Chapter 4: Management Direction

In this chapter:

This chapter presents the goals, objectives, and potential strategies that will guide management and administration of Big Stone National Wildlife Refuge (NWR, Refuge) over the next 15 years. This management direction represents the plan for the Refuge and mirrors Alternative 6 in the Environmental Assessment, which was prepared as part of the planning process.

Goals, Objectives, Rationale, and Strategies

Goals, objectives, and strategies comprise the future management direction. Goals are descriptive broad statements of desired future conditions that convey a purpose. There are three goals for Big Stone NWR, one each for habitat, wildlife, and people. Goals are followed by objectives, which are specific statements describing management intent. Objectives provide detail and are supported by rationale statements that describe background, history, assumptions, and technical details to help clarify how the objective was formulated.

Finally, beneath each objective there is a list of potential strategies, the specific actions, tools, and techniques required to fulfill the objective. The strategies may be refined or amended as specific tasks are completed or new research and information come to light. When a time in number of years is noted in an objective or strategy, it refers to the number of years from approval of this CCP. If no time is given, the objective is to be accomplished within the 15 years of the life of the plan.

Habitat Goal

Big Stone NWR will actively restore, manage, and protect diverse native communities of tallgrass prairie, wetland, riparian, and granite outcrop habitats to enhance the vitality and health of the natural environment. See figure 4-1 for future land cover at Big Stone NWR.

Objective 1-1 Riverine Habitat

Over the life of the plan, improve riverine habitat for plants, wildlife, and fish by restoring natural alignment, channel capacity, and meander relationships on approximately five miles of the upper portion of the Minnesota River within the Refuge. This will improve habitat diversity and redistribute the timing and delivery of waters and sediments within the Refuge.

Performance Measure

Miles of Minnesota River restored.

Rationale

Service policy calls for maintaining or, where feasible and consistent with Refuge purposes, restoring the composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the

environment (FWS, 2001). Alterations to hydrologic conditions—water movement, distribution, and quality—within the Minnesota River watershed over the past 150 years make it infeasible to fully restore historic hydrologic conditions, but it is possible to mimic some components of historic hydrology within the Refuge. Reintroducing these elements of historic hydrologic conditions is consistent with Service policy and would continue to meet the purposes of the Refuge by providing habitat for migratory birds and other wildlife.

Potential Strategy

- Work in conjunction with the U.S. Army Corps of Engineers (USACE) and the Upper Minnesota River Watershed District to assess restoration of the Minnesota River channel within the Refuge.

Objective 1-2 Water Quality

Within 15 years of plan approval, improve water quality within the Minnesota River and tributaries on or immediately upstream of the Refuge to move towards compliance with Environmental Protection Agency (EPA) and Minnesota Pollution Control Agency (MPCA) standards. The long-term goal is to have the streams removed from the list of impaired waters.

Performance Measure

Number of impaired stream reaches and number of impairment types compared to those identified by the MPCA in 2012.

Rationale

Three tributary streams (South Fork Whetstone River, Yellow Bank River, and Stony Run Creek) entering the Minnesota River on or upstream of the Refuge, along with the Minnesota River itself, have been listed as an impaired water by the MPCA, South Dakota Department of Environment and Natural Resources, and the EPA because of high levels of mercury, turbidity, and bacteria. Improving water quality will help restore the biological integrity and environmental health within these streams and is consistent with current Service policy (FWS, 2001).

Potential Strategy

- Work in conjunction with Morris Wetland Management District to focus efforts of Partners for Fish and Wildlife program within the portion of Minnesota River watershed upstream of the Refuge.

Objective 1-3 Riparian Habitats

Over the life of the plan, maintain approximately 200 acres as riparian woodlands with a structurally diverse native plant community with canopy cover ranging from 50 to 100 percent, subcanopy ranging from 0 to 50 percent areal coverage, and a ground layer ranging from 0 to 25 percent areal coverage in spring up to 50 percent areal coverage in midsummer. Over the life of the plan, maintain approximately 400 acres as riparian grassland habitat with a structurally diverse native plant community (ranging from 30 cm to 1.5 m in height) composed of native grasses and forbs with up to 70 percent areal coverage of shrubs and trees.

Performance Measure

Acres of riparian woodlands and riparian grasslands.

