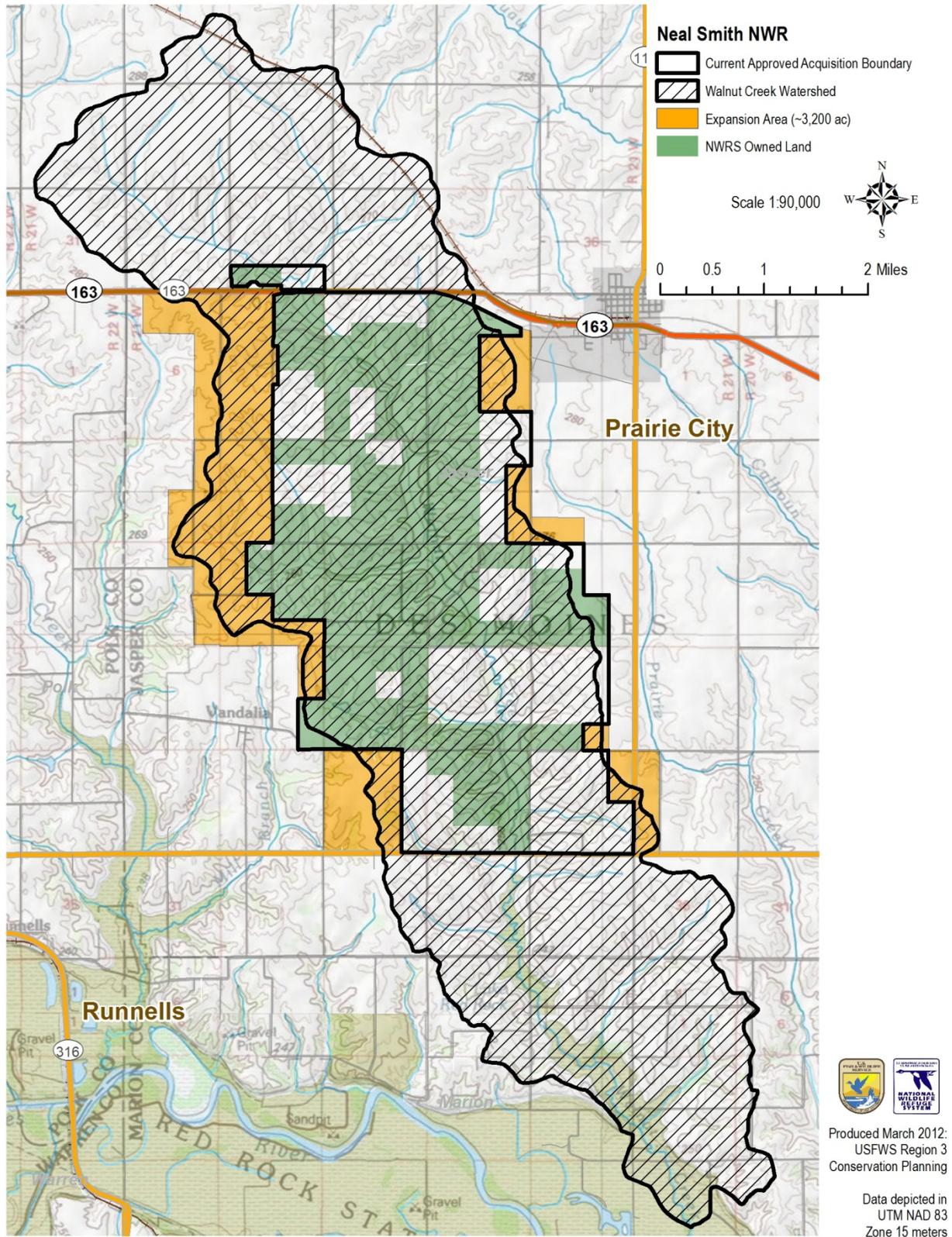
Structured decision-making is an organized approach to identifying and evaluating options and making choices in complex decision situations. It will help Refuge staff to clearly define the most pressing management questions and to direct limited resources toward obtaining scientifically sound answers (FWS, 2008b). New information from research and monitoring only becomes useful if it influences future management decisions and actions. Thus two important steps in the AM loop are analyzing study data and incorporating the results into future actions (Williams et al., 2007).

Refuge staff will promote specific studies designed to evaluate management practices at Neal Smith NWR. This work could be conducted in-house or through college and university partners. Partnerships with academic institutions are critical to successful design, implementation, and evaluation of AM studies on the Refuge.

Objective 1-10: Landscape-Scale Development and Habitat Loss

Reduce the effects of urban development, wildlife habitat loss, and climate change by continued conservation partnerships, and by expanding the Refuge boundary to include 3,200 additional acres of the Walnut Creek watershed that lie to the east and west of the current boundary (figure 4-2).

Figure 4-2: Refuge Boundary Expansion



Strategies

- Partner with neighboring landowners and the Iowa Private Lands Office to increase use of available conservation programs and tools.
- Work with partners to further reduce erosion and improve water quality in the Walnut Creek watershed.
- Work with partners to establish wildlife habitat corridors between the Refuge, Lake Red Rock, and Chichaqua Bottoms Greenbelt.
- Work with partners to protect and restore high-value prairie remnants within the 38-county local ecotype zone, especially those that can provide rare plant seeds that are hard to acquire elsewhere.
- Encourage better local zoning regulations and lower-impact development.
- Reduce impacts of subsurface drainage on Refuge habitats.

