

U.S. Fish & Wildlife Service

Big Stone

National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment



The mission of the U.S. Fish & Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Comprehensive Conservation Plans provide long-term guidance for management decisions; set forth goals, objectives and strategies needed to accomplish refuge purposes; and, identify the Fish and Wildlife Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.



United States Department of the Interior



FISH AND WILDLIFE SERVICE

5600 American Boulevard West, Suite 990
Bloomington, Minnesota 55437-1458

IN REPLY REFER TO:

FWS-NWRS/CP

May 9, 2012

Dear Reviewer:

We are pleased to provide you with this Draft Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) for Big Stone National Wildlife Refuge (NWR).

Big Stone NWR is located along the Minnesota River in west-central Minnesota near Odessa and Ortonville and encompasses more than 11,500 acres of grasslands, wetlands, and riparian woodlands.

The CCP will guide management of the Refuge for the next 15 years and will help the Refuge meet its purpose and contribute to the mission of the National Wildlife Refuge System. The CCP will provide both broad and specific guidance on various issues; describe a vision, goals, and measurable objectives; and list strategies for reaching the objectives.

We invite you to review and comment on the Draft CCP and EA. By sharing your thoughts, you can help ensure that the final CCP is both visionary and practical. We will host an open house where you will be able to ask questions, seek understanding, and voice concerns and suggestions. A meeting date and location will be announced through the media and other means.

Written comments are also welcome during the 30-day comment period and should be addressed to: U.S. Fish & Wildlife Service, Big Stone NWR, Attention: CCP Comment, 44843 County Road 19, Odessa, MN 56276. You may also send comments to us through the following web address: <http://www.fws.gov/midwest/planning/BigStoneNWR/>

To be considered in preparing the final CCP, comments must be received by June 8, 2012.

We look forward to continuing the dialogue on the future of the Refuge, and thank you for your continued interest in keeping this Refuge a special place for wildlife and people.

Sincerely,

Dean Granholm
Refuge Planner, Division of Conservation Planning

Big Stone

National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment

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Chapter 1: Purpose of and Need for Action

In this chapter

- 1.1 Introduction
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- 1.8 Refuge Vision and Goals
- 1.9 Planning Issues
- 1.10 Other Issues Considered

1.1 Introduction

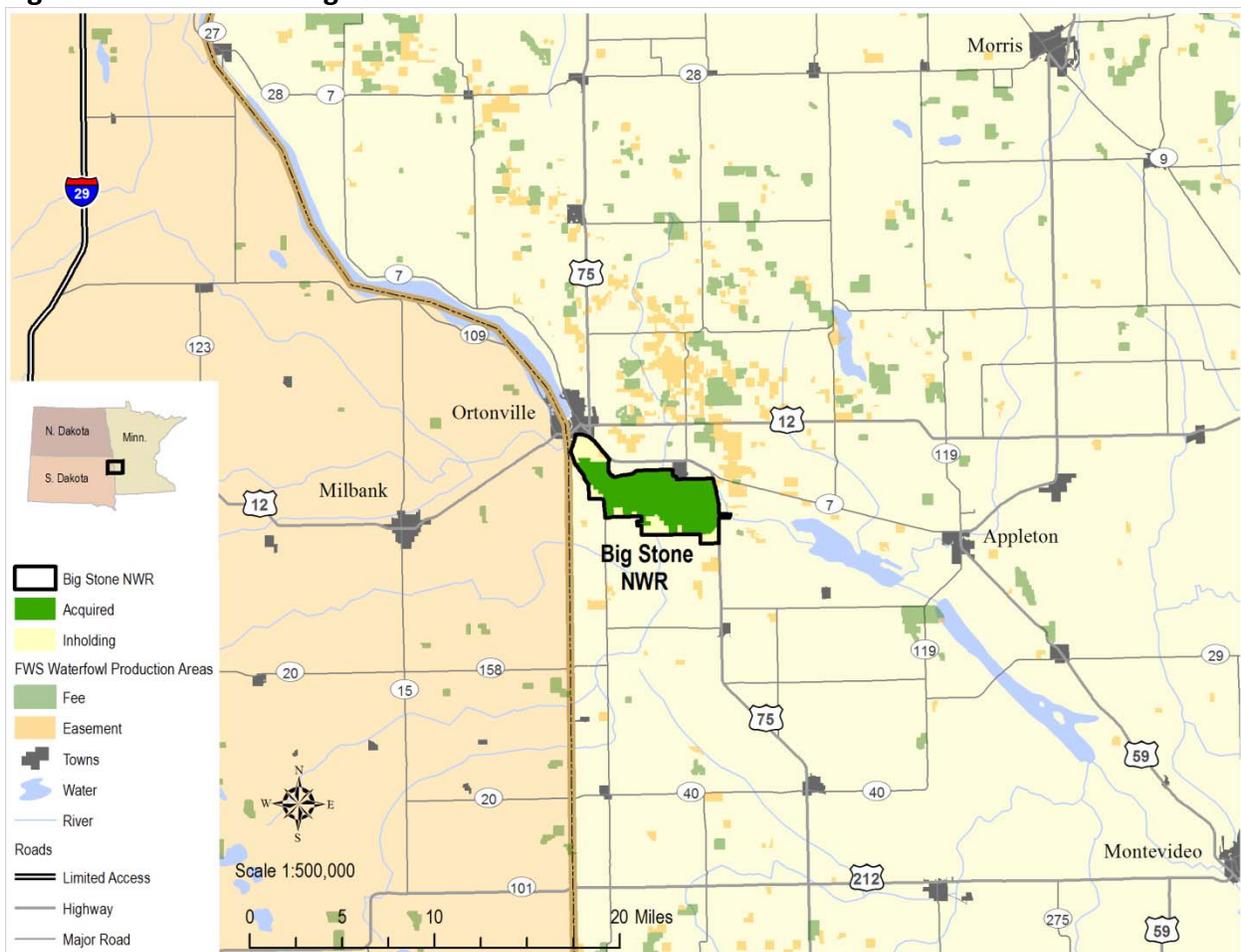
This document presents an Environmental Assessment (EA) that evaluates alternatives for, and expected consequences of, managing Big Stone National Wildlife Refuge (NWR, Refuge). Alternative 6 is the preferred action of the U.S. Fish and Wildlife Service (FWS, Service) and is presented in Appendix A: Implementation of the Preferred Alternative (Draft CCP) as the draft Comprehensive Conservation Plan (CCP) for the Refuge. This chapter provides an introduction to the CCP process including the purpose and need for the planning effort. It also describes: the history of the Refuge; existing laws and policies that guide management; involvement of the Service, the State of Minnesota, the public, and others; and conservation issues and plans that affect the Refuge. The remaining chapters provide more specific information on the alternatives (Chapter 2: Alternatives), Refuge resources (Chapter 3: Affected Environment and Current Management), and consequences associated with each alternative considered (Chapter 4: Environmental Consequences). Appendix A provides objectives and rationale for the preferred alternative, which is also considered the Draft CCP. When finalized, the CCP will serve as a working guide for management programs and actions over the next 15 years.

The Refuge is located along the Minnesota River in west-central Minnesota near Odessa and Ortonville and includes portions of the river and its floodplain (figure 1-1 Location of Big Stone NWR). Present Refuge management is focused on maintaining and restoring native



prairie, wetland management, and providing a variety of wildlife-dependent recreation. A unique visual and geological feature of the Refuge is the red, lichen covered granite outcrops for which the Refuge was named. Most of the granite outcrops are highly visible from the entrance to and along the Auto Tour Route near Ortonville, Minnesota. Another unique feature is the ball cactus. The only known population of this cactus in Minnesota is located in the Minnesota River Valley of Big Stone and Lac qui Parle Counties. Big Stone NWR is primarily a grassland system with an interesting prairie-floodplain woodland transition. Riparian woodlands dominate along the Minnesota River corridor within the northwest portion of the Refuge as well as along the Yellow Bank River corridor, with scattered trees found in prairie coulees and surrounding wetlands. Beyond the river corridor, upland prairie is the dominant habitat.

Figure 1-1 Location of Big Stone NWR



Refuge staff members also oversee land acquisition and management of the Big Stone Wetland Management District (WMD). WMDs are areas where the Service places increased attention on the conservation and restoration of small wetlands important to migratory birds. The Big Stone WMD encompasses Lyon and Lincoln counties. The Refuge works with landowners within the WMD boundary to conserve or restore small wetlands and their surrounding uplands. These

sites, widely distributed throughout the WMD, are called Waterfowl Production Areas (WPAs). The Service maintains WPAs in perpetuity through fee title acquisition or easements with landowners. Although managed by the same staff, Big Stone WMD and Big Stone NWR are distinct units of the National Wildlife Refuge System. The CCP for Big Stone WMD was completed in 2003 and is available online at <http://www.fws.gov/midwest/Planning/>.

The Big Stone NWR Project Leader is also responsible for the coordination of the Northern Tallgrass Prairie NWR, which was established in 2000 with the goal of one day preserving 77,000 acres of native prairie and buffer lands at widespread locations within the historic range of the northern tallgrass region of Minnesota and northwest Iowa.