Rationale

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (FWS, 2001). The riparian woodlands provide habitat for several species of woodpeckers, raptors, tree nesting waterfowl (Wood Duck and Hooded Merganser), passerines, and resident wildlife, such as, white-tailed deer, mink, raccoon, and squirrels. Due to wet soil conditions and severely limited machinery access, management options for this habitat are limited. Riparian grasslands serve as a transitional zone between riparian woodlands and other habitats such as wet meadow or granite outcrops. The soils are slightly drier than the riparian woodlands and are grass-dominated with trees, shrubs, and forbs. Several areas of the riparian woodlands/grasslands have become dominated with reed canarygrass. Controlling this species is very difficult due to the limitations mentioned above. Over time, reed canarygrass may serve to suppress the establishment and recruitment of young trees in canopy gaps such that eventually the riparian forest may ultimately succeed to monotypic stands of reed canarygrass. Management emphasis will be to maintain the riparian woodland/grassland habitat and evaluate ways to reduce reed canarygrass and restore the native plant diversity.

Objective 1-4 Shallow Lake Habitat (impoundments)

Over the life of the plan, continue to manage 3,500 acres of shallow lake habitat within West Pool, East Pool, and Pools 3, 4, 4a, 5, and 6 to increase the amount of food and cover for migratory birds and other wildlife. Contingent on Minnesota River channel restoration (Objective 1-1), increase the distribution, amount, and diversity of submerged vegetation within West Pool (as compared to an average of amounts and distributions available in years prior to plan approval) through increased variability in water level management and improved water quality within the unit. Management will continue to be affected by periodic releases of high volumes of water from upstream and the impoundment of these waters on the Refuge to meet USACE flood control objectives.

Performance Measure

Amount and distribution of submerged vegetation in West Pool relative to the average of amounts and distributions in years prior to 2012.

Rationale

Big Stone NWR gets it purposes from five different legal authorities that collectively provide broad direction regarding conservation of fish and wildlife and their habitats with specific mention of migratory birds, threatened and endangered species, and wetlands. Hemi-marsh conditions are well accepted as ideal conditions for breeding waterfowl. The interspersion of water and vegetation allow for pair isolation, provide escape cover for broods, and encourages an abundant and accessible invertebrate food source. However, prairie wetlands historically existed under dynamic climatic (and thus hydrologic) conditions. Prolonged static water levels can create anaerobic conditions that limit decomposition and nutrient cycling. High water levels

can also adversely influence the growth and development of aquatic vegetation by limiting light penetration and oxygen availability and allowing water temperatures to remain cool. Continuous high-level water management also causes increased rates of erosion to shores and islands. Appropriate water-level manipulations can create habitats that provide open water areas with submerged vegetation and shallow areas with emergent food resources and cover for many wetland-dependent species. The exposure of wetland sediments to the atmosphere increases decomposition of organic material and improves the overall biological production potential. Refuge wetlands would be managed to emulate the natural wet-dry cycles of the Great Plains. These natural water cycles provide a mosaic of habitats for shorebirds, amphibians, reptiles, waterfowl, invertebrates, waterbirds, and other wildlife, and they also help recycle nutrients.

Potential Strategy

- Develop a water management regime as part of a Habitat Management Plan to meet wildlife and habitat objectives.

Objective 1-5 Wetland Natural Depression

Over the life of the plan, maintain approximately 260 acres of natural depressional wetland habitat with a diverse aquatic plant community consisting on average of 50 percent open water and 50 percent aquatic vegetation (hemi-marsh) with water depth ranging from of 5 to 20 inches.

Performance Measure

Acres of natural depression wetlands.

Rationale

Previous research has indicated that wetlands with an approximate 50:50 ratio of open water and emergent vegetation such as cattails and bulrushes, often termed hemi-marshes, attract the highest densities and diversities of wetland birds (Weller and Spatcher, 1965). Open water to emergent vegetation ratios will likely be close to 50:50 (that is, 30:70 ratio, 70:30 ratio) in most natural wetlands. Because of the dynamics involved with prairie – wetland conditions over time, in certain years the coverage of emergent vegetation may fall well outside the target range (30 to 70 percent coverage). During years of extreme drought, emergent vegetative cover 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.

Potential Strategy

- Periodically employ disturbance such as fire, grazing, or mowing to retard growth of cattails and woody vegetation.