Rationale

The Refuge is located in a primarily rural area just 20 miles east of Des Moines. Over 99 percent of the historic tallgrass prairie ecosystem has been lost to agricultural and urban development, and pressure on remaining wildlife habitat is increasing as the city and suburbs expand. Protected areas such as Neal Smith NWR, Lake Red Rock, and Chichaqua Bottoms Greenbelt are isolated islands of conservation surrounded primarily by croplands. As a result, the ability of many wildlife species to move across the landscape is limited. Off-Refuge land use patterns also can affect the Service's ability to restore and manage lands and waters on the Refuge.

Diverse partnerships are important in meeting Refuge purposes, National Wildlife Refuge System (NWRS, Refuge System) goals, and the mission of the Service. Neal Smith NWR partners include individual landowners; federal, state, and local government agencies; non-governmental organizations, and other stakeholders.

Lands within the proposed Refuge boundary expansion are located within the Walnut Creek watershed and include the headwaters of those tributaries that flow through the Refuge. The expansion area lies south of State Highway 163 and north of County Road 70. The expanded boundary generally follows roads and/or quarter-section lines adjacent to the watershed boundary, which provides a clearly defined acquisition boundary while also limiting the expansion only to those lands of greatest conservation value in meeting Refuge purposes and objectives.

The expanded boundary will help buffer Refuge wildlife and habitat from the increasing pressures of urban expansion, habitat fragmentation, and climate change, and improve habitat for migratory grassland bird species that require large tracts of prairie for successful nesting. Habitat quality on existing Refuge uplands will increase by restoring more natural subsurface drainage patterns.

Drainage tiles under the Refuge reduce the amount of water in the soil above, so many sites are drier than they would be without tiles. Reducing or eliminating the drainage system under the Refuge would restore the natural soil moisture regimes needed for more diverse and sustainable habitat restoration. Breaking, plugging, or removing tiles only within the current Refuge boundary, however, is not enough. Sections of tile line that lie up-gradient of the Refuge on private lands would remain intact, continuing to discharge groundwater onto Refuge lands and increasing the threat of severe headcutting.

Private landowners are unlikely to break, plug, or remove tiles because wetter soil would significantly reduce agricultural productivity. Consequently, fee title acquisition by the Service is likely to be the most viable option for meeting Refuge objectives, although easements or cooperative agreements also may be feasible in some locations. Land acquisition is proposed on a willing-seller-only basis, which means that any acquisition would occur only when landowners choose to sell. Additional information about this proposal can be found in the Land Protection Plan in Appendix B of this CCP.

Drainage tiles north of State Highway 163 do not flow under the Refuge, so these northernmost watershed reaches do not affect the soil moisture of most Refuge prairies, savannas, and upland sedge meadows. These northern reaches, however, do affect the Walnut Creek floodplain. Service land acquisition north of the highway would facilitate efforts to restore the natural hydrology of the creek, but attempting to engineer this restoration would take many years at a very high cost and is unlikely to be successful. Active channel restoration involving strategies such as armoring streambanks or installing channel meanders is not likely to work until water balance and hydrology are restored (Schilling et al., 2012). In addition, the creek already is moving slowly toward a new state of equilibrium and will eventually restore many of its historic functions if allowed to evolve naturally. Allowing natural processes to occur in the stream network (beaver dams, debris dams, etc.) do not cost anything and encourage stream evolution and readjustment (Schilling et al., 2012). Therefore, the Walnut Creek watershed north of Highway 163 is not included within the expanded Refuge land acquisition boundary. These lands, however, are a high priority for Service partnerships aimed at increasing the conservation value of private lands near the Refuge.

Refuge staff will assist agency partners, landowners, and other stakeholders in their efforts to restore and protect habitat and wildlife outside the expanded Refuge boundary. Priority areas for such assistance include the Walnut Creek watershed north and south of the Refuge, the Chichaqua Bottoms Greenbelt corridor, and habitat remnants determined to be of highest conservation value. Refuge staff may provide technical assistance and other support as requested, but any fee-title acquisition, easements, and ongoing management responsibility in these areas would be provided by others.

The Service's Partners for Fish and Wildlife Program (Partners Program) will be a key partner in meeting this objective. The Partners Program works beyond the boundaries of refuges with landowners and other partners to improve habitat on private lands for fish and wildlife. Neal Smith NWR, Lake Red Rock, and Chichaqua Bottoms Greenbelt lie within the Lower Des Moines River Corridor, a primary focus area of the Partners Program in Iowa. This focus area was established to help improve connectivity between Iowa's major habitat units.

Ultimately, restoring ecological functions and values in the tallgrass prairie ecosystem in central Iowa will require conservation and restoration of both public and private lands. Neal Smith NWR, Chichaqua Bottoms Greenbelt, and Lake Red Rock would serve as core areas of permanently protected and restored habitat connected by a matrix of public and private conservation lands.