1.2 Purpose of and Need for the Proposed Action

The Service proposes to prepare and implement a CCP for Big Stone NWR. The purpose of the proposed action is to describe the desired future conditions of the Refuge and to provide guidance and management direction for a 15-year period for the conservation of fish, wildlife, and plant resources and their related habitats, while providing opportunities for compatible wildlife-dependent recreational uses (FWS, 2000). The CCP should do the following:

- achieve Refuge purposes (section 1.5.1 Refuge Purposes);
- help fulfill the National Wildlife Refuge System (NWRS, Refuge System) mission (section 1.5.2 National Wildlife Refuge System Mission, and Goals);
- maintain and where appropriate, restore the ecological integrity of the Refuge (section 1.5.3 Ecological Integrity);
- help achieve the goals of the National Wilderness Preservation System (section 1.5.4 Wilderness Review),
- and meet other mandates including the U.S. Department of the Interior (DOI) Secretarial Orders 3289 and 3226 which direct all DOI agencies to consider and analyze potential climate change impacts as part of any long-range planning effort (section 1.5.5 Legal, Policy, and Administrative Guidelines).

The proposed action is needed because adequate, long-term management direction does not exist for the Refuge. A Master Plan completed in 1986 guided Refuge management for years, but it is now out of date and is superseded by more recent Service policies. The proposed action is also needed to address management issues and opportunities and to satisfy the legislative mandate of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for each national wildlife refuge.

The Draft CCP and EA were prepared by a planning team composed of representatives from various Service programs and incorporated input from the Minnesota Department of Natural Resources (MN DNR) and the public. Public involvement and the planning process are described in section 1.4 Overview of the Planning Process. Preparation of a CCP is guided by Service policy and includes compliance with the National Environmental Policy Act (NEPA). This EA describes, compares, and analyzes the No Action alternative (which continues current management) and five action alternatives developed in response to nine planning issues. Any of the alternatives

could be selected as the CCP guiding Refuge management over the succeeding 15 years. Alternative 6 is identified as the Preferred Alternative, because it best meets the *Purpose of and Need for the Proposed Action* as described above and addresses the significant issues.

1.3 Decisions Needed

The Regional Director for the Midwest Region (Region 3 of the Service) will make two decisions based on this EA: 1) select an alternative to serve as the CCP and provide long-term management direction for the Refuge, and 2) determine if the selected alternative is a major federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement. The planning team recommends Alternative 6, the preferred alternative, to the Regional Director.

1.4 Overview of the Planning Process

Our planning process follows eight basic steps described in the Service's planning policy. The steps are:

- Preplanning: Planning the Plan
- Initiate Public Involvement and Scoping
- Review Vision Statement and Goals, and Determine Significant Issues
- Develop and Analyze Alternatives, Including the Proposed Action
- Prepare Draft Plan and NEPA Document
- Prepare and Adopt Final Plan
- Implement Plan, Monitor, and Evaluate
- Review and Revise Plan

The Refuge began pre-planning for the CCP in 2008. At an October 2008 meeting Regional Office planners and Refuge staff met to discuss likely planning issues, data needs, and to develop a draft version of the Refuge vision and goals for public review. A planning team was formed that consisted of Refuge staff, Regional Office planning staff, representatives from other programs within the Service, and representatives from the MN DNR. Geographic Information System (GIS) data were assembled and organized. In late January 2009, the planning team met with invited representatives from the Service and MN DNR to discuss Refuge management concerns and opportunities. In February 2009, the Refuge held an open house meeting to collect public input. The comments received from the public as well as Service and MN DNR staff were grouped and summarized into nine planning issues that describe problems or opportunities associated with the Refuge (see 1.9 Planning Issues and the first two issues under 1.10 Other Issues Considered). The planning team met in early December 2009 to develop a range of alternatives (see Chapter 2: Alternatives), which address the planning issues and adhere to Refuge management direction (see section 1.5 Refuge Management Guidance).

In December 2008 scoping and public involvement officially began. Scoping is a term used in the NEPA to describe the process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action, in this case developing a CCP for the Refuge. The sequence of scoping events and other planning milestones are summarized in

table 1-1 Summary of Scoping and Planning Events; additional scoping information is included in the planning record.

Table 1-1 Summary of Scoping and Planning Events

October 7, 2008	The planning team held a meeting with Refuge staff to kick off the CCP process and collect comments on known issues and opportunities and develop a draft version of the Refuge vision and goals.
December 17, 2008	A Notice of Intent to prepare a CCP was published in the Federal Register marking the official start of the scoping process.
December 30, 2008	An invitation letter was sent to local elected officials inviting them to attend a January open house meeting.
December 31, 2008	A news release was sent to eight local media outlets announcing the date, time, and location of an open house to gather public comments.
January 8, 2009	The website for the Refuge CCP planning effort was made available and includes planning information such as the date and location of the scoping meeting and online comment submission.
January 13, 2009	An open house meeting scheduled for this date was postponed because of inclement weather.
January 27-29, 2009	The planning team met with invited representatives from the Service and MN DNR to discuss Refuge management concerns and opportunities.
February 24, 2009	An open house meeting was held at Odessa City Hall from 2:00 PM to 8:00PM attended by about 25 people who submitted 15 response sheets collectively containing dozens of comments.
March 19, 2009	The planning team held a meeting in the Midwest Regional Office at Fort Snelling, Minnesota to collect additional comments from regional staff on issues and opportunities associated with the Refuge.
December 1-3, 2009	The planning team met to develop alternatives.

The alternatives and a more fully developed section of planned programs for the proposed CCP are contained in this document.

1.5 Refuge Management Guidance

This section explains general guidance for managing the Refuge, referenced in section 1.2, which comes from several sources including refuge purposes, the Refuge System mission, Service policies, and other laws.

1.5.1 Refuge Purposes

Big Stone NWR is part of a national network of lands administered by the Service as the Refuge System. Each unit of the Refuge System has one or more purposes specified in or derived from the legal instrument that established, authorized, or expanded it. Our first obligation is to fulfill and carry out the purposes of each refuge (FWS, 2006). Big Stone NWR gets its 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. The specific purposes follow:

. . . shall be administered by him [Secretary of Interior] directly or in accordance with cooperative agreements . . . and in accordance with such rules and regulations for the

conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, . . . 6 16 U.S.C. I:l 664 (Fish and Wildlife Coordination Act)

. . . suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species . . . 6 16 U.S.C. I:l 460k-1 0 . . . the Secretary . . . may accept and use . . . real . . . property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors . . . 6 16 U.S.C. I:l 460k-2 (Refuge Recreation Act (16 U.S.C. I:l 460k-460k-4), as amended)

. . . the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions . . . 6 16 U.S.C. I:l 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986)

. . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . 6 16 U.S.C. I:l 742f(a)(4) 0 . . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . . 6 16 U.S.C. I:l 742f(b)(1) (Fish and Wildlife Act of 1956)

. . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds...6 16 U.S.C. I:l 715d (Migratory Bird Conservation Act)

1.5.2 National Wildlife Refuge System Mission, and Goals

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The goals of the Refuge System are:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

1.5.3 Ecological Integrity

The National Wildlife Refuge System Improvement Act of 1997 directs the Service to ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans. In response to this direction, the Service, through a public process, developed policy that provides more specific guidance on the maintenance of biological integrity, diversity, and environmental health—collectively referred to as ecological integrity. The policy contains a process to evaluate each refuge and identify the best management direction to prevent degradation of environmental conditions; and where appropriate and in concert with refuge purposes and the Refuge System mission, restore lost or severely degraded components of ecological integrity as compared to those found under historic conditions (see definitions below).

The complete policy is available at <http://www.fws.gov/policy/601fw3.html>.

Biological Integrity—Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.

Biological Diversity—The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur.

Environmental Health—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.

Historic Conditions—Composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape.

1.5.4 Wilderness Review

Refuge planning policy mandates that wilderness reviews be conducted through the comprehensive conservation planning process (FWS, 2000). The wilderness review process consists of three phases: inventory, study, and recommendation. In the inventory phase we look at Service-owned lands and waters within the Refuge that are not currently designated wilderness and identify those areas that meet the criteria for wilderness established by Congress. The criteria are size, naturalness, opportunities for solitude or primitive recreation, and supplemental values. Areas that meet the criteria are called Wilderness Study Areas (WSAs). In the study phase we develop and evaluate a range of management alternatives for the WSAs to determine if they are suitable for recommendation for inclusion in the National Wilderness Preservation System. In the recommendation phase we forward the suitable recommendations in a Wilderness Study Report that moves from the Director of the U.S. Fish and Wildlife Service through the Secretary of Interior and the President to Congress.

No lands within Big Stone NWR meet the criteria for wilderness established by Congress and described in Service policy (FWS, 2008). Big Stone NWR does not contain 5,000 contiguous acres of roadless, natural lands, nor does the Refuge possess any units of sufficient size to make their preservation practicable as wilderness. Refuge lands and waters have been substantially altered by humans, especially by agriculture, dam construction, river channel modifications, and road building.

1.5.5 Legal, Policy, and Administrative Guidelines

Laws, Executive Orders, and DOI and Service policies guide administration of refuges. A list of pertinent statutes and policy guidance can be found in Appendix G: Compliance Requirements.