Objective 1-6 Remnant Prairie (dry, mesic, and wet)

Over the life of the plan, maintain the existing amount (about 1,700 acres) of remnant prairie with a structurally diverse native plant community having less than 5 percent areal coverage of

woody vegetation. It is comprised of dry prairie 20 to 40 cm in height with litter depths from 1 to 2 cm; mesic prairie 30 cm to 1.5 m in height with litter depths from 5 to 7.5 cm; and wet prairie 60 to 1.5 m in height with litter depths from 5 to 7.5 cm.

Performance Measure

Acres of remnant prairie.

Rationale

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (FWS, 2001). Big Stone NWR purposes derive from five different legal authorities that collectively provide broad direction regarding conservation of fish and wildlife and their habitats with specific mention of migratory birds, threatened and endangered species, and wetlands. The Refuge is within the range of the historic tallgrass prairie, which once stretched from Canada to Oklahoma including an estimated 18 million acres in Minnesota (Samson et al., 1998). Most of the tallgrass prairie was converted to agriculture leaving scattered remnants. Today the amount of remnant tallgrass prairie in Minnesota is estimated at 37,000 acres, a 99 percent decrease from its former extent, with much of it occurring in small scattered parcels. The 1,700 acres of remnant prairie on the Refuge provides habitat for grassland associated wildlife, including many that are declining in number. It also provides the public with an important environmental education opportunity as to the importance of this habitat and its history in the area.

Potential Strategy

- Periodically employ disturbance such as fire, grazing, or mowing to retard growth of invasive species and woody vegetation.

Objective 1-7 Restored Grassland (native grasses and forbs of local ecotypes)

Over the life of the plan, maintain the existing amount of restored grassland (about 500 acres), and increase it by 1,100 acres. Manage the total amount, about 1,600 acres, to have a minimum floristic quality that contains at least eight grass species and 25 forb species.

Performance Measure

Acres of restored grassland.

Rationale

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (FWS, 2001). Most of the lands within the Refuge were once covered with tallgrass prairie but were converted to agriculture or other land cover types prior to Refuge establishment. Restored grasslands, which contain native grasses and forbs, provide some of the functions of more diverse remnant prairie and may one day develop soils capable of supporting a full range of prairie plants and wildlife.

Potential Strategies

- Periodically employ disturbance such as fire, grazing, or mowing to retard growth of invasive species and woody vegetation.
- Based on site conditions, plant forbs, or grasses and forbs.

Objective 1-8 Partially Restored Grassland (native grasses of local ecotypes)

Over the 15-year life of the plan, reduce the amount of partially restored grassland from 1,300 acres to approximately 700 acres. Over the long term, convert all partially restored grasslands acres to fully restored grasslands.

Performance Measure

Acres of partially restored grassland.

Rationale

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (FWS, 2001). Most of the lands within the Refuge were once covered with tallgrass prairie but were converted to agriculture or other land cover types prior to Refuge establishment. Partially restored grasslands—sites which contain native grasses but no forbs—provide some of the functions of more diverse remnant prairie or restored grasslands. Of the 1,300 acres of partially restored grasslands on the Refuge, about 1,100 acres occur on sites suitable for seeding forbs. Site suitability is determined by soils, drainage, hydrology, and their expected effects on vegetation. Suitable sites must also accommodate access and operation of equipment necessary to complete restoration. This planning period at least 600 acres would be restored, but eventually (beyond the present 15-year planning period) all accessible acres would be seeded with forbs and converted to restored grasslands.

Potential Strategy

- Periodically employ disturbance such as fire, grazing, or mowing to retard growth of invasive species and woody vegetation.

Objective 1-9 Non-native Grassland

Over the life of the plan, eliminate non-native grassland on all accessible areas, reducing the total amount from 800 acres to approximately 300 acres. If future conditions or methods allow, eliminate all remaining (presently inaccessible) non-native grassland acres.

Performance Measure

Acres of non-native grassland.

Rationale

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (FWS, 2001). About 800 acres of the Refuge are covered by non-native grasses. Converting 500 acres to native grasses and forbs increases floristic and structural diversity and makes the sites suitable for a greater number of wildlife species. The remaining 300 acres were excluded because the sites are not accessible to the equipment required to complete the work.

Potential Strategy

- Disturb sites, typically done through farming, for several consecutive years to eliminate unwanted vegetation and prepare the seedbed for planting of native grasses and forbs.