4.2.2 Wildlife

Goal: The Refuge will protect, restore, reconstruct, and maintain biologically diverse populations of native wildlife associated with healthy prairie, savanna, sedge meadow, and aquatic ecosystems, with an emphasis on grassland and savanna bird species including Greater Prairie-Chicken, Northern Bobwhite, Northern Harrier, Upland Sandpiper, Short-eared Owl, Red-headed Woodpecker, Northern Flicker, Loggerhead Shrike, Bell's Vireo, Sedge Wren, Eastern Bluebird, Eastern Towhee, Field Sparrow, Grasshopper Sparrow, Henslow's Sparrow, Le Conte's Sparrow, Smith's Longspur, Orchard Oriole, Dickcissel, Bobolink, Eastern Meadowlark, and Western Meadowlark.

Objective 2-1: Grassland and Savanna Birds

Increase or maintain the populations of native grassland and savanna birds of Service concern that occur on the Refuge. Increase Red-headed Woodpecker populations by five to ten percent over 15 years, Henslow's Sparrow population by 20 percent over 15 years, and maintain Grasshopper Sparrow and Dickcissel populations (currently at 88 and 661 singing males, respectively).

Strategies

- Through management actions, restore and reconstruct tallgrass prairie and oak savannas to benefit bird species that are in decline including Northern Harrier, Upland Sandpiper, Short-eared Owl, Red-headed Woodpecker, Northern Flicker, Sedge Wren, Eastern Towhee, Field Sparrow, Grasshopper Sparrow, Henslow's Sparrow, Le Conte's Sparrow, Smith's Longspur, Dickcissel, Bobolink, Eastern Meadowlark, and Western Meadowlark.
- Conduct prescribed burns on a variable schedule every one to five years and in different seasons to prevent spread of woody vegetation within savanna and prairie habitats and provide structural diversity.
- Continue bird monitoring to determine populations of grassland and savanna bird species and their relationship to Refuge management.
- Analyze point count data collected since 1994 to determine population trends of grassland birds on the Refuge in relation to prairie restoration and Refuge management.
- Promote research on breeding and nest success of grassland birds using the Refuge.
- Promote research to determine the relationship between grassland birds and prairie conditions such as floristic quality.
- Evaluate conditions necessary to introduce Greater Prairie-Chicken to the Refuge. Continue partnership with Iowa Department of Natural Resources (DNR); encourage the DNR to take the lead on reintroduction.

Rationale

Widespread declines of many species of grassland and savanna birds are occurring throughout North America (Sauer et al., 2011). In the Midwest, this loss is primarily due to the conversion of prairie to cropland, resulting in both habitat loss and fragmentation (Brennan and Kuvlesky, 2005). The tallgrass prairie ecosystem has been reduced to less than one percent of its former extent east of the Missouri River and less than 0.1 percent in Iowa. Of the bird species listed in Appendix H: Birds of Special Consideration, Neal Smith NWR could have the most influence on regional populations of Henslow's Sparrow, Dickcissel, and Red-headed Woodpecker because central Iowa is an important part of the breeding range of all three, and they are highly associated with tallgrass prairie and oak savanna habitats. Table 4-1 shows current and future Refuge population estimates.

Table 4-1: Bird populations on Neal Smith NWR

Species	Current Population Estimate	Long-term Population Estimate*
Henslow's Sparrow	317	745
Dickcissel	661	1,553
Red-headed Woodpecker	11	99

*When all Refuge land acquisition/restoration is complete within expanded Refuge boundary

When the habitat objectives in this CCP are achieved, the population of Henslow's Sparrows on currently owned Refuge land could potentially increase to about 500 singing males (based on 2011 densities of 9.2 singing males/100 acres of Refuge grasslands). Over the longer term, when all lands within the expanded Refuge boundary are acquired and restored, the Henslow's Sparrow population could reach 745 singing males.

Dickcissel populations fluctuate and densities in 2011 were 19.1 birds/100 acres of grassland. The current population estimate is 661 birds on 3,457 grassland acres. If suitable grassland habitat were established on all appropriate soils throughout the current Refuge boundary, the population could reach 1,032 birds. However, since their populations peak two years after planting, it is doubtful that number could be maintained. Maintaining a population of 661 singing males would meet the 15-year objective. Over the longer term, full land acquisition and restoration within the expanded Refuge boundary would result in an estimated population of 1,553 breeding male Dickcissels.

The current estimate for Red-headed Woodpeckers on the Refuge is 11 individuals. Over the long term, when savanna has been restored on all suitable soils within the expanded Refuge boundary, the population could potentially reach 99 individuals (based on 2011 densities of 2.9 birds/100 acres).

The current population estimate for Grasshopper Sparrows is 88 singing males on the Refuge, primarily inhabiting the bison enclosure. There they are found at a density of 2.5 singing males/100 acres of grassland. Since they are associated with grazed or shorter grasses their population should remain stable unless grazed areas are increased or decreased. Estimates are based on numbers of birds within 50 meters of point transects conducted in 2011 and the amount of suitable cover that the points were located in.

Bird populations vary from year-to-year and season-to-season. Numbers indicate estimates of breeding birds. For most breeding songbirds, numbers indicate primarily singing males, the most commonly recorded individuals on point counts. For Red-headed Woodpeckers, males and females could not be distinguished for most observations. It is unknown whether these birds have mates or successfully fledge young. Density does not necessarily indicate habitat quality or nest success, and in some species intermediate densities may have higher rates of nest success.