1.6 Ecological Context and Landscape Goals

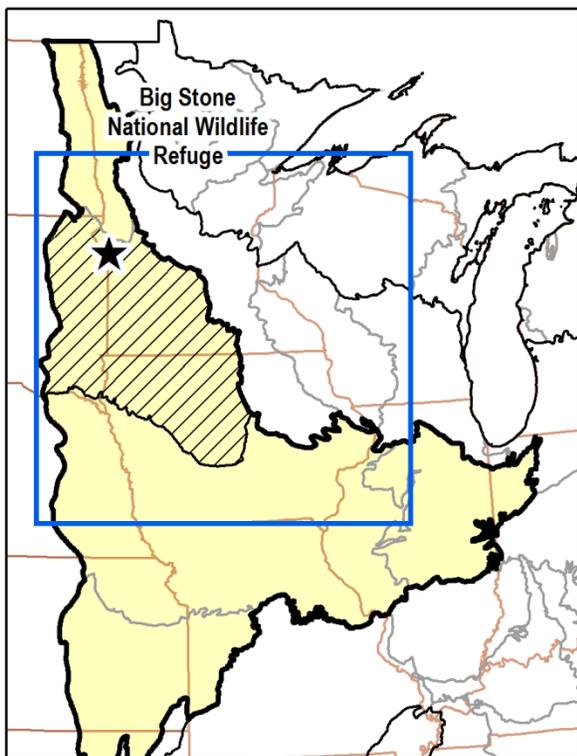
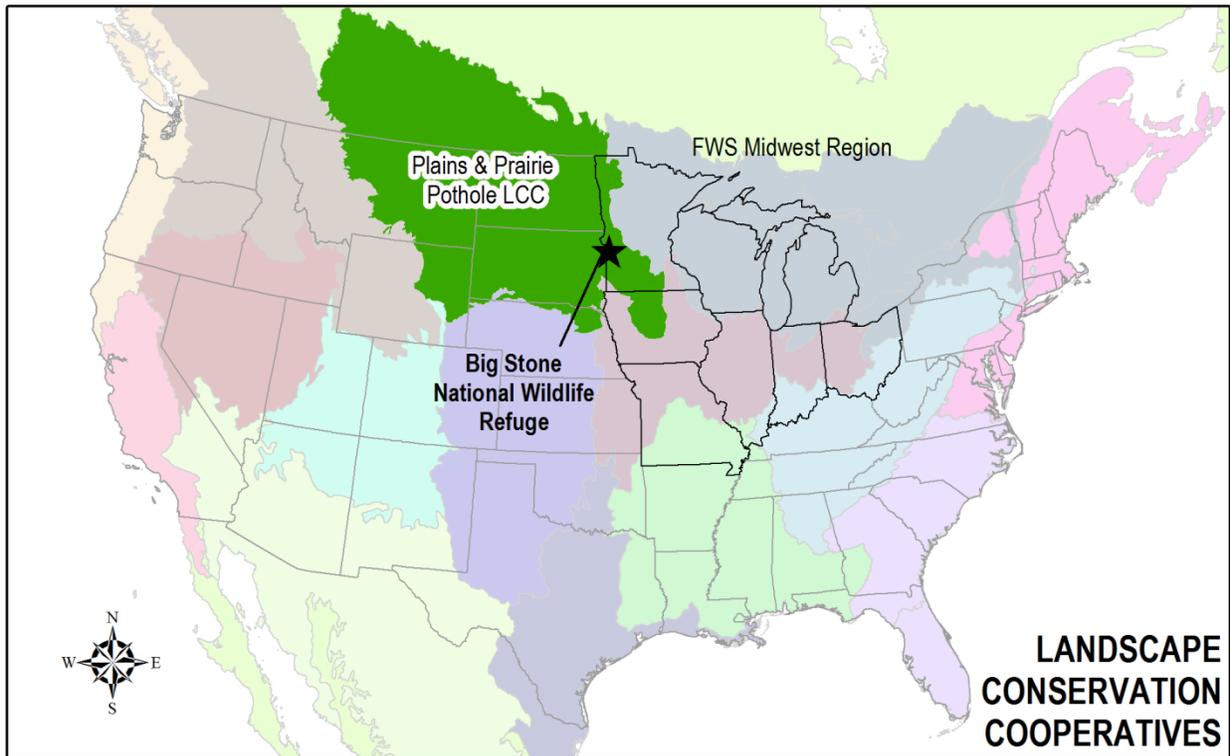
1.6.1 Plains and Prairie Pothole Landscape Conservation Cooperative

The Service, with support and cooperation from the U.S. Geological Survey, has developed a national geographic framework for “putting science in the right places” to conserve our nation’s fish and wildlife resources. Just as flyways provided an effective spatial frame of reference to build capacity and partnerships for international, national, state, and local waterfowl conservation; the national geographic framework provides a continental platform upon which the Service can work with state and other partners to connect project- and site-specific efforts to larger biological goals and outcomes. By providing visual context for conservation at “landscape” scales—the entire range of a priority species or suite of species—the framework helps ensure that resource managers have the information and decision making tools they need to conserve fish, wildlife, plants and their habitats in the most efficient and effective way possible.

The Service is using the framework as a basis for locating Landscape Conservation Cooperatives (LCCs). Facilitated by the DOI as part of its collaborative, science-based response to climate change, LCCs complement and build upon existing science and conservation efforts—such as fish habitat partnerships and migratory bird joint ventures—as well as water resources, land, and cultural partnerships. Big Stone NWR is within the boundary of the Plains and Prairie Pothole LCC, which is one of a network of partnerships working in unison to ensure the sustainability of America’s land, water, wildlife, and cultural resources.

The Plains and Prairie Potholes LCC is dedicated to the conservation of a landscape unparalleled in importance to a vast array of unique species whose populations are in steep decline. The LCC boundary transcends existing Service regional boundaries and the international border with Canada (figure 1-2 Plains and Prairie Pothole LCC and Ecoregions) Currently, the Service and our partners are working to develop and apply the scientific tools necessary to determine how climate change, coupled with existing stressors such as the conversion of native prairie for agricultural purposes may affect the health and productivity of shared natural resources in this landscape. The actions of the Plains and Prairie Pothole LCC will support and supplement state Wildlife Action Plans and enhance protection for fish and wildlife resources in the region.

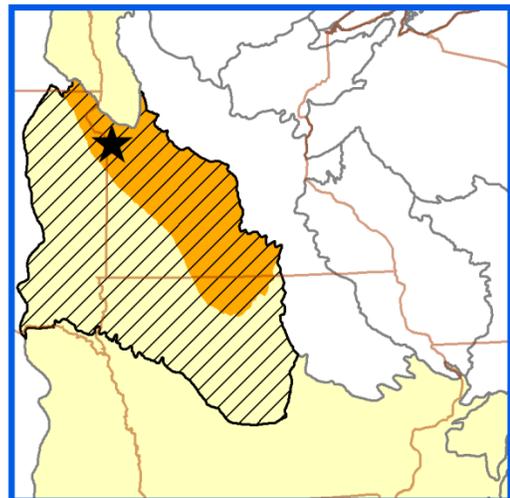
Figure 1-2 Plains and Prairie Pothole LCC and Ecoregions



BAILEY'S ECOREGIONS

Prairie Parkland (Temperate) to North Central Glaciated Plains

North Central Glaciated Plains to Upper Minnesota River - Des Moines Lobe



1.6.2 Ecoregion

An Ecological Classification System was developed by the MN DNR and the U.S. Forest Service for ecological landscape classification in Minnesota following the National Hierarchical Framework for Ecological Units. Four provinces (ecoregions) are identified for Minnesota. Provinces are units of land defined using major climate zones, native vegetation, and biomes. Big Stone NWR is within the Prairie Parkland Province (figure 1-2 Plains and Prairie Pothole LCC and Ecoregions). The province traverses western Minnesota, extending northwest into Manitoba, west into North Dakota and South Dakota; south into Iowa, Nebraska, Kansas, Oklahoma, and Missouri; and east into Illinois and Indiana. In Minnesota, the province covers just over 16 million acres (6.5 million hectares), coinciding with the part of the State historically dominated by tallgrass prairie. Low winter precipitation, short duration of snow cover, and desiccating westerly winds promote severe spring fire seasons that favor grassland over forest vegetation. The land surface of the province was heavily influenced by glaciation. Ice sheets crossed the province several times during the Wisconsin glaciation. The last lobe of ice, the Des Moines lobe, deposited calcareous drift in the southern part of the province.

The province is divided into two sections (Red River Valley and North Central Glaciated Plains). The Red River Valley lies in the north end of the province. The Refuge is in the North Central Glaciated Plains section (figure 1-2 Plains and Prairie Pothole LCC and Ecoregions). The largest portion of this section is a level-to-rolling region of calcareous till deposited by the Des Moines lobe. This region is bisected by the deeply incised Minnesota River Valley. The section also contains a highland region known as the Prairie Coteau, which flanks the southwestern edge of the Des Moines lobe in Minnesota, South Dakota, and Iowa. The Prairie Coteau is covered with glacial till and loess predating the Wisconsin glaciation. Level-to-rolling till plains, moraines, lake plains, and outwash plains cover much of the section and supports mainly treeless fire-dependent communities, with upland prairie communities by far the most common, covering 82 percent of the section. These landforms also support smaller amounts of marsh, wetland prairie, and wet meadow communities. Rugged terrain and lands deeply dissected by rivers support a mosaic of prairie and wooded communities.

The North Central Glaciated Plains section is further subdivided into three subsections (Coteau Moraines, Inner Coteau, and Minnesota River Prairie). The Refuge is located within the Minnesota River Prairie subsection, which consists of a gently rolling ground moraine about 60 miles wide. Most of this subsection is covered by 100 to 400 feet of glacial drift (Olsen and Mossler 1982). Cretaceous shales, sandstones, and clays are the most common kinds of bedrock. The Minnesota River Prairie is drained by the Minnesota River, which splits the subsection in half. Smaller rivers and streams eventually empty into the Minnesota River or the Upper Iowa River. The subsection drainage network is poorly developed due to thousands of wet depressions or potholes that dot the landscape. Wetlands were very common before settlement. Most have been drained for cropland.