Objective 1-10 Rock Outcrop

Over the life of the plan, maintain approximately 100 acres of shortgrass prairie (flora and fauna) on the granite outcrops to achieve a structurally diverse native plant community (ranging from 20 to 40 cm in height). This community will be composed of native grass, forb, and sedge species with a small (0 to 20 percent areal coverage) native shrub component. Management will focus on control of exotic/invasive species.

Performance Measure

Acres of rock outcrop with shortgrass prairie.

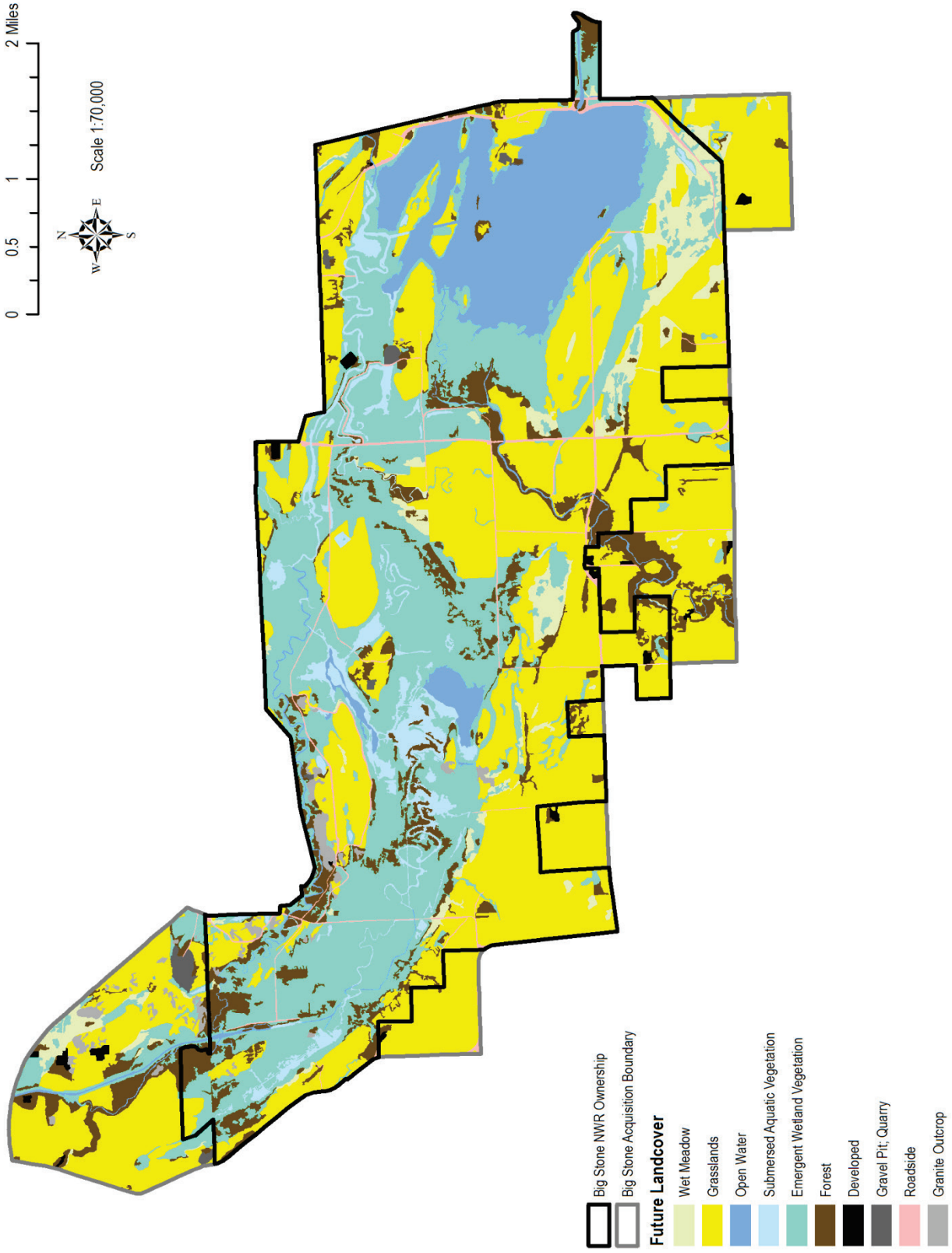
Rationale

The soils on the granite outcrops are fragile and shallow ranging from 0.5 cm to 7.5 cm. The shortgrass obligate prairie species depend on these soils. State threatened and endangered plant species are found only in these areas of the Refuge. Other species such as the 5-lined skink live on the outcrops. Over time trees invaded several of the outcrops. The shading created by the presence of trees is detrimental to plant species that exist. The Refuge will make a concerted effort to remove trees from the outcrops to preserve the flora and fauna unique to this habitat. The Refuge will take the necessary actions to preserve the outcrop habitat.