Each species of grassland bird has specific habitat requirements. Many species, such as Killdeer (*Charadrius vociferus*), Horned Lark (*Eremophila alpestris*), and Smith's Longspur, are able to use short sparse grasslands such as agricultural fields and pastures. This habitat type is abundant throughout the region in which the Refuge is located. Some short-grass prairie species, such as Upland Sandpiper, Grasshopper Sparrow, and Western Meadowlark, are found in drier prairies on sandy soils, brome fields, and pastures in Iowa but are more abundant in the core of their range west of Iowa. Tallgrass prairie is important habitat for Sedge Wren, Henslow's Sparrow, Le Conte's Sparrow, Eastern Meadowlark,

Bobolink, and Dickcissel. Birds requiring large tracts of grassland include Greater Prairie-Chicken, Northern Harrier (*Circus cyaneus*), and Short-eared Owl.

Henslow's Sparrow is a species of particular concern to the Service. Historically a tallgrass prairie species, it has a relatively small range and is limited to areas of tall grasslands. Dickcissel is another tallgrass prairie species, although more widespread and less specific in its habitat requirements. Other than prairie found on Refuge lands, most tallgrass prairie in Iowa is found on private lands enrolled in the CRP or along roadsides. Since the early 1990s, populations have increased as enrollment in CRP has increased.

In recent years, many CRP plantings are rapidly being converted back to agricultural fields. By restoring and reconstructing tallgrass prairie and sedge meadow at Neal Smith NWR, the Refuge will continue to create habitat for a diversity of grassland birds that are dependent on these plant communities. In general, it is these prairie-dependent species that are experiencing declines due to loss of these plant communities.

Red-headed Woodpecker is another species experiencing steady declines. Savanna restoration will create larger areas of suitable habitat for this species. Red-headed Woodpecker populations respond well to savanna restoration, so populations are expected to increase on the Refuge.

The Refuge has conducted breeding season bird point counts almost every year since 1994. The surveys were originally conducted to collect baseline data on birds and look for population trends during the early stages of prairie reconstruction (Thomas, 1999). This study found increases in grassland birds such as Dickcissel and Grasshopper Sparrow during the first few years after Refuge establishment. Since then an analysis was carried out examining the bird species composition in prairie plantings of different ages (Olechnowski et al., 2009). This study found that the bird species found in a certain areas of the Refuge were related to the age of the planting. For example, Henslow's Sparrows were found in more established plantings, while Killdeer, Horned Lark, and Vesper Sparrow were most abundant in the first year after planting. Dickcissels peaked in abundance the second year after planting.

Objective 2-2: Bison Genetics

Participate in the U.S. Department of the Interior's (DOI) program to conserve bison genetics.

Strategies

- Maintain an optimum herd size that will not compromise habitat quality or other wildlife populations within the bison and elk enclosure.
- Selectively exchange bison with other herds on other refuges as needed to maintain widespread genetic diversity based on data developed by the FWS Wildlife Health Office (WHO) in Bozeman, Montana.
- Expand and reconfigure bison enclosure to minimize parasite problems associated with repeated use of the same area.

Rationale

The primary purpose of the bison and elk herds on Neal Smith NWR is to establish native wildlife species to the tallgrass prairie reconstruction that played key roles in the ecology of the natural prairie ecosystem. Bison and elk were the dominant native grazers on the tallgrass prairie; and, as such, they shaped the vegetative communities and had direct impacts on other prairie-dependent species such as insects, mammals, and birds. These animals graze the reconstructed prairie within the enclosure to

approximate as closely as possible the movements and other behaviors that would have been found in the wild.

Since December 2006, the Neal Smith NWR bison herd has been part of a Service program established to help conserve the genetic diversity of the species. Modeling suggests that a herd size of 1,000–2,000 animals is necessary for high confidence of genetic conservation. The seven Refuges participating in the program have about 1,400 bison in total, with each at or near its preferred carrying capacity. Therefore, the seven small herds are managed genetically as a single large metapopulation. Exchange of animals between the participating Refuges ensures that the genetic diversity of the metapopulation is maintained. In addition, maintaining the genetic foundation broadly across several locations reduces the risk of total loss of genetic resources at a single location from a natural event or other disaster.

The DOI has made a commitment to manage and maintain bison on its lands by chartering the Bison Conservation and Management Working Group to guide management of DOI bison herds (DOI, 2008). The Working Group coordinates opportunities to increase existing DOI herds to 1,000 or more bison or establish new herds as parts of a metapopulation that can reach that size, without impacts from non-native diseases and with minimal cattle allele introgression.

Objective 2-3: Bison and Elk Herd Health

Promote bison and elk herd health at Neal Smith NWR with the following measures:

- In November of each year, at least 90 percent of individuals in bison and elk herds are in good-to-excellent condition based on body condition charts. In March at least 90 percent of animals are in fair or better condition.
- At least 90 percent of tested bison have normal blood panel results, and remaining abnormalities are minor and without herd significance.
- Elk are monitored and show no signs of Chronic Wasting Disease (CWD) and samples test negative.