1.6.3 Historic Vegetation and Processes

The presettlement vegetation was primarily tallgrass prairie, with many islands of wet prairie (Kratz and Jensen, 1983; Marschner, 1974). Portions of the Big Stone Moraine supported dry

and dry-mesic prairie (Wheeler et al., 1992). There were also dry gravel prairies. At the time of European settlement, the region was covered with dry mixed-grass and mesic tallgrass prairie. Trees were uncommon in the region, but there were narrow river-bottom forests and oak woods along the major river valleys and small patches of woodland in fire-protected areas (peninsulas, islands, isthmuses) at major lakes like Big Stone Lake and Lake Traverse. Only two wooded locations on the lands that now make up Big Stone NWR were identified and mapped during 1853-1874 (Marschner, 1974). These included a small wooded area near the Refuge headquarters and along the Yellow Bank River south of Lac qui Parle County Highway 40.

Grasslands were maintained by periodic drought, fires, and grazing by large herds of herbivores such as bison. Fires were ignited by both lightning and Native Americans. Lightning-set fires occurred primarily in July and August (Higgins, 1984), while Native American-set fires occurred both in the spring and the fall, with peaks in April and October (Higgins, 1986). Native Americans used fire for the purposes of hunting, signaling and communicating, threats, warnings, warfare, aiding theft, improving pasturage, attracting and herding wild animals, enhancing travel, masking and eliminating personal signs at camps and along trails, ceremonies, and pleasure (Higgins, 1986). The amount of vegetation available to burn was heavily influenced by bison (Higgins, 1986). Umbanhowar (1996) postulates how the elimination of bison prior to European settlement resulted in high fuel loadings, which is reflected in the peak of microscopic charcoal found in lake sediments dating to the period immediately preceding settlement. Regardless of the ignition source and the amount of fuel available, numerous personal accounts exist dating from the French exploration period of the late 1600s to the settlement era of the late 1800s/early 1900s telling of very frequent or even annual prairie fires (Higgins, 1986; Sparrow, 1981; Wulff, 1959; Dale, 1916). The same sources that described the frequency of the fires also told of the impact the fires had on vegetation composition, specifically how frequently occurring fires would prevent the growth of trees in the grassland. These forces created mosaics of habitat ranging from heavily disturbed to undisturbed (England and DeVos, 1969).

Innumerable depressions were left when the glaciers retreated. These wetland basins, called prairie potholes, contain water for various lengths of time in most years (Stewart and Kantrud, 1971). The most ephemeral wetlands hold spring runoff or summer rains for only a few days. At the other extreme are lakes, which almost never go dry. In between are seasonal wetlands, which in a typical year contain water from early spring until mid-to-late summer, and semi-permanent wetlands, which in most years are wet throughout the frost-free season. Less common are alkali wetlands—large, shallow basins with such high alkalinity that salts are blown out when the wetland is dry, and where no emergent plants grow when it is wet. Another unusual wetland type is the fen, characterized by floating or quaking mats of vegetation caused by groundwater seepage. Different wetland types support different kinds of vegetation and, in turn, different animal communities (Johnson, 1996).

Critical to understanding the prairie is recognizing its dynamic nature, particularly as driven by recurring droughts. Prairie occurs primarily under semi-arid conditions. Precipitation is generally inadequate for growth of most woody vegetation, and the herbaceous vegetation

avored fires and supported large herds of grazing herbivores, both features that further discouraged woody growth. Drought is essential to wetlands as well as uplands. The periodic drying of wetland basins facilitates nutrient cycling and results in high productivity when water returns (Murkin, 1989).

Since settlement much of the grassland habitats have been cultivated for crops. Less than one percent of the native tallgrass prairie remains in scattered fragments across the region (Samson and Knopf, 1994; Noss et al., 1995). Less mixed-grass prairie has been cultivated for crops. This is largely because the terrain is rougher and precipitation is lower and less predictable where mixed-grass prairie is found. However, irrigation has in many places rendered lands more suitable to cultivation. Corn, soybeans, sunflowers, and potatoes are the dominant crops.

European settlement brought major increases of woodlands. Tree claims were planted to protect farmsteads from the ever-present winds, and shelterbelts were established along field borders to reduce soil erosion, especially after the drought of the 1930's. Also, inadvertent increases of woody vegetation resulted from fire suppression by settlers (McNicholl, 1988).

Prairie wetlands, likewise, have been altered in a number of ways. Prairie wetlands may have fared better than uplands in the early stages of European settlement, but as population density increased and drainage techniques were improved and encouraged, many potholes were incorporated into the agricultural effort. In general, prairie wetlands were seen as undesirable, unproductive wastelands that needed to be reclaimed and improved. In the late 1800s it was still believed that wetlands released disease-causing gases, a belief that persisted into the twentieth century. Wet prairie regions were desirable for settlement, as they were flat, generally did not need to be cleared and, once drained, could be agriculturally valuable. Drainage of basins to facilitate cultivation was very common. Sometimes several small wetlands were drained into a larger one, which eliminated the smaller wetlands and altered the hydrology of the receiving wetland. The MN DNR estimates that over 90 percent of the wetlands in the prairie have been lost since settlement times. Smaller, more temporary wetlands were more susceptible to drainage than were the larger, more permanent basins. Since European settlement the landscape has become highly altered and fragmented to the detriment of prairie habitats and the wildlife populations that depend on them. The prairie wetlands that remain, like the remnant prairie grasslands, are tiny islands in a sea of agriculture and are invariably influenced by the surrounding land management practices.

1.6.4 Goals and Objectives for other Landscape Level Plans

1.6.4.1 Migratory Bird Conservation Initiatives

Several migratory bird conservation plans have been published over the last decade that can be used to help guide management decisions on refuges. Bird conservation planning efforts have evolved from a largely local, site-based orientation to a more regional, even inter-continental, landscape-oriented perspective. Several transnational migratory bird conservation initiatives have emerged to help guide the planning and implementation process. Each of the bird conservation initiatives has a process for designating priority species, modeled to a large extent

on the Partners in Flight method of computing scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance, and population trends. These scores are often used by agencies in developing lists of priority bird species. The Prairie Pothole Joint Venture implementation plan draws on the information from the larger conservation initiatives and contains direction relevant to Big Stone NWR.

1.6.4.2 Region 3 Fish and Wildlife Conservation Priorities

Every species is important; however, the number of species in need of attention exceeds the resources of the Service. To focus effort effectively, Region 3 of the Service compiled a list of Resource Conservation Priorities. The list includes:

- All federally listed threatened and endangered species and proposed and candidate species that occur in the Region.
- Migratory bird species derived from Service-wide and international conservation planning efforts.
- Rare and declining terrestrial and aquatic plants and animals that represent an abbreviation of the Endangered Species program's preliminary draft "Species of Concern" list for the Region.

1.6.4.3 Minnesota Comprehensive Wildlife Strategy

In 2005, Minnesota completed the Comprehensive Wildlife Conservation Strategy (CWCS), a strategic plan to better manage populations of "species in greatest conservation need" in Minnesota. The plan was developed with the support of funding from the State Wildlife Grant Program created by Congress in 2001. The heart of the strategic plan is for a partnership of conservation organizations across Minnesota to work together to sustain the populations of the identified species. Members of the partnership include the MN DNR, the Service, The Nature Conservancy, Audubon Minnesota, and the University of Minnesota, as well as many other agencies and conservation organizations. The plan outlines priority conservation actions that might be undertaken by partners.

1.6.5 Other Recreation and Conservation Lands in the Area

Fish and Wildlife Areas

Big Stone NWR serves essentially as a "hub" within a dynamic four-county area including Big Stone and Lac qui Parle Counties in Minnesota and Grant and Robert Counties in South Dakota (figure 1-3 Conservation Lands in the Area of Big Stone NWR). This four-county area has an abundance of state- and federal-owned and managed natural resource lands, most being opened to the public and provide hunting and other wildlife-oriented recreational opportunities. All areas combined complement each other in terms of waterfowl production and migration needs as well as providing a wide variety of recreational opportunities, within a variety of different habitats, and all within reasonable travel distances from each other.

Within the two Minnesota counties there are 84 state-owned Wildlife Management Areas containing 14,366 acres and 76 Federal Waterfowl Production Areas containing 15,811 acres.

Most notable is the Lac qui Parle Wildlife Management Area complex managed by the MN DNR, which contains 24,274 acres of additional fish and wildlife habitat most of which is open to the public. This WMA is directly downstream of the Refuge and includes Marsh Lake and Lac qui Parle Lake.