Potential Strategy

- Periodically remove unwanted vegetation by using fire, chemicals, or hand removal.

Figure 4-1: 15-Year Future Land Cover, Big Stone NWR



Wildlife Goal

Big Stone NWR will enhance and maintain habitats for biologically diverse and abundant populations of native fish and wildlife associated with healthy refuge environments.

Objective 2-1: Mallard Production

Over the life of the plan, annually provide waterfowl production habitat to support up to 120 Mallard breeding pairs on Refuge wetlands.

Performance Measure

Breeding pairs of Mallards.

Rationale

Hemi-marsh conditions are well accepted as ideal conditions for breeding waterfowl (Weller and Spatcher, 1965; Murkin et al., 1982; Murkin et al., 1997). The interspersion of water and vegetation allow for pair isolation, provide escape cover for broods, and encourages an abundant and accessible invertebrate food source. High quality, naturally occurring wetland basins considered to be benchmarks for evaluating biotic integrity typically have very diverse plant communities. Invasive species such as cattail, reed canarygrass, and willows can form monocultures that can change the function of the wetlands.

Ten years of Refuge waterfowl pair count data were analyzed, which revealed on average the Refuge provides habitat for 90 pairs of Mallards. In order to evaluate the Refuge's potential for supporting Mallard pairs under hemi-marsh conditions we used waterfowl pair count models ("thunderstorm map") developed by the Habitat Population and Evaluation Team (HAPET) in Fergus Falls, MN. Under ideal wetland habitat conditions the Refuge could provide habitat for 145 breeding pairs of Mallards. However, the Refuge wetlands are located in a riverine system that is prone to erratic high water events, i.e., flooding. Refuge impoundments have water control structures but constricted water management capability due to the sheer volume of water that flows through the system. This in turn has an effect on the Refuge's ability to create optimal habitat conditions (hemi-marsh). Some areas that under ideal conditions could be hemi-marsh are not feasible. Some of the wetlands are prone to cattail domination. Therefore, these factors were taken into account when using the HAPET models.

With the planned increase in grassland restoration and water management capability as outlined in this plan, greater vegetative and structural diversity would be created and provide better nesting habitat for not only waterfowl but also a variety of grassland nesting birds. Realizing the limitation to water management capability in this riverine system and the enhanced habitat condition the HAPET models predict, habitat could be provided for up to 120 Mallard breeding pairs.

Potential Strategy

- Annually monitor Mallard breeding pairs within Refuge wetlands.

Objective 2-2: Bobolink Production

Increase the Bobolink breeding population of 194 pairs (current estimate) within the Refuge grassland habitats by 20 percent throughout the life of the plan.

Performance Measure:

Bobolink breeding pairs.

Rationale

In order to obtain an estimate of the number of breeding Bobolink pairs that the Refuge currently supports, 10 years of data were analyzed from the Refuge's Breeding Bird Survey (BBS). The 10 year (2002–2011) average for Bobolink was 28.2 males/BBS route. The breeding population estimate was derived from formulas that were used in Rosenberg, 2004. This study focused on setting Partners in Flight (PIF) priorities and objectives at the State and Bird Conservation Region (BCR) level for landbird species.
http://www.fishwildlife.org/files/MN_PIF_OBJ_PRIO.pdf

BBS-based estimate of abundance was calculated according to the following steps:

1. Annual Bobolink numbers per BBS route were averaged over a ten year period to develop a single average number of birds/route.
2. An index of abundance was calculated for the geographic polygon (1781 ha = 4,400 acres of grassland) by multiplying the average count per BBS route times area of the geographic polygon, and dividing by the theoretical area covered by a BBS route (2510 ha, assuming 400-m radius around each of the 50 count circles). For example, the index of abundance for Bobolink in the grasslands on the Refuge equals 28.2 birds/route x 1781 ha (4,400 acres of grassland)/ 2510 ha (area per BBS route) equals approximately 20 birds.

   (ha = hectare)
3. The index of abundance was converted to a population estimate by applying three correction factors (see Rosenberg and Blancher, 2005).