Strategies

- Conduct regular visual assessments of health of at least 80 percent of the animals in the bison and elk herds every one to two weeks (when travel conditions within the enclosure allow) to monitor population and determine body condition, injuries, abnormal behavior, or other signs of disease.
- In cooperation with the FWS WHO, conduct bison health assessments during annual roundup, sample sizes determined by WHO as appropriate for disease and needed sensitivity. Collect fecal samples when advised by WHO for assessing parasite trends and management effectiveness.
- Euthanize moribund animals, and conduct postmortem exams of all euthanized animals and of found carcasses in suitable postmortem condition.
- Comply with the Refuge's Chronic Wasting Disease Surveillance and Management Plan, which addresses surveillance/detection, communication/education, and containment/eradication. Refuge staff will confer with the Iowa DNR if CWD appears in the State of Iowa.
- Continue to coordinate with the DOI, Intertribal Bison Cooperative, and Native American tribes to donate excess bison to maintain an appropriate herd size. Manage the elk herd toward maintaining a 50/50 sex ratio of no more than 20 adult animals.
- Continue minimal interference with herds, handling bison only once per year as needed to manage herd size and genetics, and not handling elk at all if possible.

- Avoid domestic animal practices such as vaccination, feeding, and individual animal treatment with exception of herd management practices that include parasite treatment.

Rationale

Bison and elk are nomadic/migratory animals. However, Neal Smith bison and elk herds are confined to a 700-acre enclosure. Confinement to small areas, dense animal aggregation, and repetitive use of select forage all enhance spread of transmissible diseases and parasites. Direct life cycle parasites are a known problem in Neal Smith NWR bison.

Currently the bison herd size is being maintained at approximately 70 head, but appropriate herd size may change with new information derived from research, changes in the size of the enclosure, parasitic loads, as well as vegetative and wildlife response to grazing benefits. The 700-acre enclosure currently produces enough forage to maintain approximately 70 head of bison with healthy body condition and weight and no evident damage to the prairie based on visual observations of the vegetation.

Objective 2-4: Regal Fritillary Butterfly

Increase the prairie violet (*Viola pedatifida*) population on the Refuge to provide larval food source for the regal fritillary butterfly by establishing at least 500 violet plants in ten additional burn units within ten years.

Strategies

- Purchase or collect local ecotype prairie violet seeds and grow in the greenhouse for planting out.
- Plant prairie violet seeds and plants throughout different burn units of the Refuge, including the bison enclosure where disturbance is beneficial.
- Monitor violet and butterfly populations.

Rationale

The regal fritillary, a species of concern in Iowa, was re-introduced to Neal Smith NWR in 2000. The species was not found when initial butterfly surveys were conducted on the Refuge in 1994 (Klaas and Bishop, 1995). The larval host plant consists of only a few species of violets. Prairie violet is one of the primary host plants and is appropriate for the soil types found on Neal Smith NWR. Before and after reintroduction of the butterflies, prairie violet plugs were planted in several units on the Refuge. Regal fritillary butterflies continue to persist on the Refuge as do the violets where they were planted.

More prairie violets across the Refuge would increase habitat for regal fritillary butterflies and increase their likelihood of locating a patch of violets on which to lay eggs. Increasing the number of burn units on the Refuge that support prairie violets would also reduce the percentage of prairie violet patches burned, and thereby the number of regal fritillary larvae destroyed, in a given year. Prairie violets are conservative plants (coefficient of conservatism for Iowa is 8 on a scale of 0 to 10, with 10 being the highest) making their presence an indication of high quality prairie. Establishing more prairie violets on the Refuge would increase the floristic quality of the prairie and increase the cover of cool season native species, which could make the prairie plant community better able to compete with invasive plant species.

Monitoring of the violets and regal fritillaries is needed to measure success.

Objective 2-5: Indiana Bat

Within three years, initiate Indiana bat monitoring to determine if the species is still present on the Refuge; and, if so, determine locations and whether there is evidence of reproduction. Coordinate endangered species consultation with FWS Ecological Services staff as needed for any restoration work that potentially could impact the Indiana bat.

Strategies

- Conduct baseline inventory of bats within oak savanna habitat across the Refuge.
- Map areas where the Indiana bats are located.
- Continue to monitor every five years in sites known to contain the Indiana bat.

Rationale

Several endangered Indiana bats were found on the Refuge between 1992 and 1995, but no surveys have been conducted since then. Savanna sites will be restored and reconstructed throughout the Refuge over the next 15 years, and it is important to know whether Indiana bats are currently present in these areas or in other areas of the Refuge where restoration work may take place. Bats may begin to occur here in higher numbers as ecosystem restoration continues. Monitoring to determine presence or absence of Indiana bats will provide a better understanding of what, if any, measures should be taken to avoid negatively impacting the population. At a minimum, restoration work such as tree removal and prescribed burning in occupied Indiana bat habitat should occur only between September 15 and April 15. Mist-net surveys will follow guidelines described in the Indiana Bat recovery plan (FWS, 2007).

4.2.3 People

Goal: The Refuge will provide a variety of wildlife-dependent recreational and educational opportunities for visitors to experience and develop an appreciation for the native tallgrass prairie heritage, ecological processes, and cultural resources while participating in ecological restoration efforts or enjoying other activities on the Refuge.