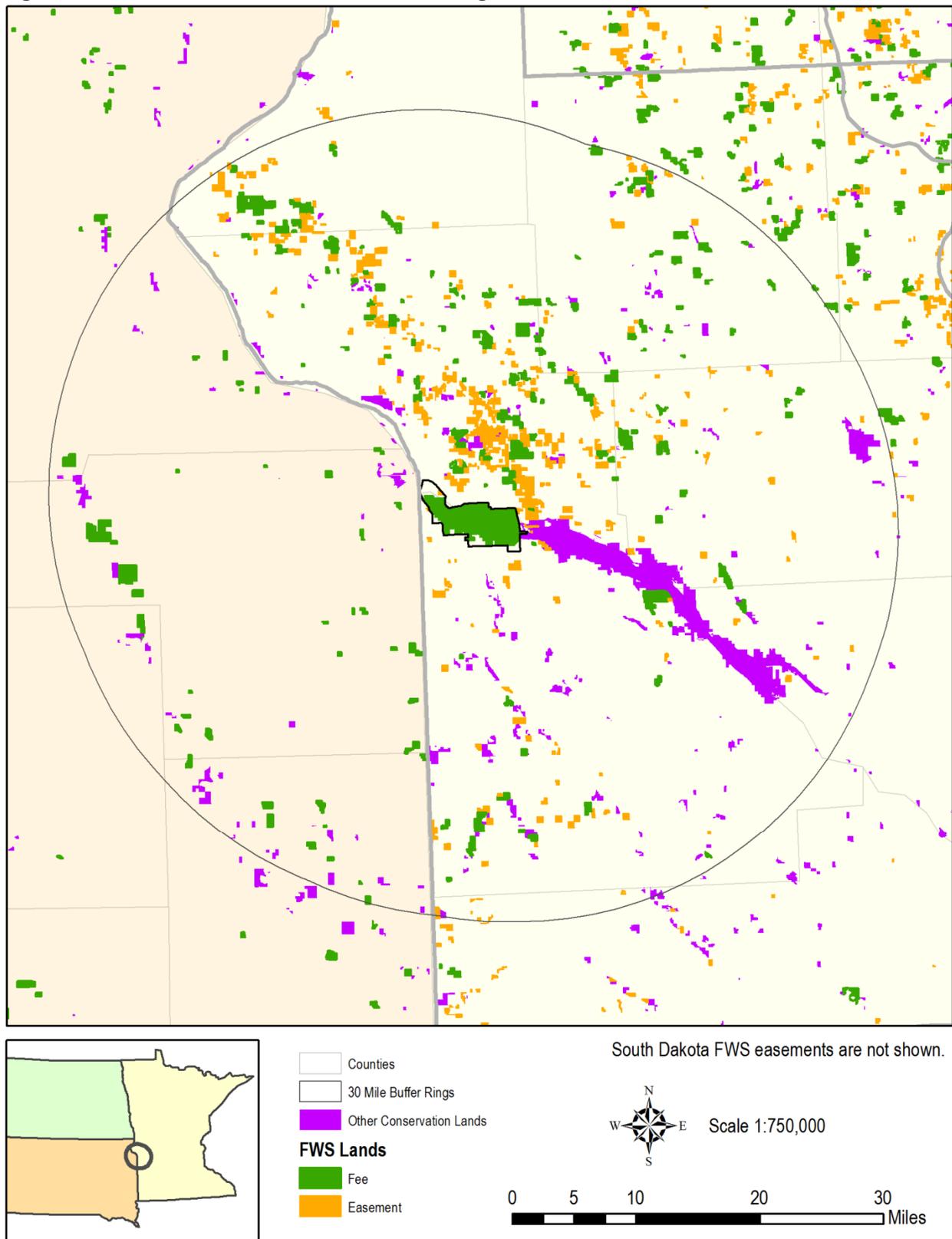
In the two adjoining South Dakota counties, there are 41 state-managed Game Production Areas containing 7675 acres and 52 Federal Waterfowl Production Areas containing 10,425 acres of wildlife habitat open to the public.

Other Recreation and Conservation Lands

In addition to wildlife-oriented recreational areas there are several state parks within this four-county area (figure 1-3 Conservation Lands in the Area of Big Stone NWR). They include: Lac qui Parle State Park and Big Stone State Park in Minnesota and Hartford Beach State Park in South Dakota. They all offer camping facilities, swimming, hiking trails, historic and prehistoric points of interest, and wildlife observation opportunities.

A fourth park known as Big Island is a 100 acre undeveloped island in Big Stone Lake within South Dakota. There are no facilities available there, and it is accessible only by boat. Hiking, fishing and wildlife observation opportunities exist there.

Figure 1-3 Conservation Lands in the Area of Big Stone NWR



1.7 Brief History of Refuge Establishment and Acquisition

Big Stone NWR was officially established May 21, 1975 when 10,540 acres of land purchased by the U.S. Army Corps of Engineers (USACE) were transferred to the Service. The USACE acquired the lands as part of the Big Stone Lake-Whetstone River Project authorized by the Flood Control Act of 1965. The purposes of the project were: to reduce sedimentation in Big Stone Lake by redirecting the Whetstone River into the Minnesota River, to provide flood control for lands downstream, and to provide habitat for migratory birds and other wildlife. The project included construction of the Highway 75 Dam, which the USACE completed in 1974. Originally, the intent was to have the Service manage the lands under a cooperative agreement, but the agreement was never finalized, and the lands were transferred to the Service except for lands that hold the dam and related water control structures. Today the Refuge includes 11,586 acres because of subsequent land acquisition from willing sellers.

The original Big Stone Lake-Whetstone River project was undertaken by the State of Minnesota in the mid-1930's primarily as a measure to restore Big Stone Lake levels, which had receded because of drought. A water control structure was constructed just downstream of the outlet of the lake. In addition, the Whetstone River was diverted into Big Stone Lake to assist in maintaining the lake level. The original Whetstone River channel joined the Minnesota River about two miles downstream of the lake. The project was also planned to serve as flood control by storing surplus floodwaters in the lake and discharging regulated flows from the lake after flood conditions had subsided. However the State of Minnesota was unable to acquire necessary flowage rights on Big Stone Lake and was required to pay claims for damages brought about by the storage of flood flows in the lake. In 1947 the State stopped any attempts to regulate levels on Big Stone Lake. Local interests then claimed that the Big Stone Lake-Whetstone project had resulted in acceleration of silt deposition in the lower end of Big Stone Lake and with no operation of the stop log control structure, still caused undesirably high lake levels without adequately providing for maintenance of lake levels during drought periods.

To alleviate this problem the USACE was asked to conduct an investigation that verified the existence of several flood and related problems on Big Stone Lake and in the immediate vicinity. These problems included unsatisfactory fluctuations of water levels and excessive silting in the Big Stone Lake, both attributable to the diversion of the Whetstone River in the lake; and they included flooding in the Minnesota River Valley in the reach immediately below the lake, which was aggravated by prolonged periods of high discharges from the lake.

Many plans were discussed to solve the problem. The plan selected included a new reservoir located immediately upstream of U.S. Highway 75 combined with modifying the Big Stone Lake outlet structure. Modifications included the replacement of the stop log structure with a gated spillway, raising the silt barrier by one foot, channel improvements on the Minnesota River below the outlet structure, and constructing erosion control works on the Whetstone River. The dam would create a water storage area capable of holding run-off from the Minnesota River and thus, provide flood protection to lands further downstream. It would also help alleviate the

silting and pollution problems in the lake by allowing some of the run-off to go directly into the storage area.

1.8 Refuge Vision and Goals

1.8.1 Vision

The Refuge is a rich mosaic of native grasses and wildflowers, prairie wetlands, granite outcrops, and wooded river bottoms where wildlife abounds and visitors experience and treasure native tallgrass prairie heritage.

1.8.2 Wildlife Goal

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

1.8.3 Habitat Goal

The Refuge 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.

1.8.4 People Goal

The Refuge 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.

1.9 Planning Issues

An issue is any unsettled matter that requires a management decision, such as an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition. Issues arise from both within and outside of the Service. Public scoping as well as scoping of Refuge and Region Service staff and other agencies produced nine issues, with seven detailed in this section (see also section 1.10 Other Issues Considered).

Minnesota River Channel Flow

The course of the Minnesota River within the Refuge changed in 1985. That year marked the completion of a diversion channel built to serve as an additional water pathway during high flows. The diversion channel never worked as intended. Instead of handling excess water during high flows, it shifted the course of the Minnesota River, displacing five miles of meandering river with less than a mile of straight channel. The redirected flow increased water supply and sediment deposition, and decreased the quality of waters in Refuge wetlands. Cattails flourished atop accumulated sediment. The expanding cattail mats further slowed water flow leading to yet more sedimentation. This ongoing process continues to cause water to spread out and move as sheet flow overland instead of within a defined channel. Combined with poor drainage, this hampers water level management of West Pool impoundment which in turn affects the amount and quality of habitat available to migratory birds.

Refuge Integrity

Some activities beyond the Refuge boundary affect the ecological integrity and aesthetic qualities within the Refuge boundary. Land use and activity on lands adjacent to the Refuge, within the Upper Minnesota River Watershed, and beyond affect the water, air, and solitude within the Refuge. The Service is also emphasizing the conservation challenge posed by global climate change. The local consequences of global climate change are uncertain but could profoundly impact Refuge resources.

Abandoned Quarries

Abandoned quarries on the Refuge offer potential recreation opportunities and hazards. There are three abandoned quarries, now filled with water, within the Refuge boundary. In the past, access was permitted at the three quarry sites. Access was discontinued and the sites fenced because of the hazards posed by cables, metal plates, and other remnants left behind from the quarry operation.

Invasive and/or Nuisance Species

Certain plants and animals increase in number or extent to the point that they diminish species diversity, often displacing other species of greater conservation concern. Whether native to the local area, such as cattails, or non-native, such as common carp or reed canarygrass, all are prone to dominate and alter habitats in a way that adversely affects the ability of the Refuge to meet its management objectives.

Maintenance

The amount of maintenance associated with Refuge habitats and facilities exceeds existing workforce capacity. Roads, dikes, water control structures, administrative buildings, and public access facilities on the Refuge and within the Big Stone WMD are maintained by Refuge staff. In the past, two workers, one full-time and one half-time, were devoted to these duties. Today the Refuge has only one full-time maintenance worker.