   Pair correction: The index (20 birds) was multiplied by two on the assumption that typically a single member of a breeding pair is observed during BBS tallies.

   Detection area correction: Species have been placed into one of five detection distance categories, based on presumed effective detection during 3-minute BBS counts: 80m, 125m, 200m, 400m and 800m. Because area of detection increases as the square of detection distance, the detection area correction is then simply the square of the ratio between 400m (theoretical BBS count circle) and species-specific effective distance. For example for Bobolink, placed in the 200m class, the population index is multiplied by a detection area correction of 4 (square of 400/200). Note that effective detection distances are intended to incorporate not only the distance at which a species is normally heard and seen, but also the distance the species moves during a 3-min count period – this is why some wide-ranging species have been assigned an 800-m detection distance despite being counted within a 400-m BBS circle.

Time of day correction: Almost all species show a temporal change in detection across the 50 BBS stops, some declining from a dawn chorus, others peaking after sunrise or later in the morning. A time of day correction is applied to the population index to adjust counts to the maximum time of detection. This adjusts for birds not detected at other times of the morning. The correction factor is the ratio of counts at the peak of detection (calculated using a polynomial curve fit to smooth out stop-by-stop variance) relative to the average count over whole BBS routes. Time of day correction factors were calculated from survey-wide BBS stop-by-stop data. For Bobolink, the time of day correction is 1.21.

4. Calculation for population estimate: BBS abundance index number of birds, pair correction, detection area correction, and time of day correction factors. For Bobolink: 20 males X 2 (pair correction) X 4 (detection area correction) X 1.21 (time of day correction) = 194 pairs.

When evaluating datasets to develop a population objective for Bobolink, the habitat model for Bobolink developed and provided by HAPET was used. Refuge data was clipped out of the regional data layer of Bobolink pairs. The data indicates that approximately 3,000 pairs of Bobolink should occur on the Refuge. This model is a large landscape level model developed to assist managers with prioritizing land acquisition sites. However, it has not been used on a fine scale such as the Refuge. The density estimates in the model have not been verified on the ground which is why the BBS method was selected. There will be opportunities for the Refuge to conduct surveys to verify the validity of the model in the future.

In order to increase populations, two requirements must be met. First, adequate habitat must be provided to breeding individuals in the population base as well as the increasing number of individuals produced by population growth. Second, birds in those habitats must produce enough offspring to maintain the targeted growth rate. Providing adequate habitat requires meeting minimum area requirements as well as microhabitat needs. Minimum area requirements may vary among areas in any planning unit. Several habitat modifications via grassland restoration and enhancement efforts are described in this plan. By increasing species and structural diversity in the grasslands more habitat will be available for Bobolinks, other grassland nesting bird species and resident wildlife.

Habitat enhancements are planned on 1,100 acres (445 ha) of the Refuge grasslands. Using the BBS method calculations the Refuge could expect a 20 percent increase (48 pairs) in breeding Bobolink population. The enhanced habitat conditions could provide suitable habitat for an estimated 242 Bobolink pairs.

Potential Strategy

- Annually monitor Bobolink breeding pairs within Refuge grasslands.

People Goal

Big Stone NWR will provide a variety of wildlife-dependent recreational and educational opportunities for visitors to experience and treasure native tallgrass prairie heritage, ecological processes, and cultural resources.

Objective 3-1: Wildlife Observation and Photography

Within five years of plan approval, increase public understanding of currently available access for wildlife observation and photography.

Performance Measure

Number of contacts with visitors, media, or at events.

Rationale

Service policy supports providing opportunities for wildlife observation and photography when it is compatible with refuge purposes and the mission of the National Wildlife Refuge System (NWRS, Refuge System) (FWS, 2006d). Wildlife observation can promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Providing opportunities to observe wildlife fosters a sense of stewardship for the Refuge System, wildlife, and habitat resources through direct experience. Wildlife observation is a popular activity at the Refuge and increasing public understanding of existing access and opportunities for this activity accommodates this use while also minimizing disturbance to wildlife.

Potential Strategy

- Incorporate information on available opportunities in routine contacts with visitors, media, and at events.

Objective 3-2: Environmental Education and Interpretation

Within five years of plan approval, at least 70 percent of elementary and secondary educators within a 30-mile radius of the Refuge recognize the Refuge as a source for environmental education curriculum materials and as an outdoor destination to help reinforce environmental education concepts.