Objective 3-1: Welcome and Orient Visitors

Provide a welcoming, safe, accessible experience for at least 200,000 visitors each year. Provide clear information in multiple formats so visitors can easily determine where they can go, what they can do, and how they can safely and ethically engage in recreational and educational activities. At least 90 percent of visitors will report a satisfactory overall experience on the Refuge each year.

Strategies

- Within two years of CCP approval, review and update website(s) to provide clear, dynamic information about research, biology, visitor services (to include upcoming events, education, volunteer opportunities), and timely flora and fauna updates (i.e., what's blooming or migrating through). Review and update all other website information at least annually.
- Within five years, review and revise if needed, all informational brochures, directional signs, maps, and other welcoming/orienting publications to ensure that they are current, accurate, and in compliance with Service standards. Thereafter, review brochures annually and update if needed.
- Determine measures of visitor satisfaction, and begin collecting data within one year of completing a Visitor Services step-down plan.

- Move current kiosk closer to the beginning of the entry road; move kiosk on hill by Visitor Center to parking lot.
- Expand length of the Savanna Trail to approximately one mile incorporating savanna/prairie edge.
- Add a southern extension to the Savanna Trail that will eventually connect to the Basswood Trail when the property between is acquired.
- Realign a portion of the lower section of the Tallgrass Trail and place it farther up onto the hillside. The current location is frequently flooded and difficult to maintain.
- Add accessible after-hours restrooms and drinking water.
- Within five years, update Visitor Center display theme and exhibits.
- Develop new introduction movie, and update the theatre configuration.
- Increase Visitor Center hours Memorial Day through Labor Day (hours would be 9:00 AM – 8:00PM) to allow for more interpretive programming and provide evening visitors an opportunity to experience the Visitor Center.

Rationale

Welcoming and orienting Refuge visitors contributes to the criteria that defines a quality wildlife-dependent recreation program as identified in the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and defined in the Service Manual (Service Manual, 605 FW 1). The number of visitors has stabilized at 140,000 visitors annually. Clear signage and adequate visitor information are essential. The ease with which the public can navigate to visitor use areas on the Refuge, understand guidelines for appropriate conduct and safety, have basic needs met (parking, restrooms, maps, etc.), and fully engage in wildlife-related activities directly translates to a quality recreational experience, a positive impression of the Service, and an identification with the mission and goals of the agency.

Objective 3-2: Hunting

Develop a Refuge hunting program that provides the public with safe and enjoyable hunting opportunities, increases understanding and appreciation of tallgrass prairie and oak savanna ecosystems and associated wildlife, minimizes conflict with other compatible public uses, and is consistent with sound wildlife and resource management practices.

Strategies

- Complete a Refuge hunting plan within one year of CCP approval.
- Add hunting opportunities for youth and people with disabilities.
- Consider changes to Refuge hunt program that would align more closely with the State hunt program.
- Monitor hunter satisfaction by including a space on the hunting brochure for comments along with an email address to encourage a response.
- Host Iowa DNR hunter education courses at the Refuge.
- Review hunting program annually, updating as needed based on wildlife monitoring findings.
- Coordinate and consult with Iowa DNR on all changes to the Refuge hunting program.
- Coordinate with biological program to monitor population numbers of hunted species on the Refuge, and monitor effects on non-hunted species such as Short-eared Owl.

Rationale

Hunting is one of six wildlife-dependent recreational uses that receives priority consideration in Refuge planning and management under the Improvement Act. The Improvement Act states that “Compatible

wildlife-dependent recreation is a legitimate and appropriate general public use of the System . . . through which the American public can develop an appreciation for fish and wildlife.”

Hunting on Neal Smith NWR will allow Refuge staff to provide wildlife-dependent recreational opportunities for the public, promote a better understanding and appreciation of tallgrass prairie and oak savanna ecosystems and their associated wildlife resources, and manage game populations at acceptable levels. The Service will coordinate and consult with the Iowa DNR on all changes to the Refuge hunt program.

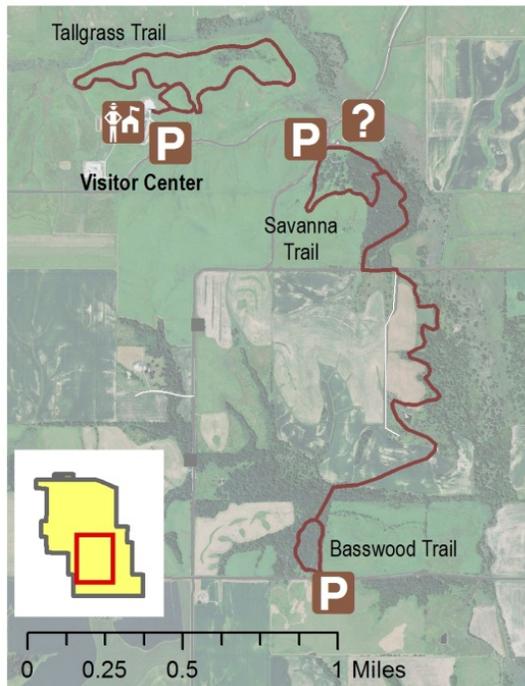
Objective 3-3: Wildlife Observation and Photography

Provide year round opportunities for at least 150,000 visitors to safely observe and photograph wildlife and plants on the Refuge. Offer a range of visitor access experiences appropriate to each activity, location, vegetation type, and time of year.