Law Enforcement

The Refuge System is guided by a policy of wildlife first, but it also encourages providing wildlife-dependent recreation at suitable levels. Refuge regulations set the boundaries for visitor activities, and enforcing those regulations plays an important role in helping the Refuge fulfill its purposes as well as the mission of the agency. Formerly, enforcement duties were carried out by Refuge staff with training and collateral responsibilities in law enforcement. The Service now relies on fewer full-time law enforcement officers that provide services to one or more Refuge System units. Currently, under this model, the Refuge has less on-site law enforcement presence than in the past.

Visitor Services

Demand for visitor services, facilities, and information exceeds existing supply and/or the capacity of existing staff and budgets. Annual visitation is estimated at 30,000, and the Refuge currently offers opportunities for wildlife observation, photography, hunting, fishing,

environmental education, and interpretation. There is interest in increasing or enhancing existing opportunities as well as for offering new opportunities. Most often this is expressed as requests for additional services or facilities. The cumulative effect of these actions must be balanced against the wildlife first policy of the Refuge System.

1.10 Other Issues Considered

The public identified some additional issues and concerns during scoping. The planning team considered these issues but did not address them in detail. The issues along with explanations of why they were not addressed in detail are described below.

Wildlife Abundance and Visibility

Some Refuge visitors who drive the Auto Tour Route report seeing less wildlife than in past years, especially deer, and attribute this to various causes including inadequate food resources or high coyote numbers. Some support planting more crops to provide food for wildlife while others believe coyote numbers should be reduced on the Refuge through hunting and trapping.

Explanation

The planning team considered this issue but chose not to include a specific response within the range of alternatives, because the abundance of white-tailed deer, coyotes, and other commonly viewed wildlife occur on the Refuge within expected levels. Wildlife abundance is closely correlated with habitat quality. The alternatives do address management of Refuge habitats.

Wildlife food sources vary seasonally and annually in response to a number of factors. Many who enjoy viewing white-tailed deer and other wildlife are alarmed when these animals are not concentrated and easily visible. Native habitats, like those on the Refuge, offer a variety of widely available food sources that both sustain wildlife and distribute it, making it less visible. Crops and food plots do attract deer and other wildlife making them more visible. But cropland is not native habitat, it requires intensive management, and it has less value to many wildlife species, including those in decline such as grassland birds. A greater number of wildlife species benefit from native habitat, especially habitats that are scarce such as prairie and wetlands. However, cropping is used on the Refuge as an initial stage in grassland restoration, and a portion of the Refuge is likely to be in cropland for years to come as part of such restoration.

Coyotes do occur on the Refuge but not in high numbers. Although coyotes may occasionally prey upon white-tailed deer, deer are not a primary food source. White-tailed deer numbers are at or above population goals set by the MN DNR for the management zone where the Refuge is located. Also, coyotes prey upon and displace smaller predators, such as red fox, which otherwise would occur in higher numbers. Red fox and other small predators commonly prey on waterfowl and other birds.

Tree Removal for Habitat Restoration

There is opposition to removing trees as part of habitat restoration. People object to removing trees for various reasons including that trees provide cover for hunters, nostalgia associated

with former homesteads, loss of trees as wildlife habitat, and concern about resource waste if the trees are not utilized for other purposes.

Explanation

The planning team considered this issue but did not include tree retention within the range of alternatives, because Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes. The Refuge is located in an area that was historically prairie with few trees. Through the years people increased the amount of trees through plantings and suppression of wildfire. Prairie restoration includes removing many of these trees. Leaving trees within prairies and other grasslands diminishes their value to grassland-associated wildlife, including some, such as grassland birds, that are declining in number.

Chapter 2: Alternatives

In this chapter

- 2.1 Introduction
- 2.2 Development of Alternatives
- 2.3 Focal Species
- 2.4 Selecting the Preferred Alternative
- 2.5 Alternatives Considered but not Analyzed in Detail
- 2.6 Summary of Alternatives

2.1 Introduction

This chapter describes and compares six management alternatives for Big Stone National Wildlife Refuge (NWR, Refuge): the No Action alternative, which means continuing under current management direction, and five action alternatives, including Alternative 6, the preferred alternative. The No Action alternative is the baseline for analysis. The descriptions of the action alternatives as well as their environmental consequences are relative to those of the



No Action alternative.

The preferred alternative is the one identified by the U.S. Fish and Wildlife Service (FWS, Service) as best meeting the purpose and need described in chapter 1.

This chapter also defines the differences between the alternatives including a summary of their environmental consequences (see table

2-1 Summary of Environmental Consequences), which are covered in greater detail in chapter 4. Alternatives are different approaches or combinations of management objectives that achieve the Refuge's purpose, fulfill the National Wildlife Refuge System (NWRS, Refuge System) mission, achieve the Refuge vision and goals, maintain and restore ecological integrity, and meet other legal mandates. In addition to these requirements, the treatment of issues by alternatives (see table 2-2 Summary of Issue Treatment by Alternative) are formulated to address the significant issues identified by the Service and the public during scoping (see chapter 1). Each alternative is a potential Comprehensive Conservation Plan (CCP) that could be implemented if selected.

2.2 Development of Alternatives

The planning team developed five alternatives in addition to the No Action alternative using the following process.

- The team considered the issues, current Refuge management, existing policies and guidance, and other information regarding biological resources and visitor services.
- Next, the team identified the aspects of Refuge management associated with each issue; that is, the elements of management likely to change in response to the issue.
- For each issue, the team identified a range of potential changes for the associated elements of Refuge management.
- The team broke into two groups, each drawing from the range of potential changes, to develop two alternatives.
- The two groups reconvened, deliberated, and ultimately developed an additional alternative that became the preferred alternative.

The six alternatives represent different approaches to the protection, restoration, and management of the Refuge's fish, wildlife, plants, habitats, and other resources as well as to compatible wildlife-dependent recreation. The alternatives are summarized in section 2.5 Alternatives Considered but not Analyzed in Detail and compared in table 2-3 Comparison of Alternatives.

2.3 Focal Species

The planning team identified 17 focal species (appendix D) from a larger set of conservation priorities, using the process detailed in *Identifying Refuge Resources and Management Priorities* (FWS, 2010). Focal species are highly associated with important habitat attributes or conditions that represent the needs of larger guilds of species and that use habitats and respond to management similarly. Requirements of the Refuge focal species helped guide development of the alternatives related to habitat. Additionally, population objectives are specified for Mallard and Bobolink for the Refuge. These two species are monitored annually and each has long-term population data. The status and trends of these populations over the course of the planning period are expected to help evaluate and inform habitat management actions. However, it is important to note that species populations and migration patterns also are influenced by conditions beyond the Refuge.

2.4 Selecting the Preferred Alternative

In selecting a preferred alternative, we considered environmental, economic, and social factors and our ability to implement the actions necessary to accomplish the alternatives. We based our decision on how well the goals of the Refuge were met by each alternative and the environmental consequences of each alternative (see Chapter 4: Environmental Consequences). We selected Alternative 6 as our preferred alternative. Alternative 6 will fulfill our statutory mission and responsibilities, and we have adequate authority to implement it.

2.5 Alternatives Considered but not Analyzed in Detail

The planning team considered working in conjunction with the U. S. Army Corps of Engineers (USACE) to explore ways to improve fish passage at the Highway 75 Dam as part of the

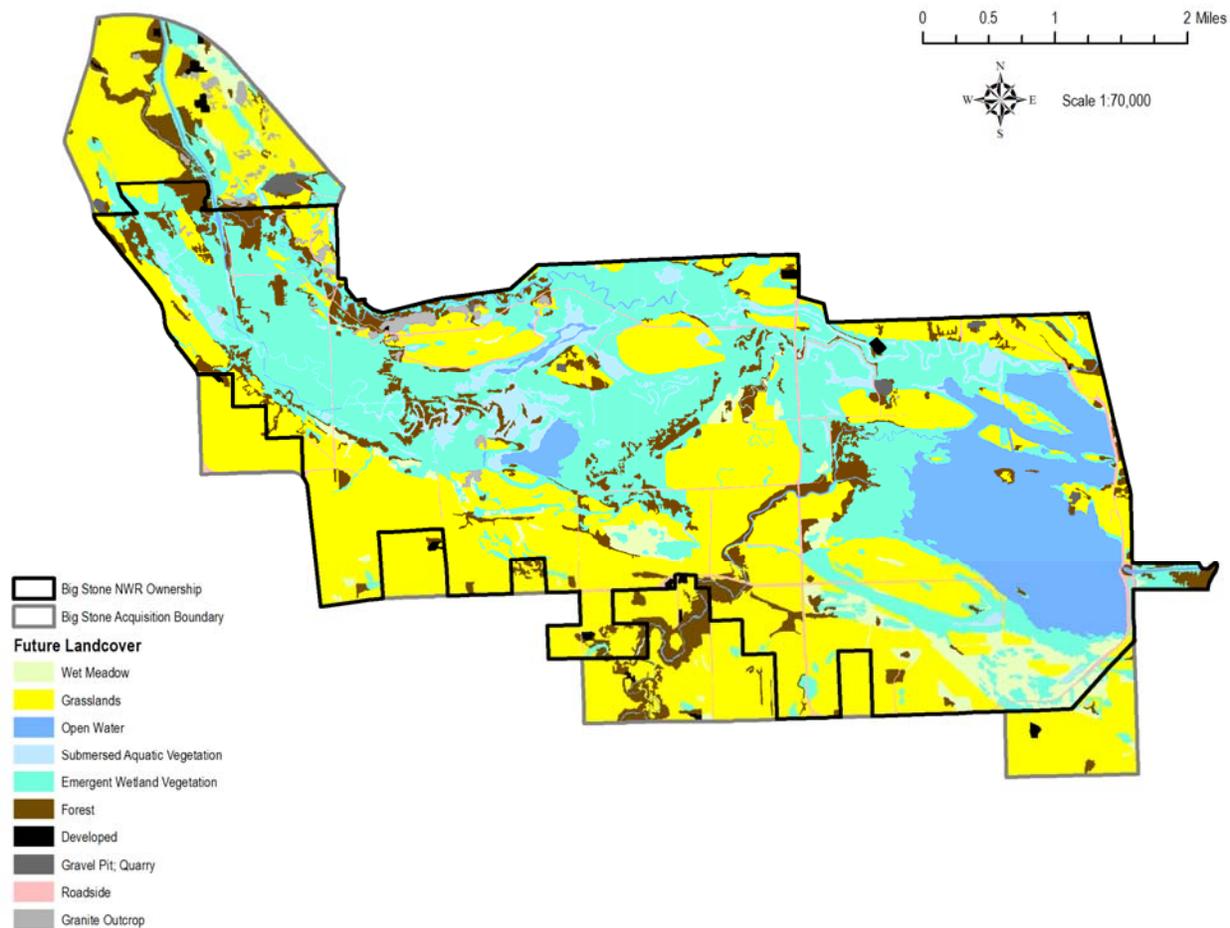
preferred alternative but decided not to further develop the proposal. Dams along the Minnesota River do obstruct movement of native fishes, but they likely also help slow the spread of some invasive fish species such as Asian carp. Improving fish passage would benefit native species, but would also aid movement and spread of invasive species. Because of this the proposal was not fully developed.