Performance Measure

Email inquiry to environmental educators.

Rationale

Providing and promoting environmental education helps 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. Environmental education is a priority for general public use of the Refuge, and Service policy directs refuges to provide environmental education programs when they are compatible with refuge purposes and the mission of the Refuge System. Well-designed interpretive programs can be effective resource management tools that provide us an opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service to influence visitor behavior when visiting units of the Refuge System. Interpretation is a priority for general public use of the

Refuge System, and Service policy directs that refuges provide interpretation when it is compatible with refuge purposes and the mission of the Refuge System (FWS, 2006g).

Potential Strategies

- Conduct teacher workshops.
- Distribute information to educators regarding availability of Refuge environmental education materials.

Objective 3-3 Hunting

Within five years of plan approval, review existing hunting opportunities and, where appropriate, increase and/or improve access and hunting opportunities with emphasis on youth and hunters with disabilities. Existing (baseline) levels include approximately 15 access points and opportunities to hunt turkey, Gray Partridge, Ring-necked Pheasant, rabbit, squirrel, white-tailed deer, raccoon, fox, and striped skunk.

Performance Measure

Visitor Services Program Evaluation (annual self-evaluation and periodic [at least every 10 years] formal evaluation).

Rationale

Hunting is an important wildlife management tool that the Service recognizes as a healthy, traditional outdoor pastime, deeply rooted in the American heritage. Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs. Hunting programs help promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Hunting is a priority general public use of the Refuge System, and Service policy directs us to provide hunting opportunities when compatible (FWS, 2006b).

Potential Strategy

- Complete a Visitor Services Step-down Management Plan including an evaluation of current hunting opportunities.

Objective 3-4 Fishing

Within five years of plan approval, where appropriate, increase and/or improve fishing access and opportunities above that available in the year the plan is approved. Existing (baseline) levels include: approximately six access points, three fishing platforms, boat fishing on the Minnesota River channel (non-motorized or electric motors only), seasonal bank and ice fishing on all Refuge waters with suitable access, and all fishing opportunities confined to daylight hours.

Performance Measure

Visitor Services Program Evaluation (annual self-evaluation and periodic [at least every 10 years] formal evaluation).

Rationale

Fishing programs help promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Fishing is a priority general public use of the Refuge System, and Service policy directs us to provide fishing opportunities when compatible (FWS, 2006c).

Potential Strategy

- Complete a Visitor Services Step-down Management Plan including an evaluation of current fishing opportunities.

Objective 3-5 Community Support and Outreach

Within five years of plan approval, develop a core group of volunteers that support the Refuge goals and management objectives through active participation and by serving as Refuge ambassadors within and beyond local communities.

Performance Measure

Amount of volunteer hours.

Rationale

The Service recognizes the value of time and expertise contributed by individuals, groups, and students. Volunteers help the Service achieve agency goals. Developing a volunteer program: 1) provides people with opportunities to assist in the accomplishment of the Refuge System mission, 2) enhances our performance through the creativity and innovations, labor, and expertise contributed by volunteers, 3) provides opportunities for students and others to gain experience in areas of interest for future careers, 4) completes work that we would not otherwise accomplish without the use of volunteers, and 5) encourages stewardship of wildlands, wildlife, and other natural and cultural resources through public participation in, and contribution to, Service programs and operations.

Potential Strategies

- Over the life of the plan, work with visitors and local communities to generate support for the Refuge that results in the donation of at least 200 volunteer hours annually.
- Work with citizens interested in forming a Friends group.
- Throughout the life of the plan, continue to provide appropriate and compatible public use opportunities.

Objective 3-6 Welcoming and Orienting Visitors

Annually, provide visitors with clear information so they can easily determine where they can go, what they can do, and how to safely and ethically engage in recreational and educational activities on the Refuge.

Performance Measure

Visitor Services Program Evaluation (annual self-evaluation and periodic [at least every 10 years] formal evaluation).

Rationale

Welcoming and orienting Refuge visitors contributes to several of the criteria defining a quality wildlife-dependent recreation program (FWS, 2006a). Providing clear information including signs and brochures is recognized as an important aspect in making visitors feel welcome and safe at national wildlife refuges (FWS, 2011).

Potential Strategy

- Maintain updated brochures, signage, and social media to provide current information to visitors.