Strategies

- Continue to maintain current trails and auto tour route to meet FWS standards.
- Provide new trail connecting the existing Basswood and Savanna trails (figure 4-3) within ten years of acquiring the necessary land (Rothinghouse property). Upgrade the surface of the Basswood trail when connection is complete.
- Reconfigure the layout of the Savanna trail to comply with Americans with Disabilities Act regulations.
- Slightly reconfigure the Tallgrass Trail to elevate it out of the creek floodplain and to allow better visibility into the bison enclosure.
- Allow off-trail foot access year round throughout the Refuge except within and next to the bison and elk enclosure. The Refuge reserves the right to close specific units throughout the year for management or safety purposes.
- Assist with the completion of the bicycle trail adjacent to the entry road.
- Install spotting scopes on pullouts adjacent to bicycle trail and at the Visitor Center to improve viewing of bison and elk.
- Continue to allow cross-country skiing and snowshoeing in designated areas.
- Allow walking of leashed dogs on designated trails.
- Develop new amphitheater outside the bison viewing window next to the Visitor Center to provide seating for programs or viewing of bison and elk.
- Continue to limit horseback riding on the Refuge to only county roads to prevent the spread of noxious and invasive weeds, and eliminate maintenance issues created by traffic other than foot traffic.
- Increase birding opportunities and activities to meet many of the “birder-friendly” standards of the Refuge System without incorporating feeders, nest boxes, or artificial devices. (<http://www.fws.gov/refuges/pdfs/a%20birder%20friendly%20refuge7.08.pdf>)
- Continue to provide opportunities for the visiting public to view bison and elk grazing within the relatively natural landscape of the enclosure.

Figure 4-3: Future Configuration of Hiking Trails



Rationale

Wildlife observation and photography are priority wildlife-dependent recreation activities listed in the Improvement Act. They are important and valuable activities that promote understanding and appreciation of natural resources and their management. If properly managed, these uses provide invaluable opportunities for interaction between people and the natural environment with little or no detrimental effects to wildlife or vegetation.

Objective 3-4: Environmental Education

Provide quality environmental education programs to at least 15,000 students each year. Emphasize curriculum-based packages based on national and state education standards, training of teachers to lead their own educational experiences (e.g., Partner Teachers), and repeat student visits that include hands-on outdoor experiences (e.g., Partner Schools). At least 90 percent of teachers will report that Refuge environmental education programs support their curriculum and help to promote resource stewardship and conservation.

Strategies

- Within five years of CCP approval, develop and implement activities to evaluate student learning and teacher satisfaction.
- Within five years, review and update Project Bluestem lesson plans to meet new Iowa educational standards, as well as Refuge and teacher needs and teaching philosophies. These will be reviewed and updated every three years.
- Within five years, all lessons taught as part of the Partner Schools program will reinforce classroom lessons to assist teachers in meeting state standards.
- Increase number of teachers participating in the Partner Teacher program.
- Increase annual number of teacher workshops from one to at least three.
- Develop three to five core themes. Incorporate them into all environmental education programs within two years after completion of the Visitor Services step-down plan.
- Provide educational programs that explain the historic role of bison in the native ecosystems, the relationship between native cultures and bison, the role of bison on the Refuge today, and the management of the FWS bison metapopulation.

Rationale

Through repeated hands-on and minds-on learning experiences, students gain a more in-depth understanding of the value of America's unique wildlife resources and the role that the Service plays in their management and protection. Recent studies indicate that environmental education increases student engagement, academic achievement, leadership skills, critical thinking skills, overall health, and reduces discipline problems. These studies include findings from evaluations conducted at the Prairie Science Class (Prairie Wetlands Learning Center in Fergus Falls, Minnesota); research by the Place-Based Education Evaluation Collaborative; and research by the National Association of Environmental

Educators; their work can be accessed at http://www.fws.gov/midwest/pwlc/prairie_school.html, <http://www.pecworks.org/> and http://www.eeweek.org/pdf/EE_Benefits.pdf respectively.

Expanding the Partner Schools and Project Bluestem programs are high priorities for the Visitor Services program at the Refuge. These programs build on the “No Child Left Indoors” goal of the Service, as well as building skills for the future workforce (critical thinking), connecting people with nature, instilling civic responsibility, and increasing environmental literacy.

Objective 3-5: Interpretation

Provide quality interpretive experiences for at least 100,000 visitors annually. Identify three to five core themes that will make Refuge issues relevant to everyday lives. Select delivery methods, locations and target audiences to reach people of diverse age, ability, and background. At least 90 percent of people participating in interpretive activities will report learning and understanding the core messages developed in the Visitor Services step-down plan and a satisfaction with their experience.