2.6 Summary of Alternatives

Figure 2-1 15-Year Future Land Cover, Big Stone NWR for all Alternatives displays the future land cover for all alternatives. The amount and distribution of the existing vegetation types is expected to be similar under all alternatives. The alternatives differ in the expected quality of Refuge habitats, especially grasslands and wetlands. Four categories of grasslands are recognized: remnant prairie (areas with native grasses and forbs on untilled soils), restored grasslands (areas planted to native grasses and forbs on previously tilled soils), partially restored grasslands (areas planted to native grasses but no forbs), and non-native grasslands (areas dominated by non-native grasses). See Chapter 3: Affected Environment and Current Management for additional descriptions of grasslands and below for additional details for each alternative.

Figure 2 1 15-Year Future Land Cover, Big Stone NWR for all Alternatives

(see text for qualitative habitat changes specific for each alternative)

**2.6.1 Alternative 1 (Current Management/No Action)**

Alternative 1 is the No Action alternative, which means there would be no change from current management practices. Active management of Refuge habitats and visitor services would continue at present levels. Water movement and associated sediment delivery would continue to follow its current route through the Refuge, and the quality of riverine habitat would remain within its present range of conditions. There would be no change to the management capabilities of West Pool. Remnant prairie (1,700 acres), restored grasslands (500 acres), and prairie associated with granite outcrops (100 acres) would continue to be managed at present levels. The amount of partially restored grasslands would increase from 1,300 acres to 1,800 acres by converting 500 acres of non-native grasslands. The total amount of non-native grassland would decrease to 300 acres (see table 2-4 Grassland Changes by Alternative). Wildlife observation and photography, environmental education and interpretation, hunting, fishing, trapping, and gathering shed antlers and wild edible plants are recreational opportunities that would occur under this alternative if they meet the Service definition of compatibility (see Appendix: I Draft Compatibility Determinations). Refuge staff would continue

to work with visitors and local communities and provide volunteer opportunities to build support for the Refuge.

2.6.2 Alternative 2

Under this alternative the natural alignment, channel capacity, and meander relationships would be restored to the upper five miles of the Minnesota River within the Refuge, and there would be an effort to improve water quality within the Minnesota River and its tributaries. Redistributing the timing and delivery of waters and sediment would improve the ability to increase, distribute, and diversify submerged vegetation within West Pool. Remnant prairie (1,700 acres) and prairie associated with granite outcrops (100 acres) would continue to be managed at present levels. The amount of restored grasslands (grasses and forbs) would increase from 500 acres to 1,100 acres by completing restoration on 600 acres of partially restored grasslands (grasses only). The amount of partially restored grasslands would drop to 1,200 acres while non-native grassland would drop to 300 acres (see table 2-4). Wildlife observation and photography, environmental education and interpretation, hunting, fishing, trapping, and gathering wild edible plants are recreational opportunities that would occur under this alternative if they meet the Service definition of compatibility (see Appendix: I Draft Compatibility Determinations). Gathering of shed antlers would be discontinued. There would be increased outreach efforts to inform the public of existing Refuge access and recreational opportunities. Existing hunting opportunities would continue, and there would be added opportunities for youth and for hunters with disabilities. Fishing access and/or opportunities would increase beyond present levels. Refuge staff would continue to work with visitors and local communities to provide increased volunteer opportunities to build support for the Refuge.

2.6.3 Alternative 3

Under this alternative the natural alignment, channel capacity, and meander relationships would be restored to the upper five miles of the Minnesota River within the Refuge, and there would be an effort to improve water quality within the Minnesota River and its tributaries. Redistributing the timing and delivery of waters and sediment would improve the ability to increase, distribute, and diversify submerged vegetation within West Pool. Remnant prairie (1,700 acres) and prairie associated with granite outcrops (100 acres) would continue to be managed at present levels. The amount of restored grasslands (grasses and forbs) would increase from 500 acres to 1,600 acres by completing restoration on 800 acres of partially restored grasslands (grasses only) and 300 acres of non-native grasslands. The amounts of partially restored grasslands and non-native grasslands would each drop to 500 acres (see table 2-4). Wildlife observation and photography, environmental education and interpretation, hunting, fishing, trapping, and gathering wild edible plants are recreational opportunities that would occur under this alternative if they meet the Service definition of compatibility (see Appendix: I Draft Compatibility Determinations). Gathering of shed antlers would be discontinued. The amount of visitor access for wildlife observation and photography would increase. Existing hunting opportunities would continue and be reviewed to determine the need for increases or improvements to access, facilities, or opportunities. There would be added hunting opportunities for youth and for hunters with disabilities. Fishing access and/or opportunities would increase beyond present levels. Refuge staff would continue to work with

visitors and local communities to provide increased volunteer opportunities to build support for the Refuge.

2.6.4 Alternative 4

Under this alternative the natural alignment, channel capacity, and meander relationships would be restored to the upper five miles of the Minnesota River within the Refuge, and there would be an effort to improve water quality within the Minnesota River and its tributaries. Redistributing the timing and delivery of waters and sediment would improve the ability to increase, distribute, and diversify submerged vegetation within West Pool. Remnant prairie (1,700 acres) and prairie associated with granite outcrops (100 acres) would continue to be managed at present levels. The amount of restored grasslands (grasses and forbs) would increase from 500 acres to 1,600 acres by completing restoration on 600 acres of partially restored grasslands (grasses only) and 500 acres of non-native grasslands. The amount of partially restored grasslands would drop to 700 acres while non-native grassland would drop to 300 acres (see table 2-4). Wildlife observation and photography, environmental education and interpretation, hunting, fishing, trapping, and gathering wild edible plants are recreational opportunities that would occur under this alternative if they meet the Service definition of compatibility (see Appendix: I Draft Compatibility Determinations). Gathering of shed antlers would be discontinued. There would be increased outreach efforts to inform the public of existing Refuge access and recreational opportunities. Existing hunting opportunities would continue and be reviewed to determine the need for increases or improvements to access, facilities, or opportunities. There would be added hunting opportunities for youth and for hunters with disabilities. Fishing access and/or opportunities would increase beyond present levels. Refuge staff would continue to work with visitors and local communities to provide increased volunteer opportunities to build support for the Refuge.

2.6.5 Alternative 5

Under this alternative the natural alignment, channel capacity, and meander relationships would be restored to the upper five miles of the Minnesota River within the Refuge, and there would be an effort to improve water quality within the Minnesota River and its tributaries. Redistributing the timing and delivery of waters and sediment would improve the ability to increase, distribute, and diversify submerged vegetation within West Pool. Remnant prairie (1,700 acres) and prairie associated with granite outcrops (100 acres) would continue to be managed at present levels. The amount of restored grasslands (grasses and forbs) would increase from 500 acres to 1,600 acres by completing restoration on 600 acres of partially restored grasslands (grasses only) and 500 acres of non-native grasslands. The amount of partially restored grasslands would drop to 700 acres, while non-native grassland would drop to 300 acres (see table 2-4). Wildlife observation and photography, environmental education and interpretation, hunting, fishing, trapping, and gathering wild edible plants are recreational opportunities that would occur under this alternative if they meet the Service definition of compatibility (see Appendix: I Draft Compatibility Determinations). Gathering of shed antlers would be discontinued. The amount of visitor access for wildlife observation and photography would increase. The amount or extent of hunting opportunities would increase. Fishing access and/or opportunities would increase beyond present levels. Refuge staff would continue to

work with visitors and local communities to provide increased volunteer opportunities to build support for the Refuge.