Strategies

- Within 15 years of CCP approval, update all interpretive programs, signs, brochures, and exhibits to reflect new core themes.
- Continue to offer at least eight special events per year. Work to increase participation and update/revise programs as needed.
- Expand interpretive program offerings.
- Update interpretive CD for auto tour route, and offer it in MP3, podcast format or other current media.
- Develop interpretive resources that encourage native gardens for the benefit for wildlife and people.
- Provide interpretive programs, brochures, and signs that explain the historic role of bison in the native ecosystems, the relationship between native cultures and bison, the role of bison on the Refuge today, and the management of the bison metapopulation.

Rationale

Interpretation is a priority wildlife-dependent recreational use listed in the Improvement Act. Well-designed interpretation can be an effective management tool and provide the opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service. They can help develop a citizenry that has the awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively towards the conservation of our nation’s environmental resources. They can also influence visitor behavior when visiting units of the Refuge System. Future efforts will be directed toward on- and off-Refuge programs with a goal of increasing the knowledge of, and appreciation for, the Refuge and its resources.

Objective 3-6: Other Recreational Uses

Continue to provide opportunities for berry and mushroom collecting for personal consumption. Continue to allow firewood gathering in designated areas with a Special Use Permit.

Strategy

- Develop an informational sheet (or rack card) concerning berry and mushroom collecting regulations on the Refuge. The brochure will be reviewed annually and updated if necessary.

Rationale

These allowed activities promote historical uses on the Refuge while instilling a land use ethic. Visitor participation can develop a connection and appreciation for non-commercially grown foods and other consumable resources. Human populations have become more and more removed from tasting wild foods that do not require chemicals or other unnatural means to grow. This disconnect is counter to human needs.

Camping and campfires are sometimes requested by visitors, but these uses introduce a potential for increased litter, wildlife feeding issues, and wildfire, so they will not be allowed on the Refuge. Hotels and campgrounds are located within 20 miles of the Refuge allowing these uses to be accommodated by the local community, bolstering the economy, which benefits the Refuge and neighboring towns.

Objective 3-7: Outreach

Increase awareness of and support for Refuge issues in the local community and the Des Moines metropolitan area by participation in community events. Develop messages and delivery techniques that make Refuge issues relevant to everyday lives.

Strategies

- Incorporate core themes and messages into all outreach activities.
- Provide local media with news releases, television/radio spots, interviews, newsletter articles, etc. a minimum of 12 times per year.
- Develop relationships with three key reporters in the surrounding area within two years.
- Increase the frequency of community group presentations.
- Increase opportunities to interact with and listen to local residents and landowners.
- Maintain regular contact with community leaders, agencies, and organizations.
- Enlist the assistance of the Refuge Friends Group in conducting outreach activities.
- Utilize social media including Facebook, Twitter, Flickr, and YouTube, as well as any future sites approved by the Service.

Rationale

It is critical to the mission of the Refuge System and to Neal Smith NWR that the neighbors, citizens, organizations, and agencies in the surrounding landscape know about the Refuge and support it as a valuable and contributing part of the community. The Refuge is an asset to the local community and continued support is essential for the success of the Refuge and its long-term viability. Also, building support for land and water conservation among Refuge neighbors is essential in protecting the natural resources in the area over the long term.

Effective outreach depends on open and continuing communication and collaboration between the Refuge and its many publics. Outreach can foster a sense of ownership in the greater community and contribute to achievement of Refuge purposes and the Refuge System mission.

Objective 3-8: Volunteers and Community Partnerships

Provide quality volunteer opportunities that total at least 20,000 hours annually; and recruit, orient, and train new volunteers each year. Develop community partnerships with local cities and towns.

Strategies

- Recruit new volunteers from the local community and the Des Moines metropolitan area.

- Explore new opportunities for Refuge involvement in the community.
- Explore new opportunities for the community to become involved with the Refuge.
- Construct bunkhouse and RV pads for use by out-of-town volunteers, interns, and researchers.
- Continue to support the Friends Group in providing quality interpretive and educational material offered for sale in the Refuge bookstore.

Rationale

The human resource hours required to effectively manage a national wildlife refuge often exceeds that which can be provided by staff alone. The accomplishments of any refuge, especially the exemplary work above and beyond the day-to-day management needs are often the result of joint public and private teamwork and the collective interests and enthusiasm of the multitude of individuals that benefit from the Refuge. As public servants, Service staff manages a public resource owned by the citizens of this nation. The greater the involvement of the public, the more successfully the mission of the Service is met: “. . . working with others . . . for the continuing benefit of the American people.”

Whether through volunteers, support groups, or other important partnerships in the community, Refuge personnel seek to make the Refuge an integral part of the community. Volunteers and partner organizations of Neal Smith NWR become advocates for Refuge management activities and provide vital assistance in fulfilling Refuge purposes and goals. They are integral to the future of the Refuge System. Congress reauthorized the Volunteer and Community Partnership Enhancement Act in 2004, affirming its desire to involve Americans as stewards of our nation’s natural resources and wildlife.

Friends of Neal Smith NWR and other volunteers will continue to be important partners in restoring the biological integrity of Refuge lands.

Developing relationships with other conservation agencies and organizations is mutually beneficial in conducting efficient and effective natural resource work. It is important that the Refuge continue efforts to build and maintain open communication, informing partners and the public about the successes, opportunities, and challenges involved in conservation and wildlife-dependent recreation.