2.6.6 Alternative 6 (Preferred Alternative)

Alternative 6 is the preferred alternative, which means it is the one the Service identified as best meeting the purpose and need described in chapter 1. Under this alternative the natural alignment, channel capacity, and meander relationships would be restored to the upper five miles of the Minnesota River within the Refuge, and there would be an effort to improve water quality within the Minnesota River and its tributaries. Redistributing the timing and delivery of waters and sediment would improve the ability to increase, distribute, and diversify submerged vegetation within West Pool. Remnant prairie (1,700 acres) and prairie associated with granite outcrops (100 acres) would continue to be managed at present levels. The amount of restored grasslands (grasses and forbs) would increase from 500 acres to 1,600 acres by completing restoration on 600 acres of partially restored grasslands (grasses only) and 500 acres of non-native grasslands. The amount of partially restored grasslands would drop to 700 acres while non-native grassland would drop to 300 acres (see table 2-4). Wildlife observation and photography, environmental education and interpretation, hunting, fishing, trapping, and gathering wild edible plants are recreational opportunities that would occur under this alternative if they meet the Service definition of compatibility (see Appendix: I Draft Compatibility Determinations). Gathering of shed antlers would be discontinued. There would be increased outreach efforts to inform the public of existing Refuge access and recreational opportunities. Existing hunting opportunities would continue and be reviewed to determine the need for increases or improvements to access, facilities, or opportunities. There would be added hunting opportunities for youth and for hunters with disabilities. Fishing access and/or opportunities would increase beyond present levels. Refuge staff would continue to work with visitors and local communities to provide increased volunteer opportunities.

Table 2-1 Summary of Environmental Consequences

Resource Analyzed	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6 (Preferred)
Hydrology	No change	Flow and sediment delivery redirected	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Water Quality	Likely to decline	Likely to improve	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Wetlands	No change	Increased water management in West Pool	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Grasslands	Floristic and structural diversity increases on 500 acres	Floristic and structural diversity increases on 1,100 acres	Floristic and structural diversity increases on 1,400 acres	Floristic and structural diversity increases on 1,600 acres	Same as Alt. 4	Same as Alt. 4
Waterfowl, Waterbirds, Shorebirds	No change	Use would remain the same or increase	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Grassland Birds	Use would remain the same or increase	Use would increase above that expected under Alt. 1	Use would increase above that expected under Alt. 2	Use would increase above that expected under Alt. 3	Same as Alt. 4	Same as Alt. 4
Raptors	Use would remain the same or increase	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Fish and Mollusks	May decrease	Remain the same or increase	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Dakota Skipper and other prairie butterflies	Amount of habitat remains stable	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Beaver and Muskrat	No change	Increased access to habitat; numbers likely to increase	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Wildlife Disturbance	Same as present levels	Same as Alt. 1	Likely increase above present levels	Same as Alt. 1	Same as Alt. 3	Same as Alt. 1

Table 2-2 Summary of Issue Treatment by Alternative

Issue	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6 (Preferred)
Minnesota River Channel Flow	No change	Flow and sediment delivery redirected	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Refuge Integrity	No change	Work within watershed to improve water quality	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Abandoned Quarries	No change	Potential for future access pending outcome of safety review	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Invasive and/or Nuisance Species	Combat new infestations and convert 500 acres of non-native grasses	Same as Alt. 1	Combat new infestations and convert 300 acres of non-native grasses	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Maintenance	Increase maintenance workforce dependent on available funding	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Law Enforcement	No change in on-site law enforcement presence	Increase on-site law enforcement presence, dependent on available funding	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Visitor Services	No change	Increase public understanding of current access; add hunting opportunities for youth and hunters with disabilities; increase and/or improve fishing access and opportunities	Same as Alt. 2 but also: increase the amount of physical access to the Refuge; review existing hunting opportunities for potential changes	Same as Alt. 2 but also: review existing hunting opportunities for potential changes	Increase public understanding of current access and increase the amount of physical access to the Refuge; increase general hunting opportunities; increase and/or improve fishing access and opportunities	Same as Alt. 4

Table 2-3 Comparison of Alternatives

	Alternative 1 (Current Management)	Alternative 2	Alternative 3
Objective 1-1 Riverine Habitat	Over the next 15 years, retain existing water movement through the diversion channel with minimal flow through the Minnesota River channel.	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.	Same as Alt. 2
Objective 1-2 Water Quality	During the life of the plan, continue to maintain the Yellow Bank River and other streams in their current state.	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 and Minnesota Pollution Control Agency standards. The long-term goal is to have the streams removed from the list of impaired waters.	Same as Alt. 2
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.	Same as Alt. 1	Same as Alt. 1

Alternative 4	Alternative 5	Alternative 6 (Preferred Alternative)
Same at Alt. 2	Same at Alt. 2	Same at Alt. 2 (see appendix A for additional details on the preferred alternative)
Same at Alt. 2	Same at Alt. 2	Same at Alt. 2
Same as Alt. 1	Same as Alt. 1	Same as Alt. 1

	Alternative 1 (Current Management)	Alternative 2	Alternative 3
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. 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.	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.	Same as Alt. 2
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.	Same as Alt. 1	Same as Alt. 1

Alternative 4	Alternative 5	Alternative 6 (Preferred Alternative)
Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Same as Alt. 1	Same as Alt. 1	Same as Alt. 1

	Alternative 1 (Current Management)	Alternative 2	Alternative 3
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 cm to 1.5 m in height with litter depths from 5 to 7.5 cm.	Same as Alt. 1	Same as Alt. 1
Objective 1-7 Restored Grassland (native grasses and forbs of local ecotypes)	Over the life of the plan, maintain the existing amount (about 500 acres) of restored grassland.	Over the life of the plan, maintain the existing amount of restored grassland (about 500 acres), and increase it by 600 acres. Manage the total amount, about 1,100 acres, to have a minimum floristic quality that contains at least eight grass species and 25 forb species.	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.
Objective 1-8 Partially Restored Grassland (native grasses of local ecotypes)	Over the life of the plan, maintain the existing amount of partially restored grasslands (about 1,300 acres), and increase it by 500 acres to a total of approximately 1,800 acres.	Over the life of the plan, maintain approximately 700 acres of existing partially restored grasslands, and increase it by 500 acres to a total 1,200 acres.	Over the life of the plan, reduce the amount of partially restored grassland from 1,300 acres to approximately 500 acres.
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.	Same as Alt. 1	Over the life of the plan, reduce the amount of Non-native Grassland to approximately 500 acres (see Objective 1-3 Restored Grassland and Objective 1-4 Partially Restored Grassland).

Alternative 4	Alternative 5	Alternative 6 (Preferred Alternative)
Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Same as Alt. 3	Same as Alt. 3	Same as Alt. 3
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	Same as Alt. 4	Same as Alt. 4
Same as Alt. 1	Same as Alt. 1	Same as Alt. 1

	Alternative 1 (Current Management)	Alternative 2	Alternative 3
Objective 1-10 Rock Outcrop	Over the life of the plan, maintain approximately 100 acres of short grass 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.	Same as Alt. 1	Same as Alt. 1
Objective 2-1 Mallard Production	No population objective specified.	Over the life of the plan, annually provide waterfowl production habitat to support up to 120 mallard breeding pairs on Refuge wetlands.	Same as Alt. 2
Objective 2-2 Bobolink Production	No population objective specified.	Increase the Bobolink breeding population (currently estimated at 275 pairs) within Refuge grassland habitats by 10 percent throughout the life of the plan.	Same as Alt. 2
Objective 3-1 Wildlife Observation and Photography	Over the life of the plan, maintain existing wildlife observation and photography opportunities (estimated at approximately 25,000 visits annually).	Within five years of plan approval, increase public understanding of currently available access for wildlife observation and photography.	Within seven years of plan approval, enhance existing wildlife viewing opportunities by increasing the amount of physical access to the Refuge compared to that available in the year the plan is approved.
Objective 3-2 Environmental Education and Interpretation	Over the life of the plan, maintain existing environmental education, interpretation, outreach, and programming opportunities.	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.	Same as Alt. 2

Alternative 4	Alternative 5	Alternative 6 (Preferred Alternative)
Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Same as Alt. 2	Same as Alt. 3	Same as Alt. 2
Same as Alt. 2	Same as Alt. 2	Same as Alt. 2

	Alternative 1 (Current Management)	Alternative 2	Alternative 3
Objective 3-3 Hunting	Over the life of the plan, maintain existing hunting opportunities (estimated at approximately 5,000 hunting visits annually).	Within seven years of plan approval, continue to offer existing hunting opportunities and access, and add hunting opportunities that emphasize hunts for youth and hunters with disabilities.	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.
Objective 3-4 Fishing	Over the life of the plan, maintain the geographic extent, and/or duration of fishing opportunities available in the year the plan is approved.	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.	Same as Alt. 2
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.	Same as Alt. 1	Same as Alt. 1
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.	Same as Alt. 1	Same as Alt. 1

Alternative 4	Alternative 5	Alternative 6 (Preferred Alternative)
Same as Alt. 3	Within five years of plan approval, increase the number and/or geographic extent, of hunting opportunities above 2010 levels.	Same as Alt. 3
Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Same as Alt. 1	Same as Alt. 1	Same as Alt. 1

Table 2-4 Grassland Changes by Alternative

Alternative	Grassland	Existing Acres	Changes	Future Acres
Alternative 1	Restored Grasslands (Grasses and Forbs)	500	→	500
	Partially Restored Grasslands (Grasses Only)	1,300	→	1,800
	Non-native Grasses	800	→ 500	300
Alternative 2	Restored Grasslands (Grasses and Forbs)	500	→ 600	1,100
	Partially Restored Grasslands (Grasses Only)	1,300	→	1,200
	Non-native Grasses	800	→ 500	300
Alternative 3	Restored Grasslands (Grasses and Forbs)	500	→ 800	1,600
	Partially Restored Grasslands (Grasses Only)	1,300	→ 300	500
	Non-native Grasses	800	→	500
Alternative 4	Restored Grasslands (Grasses and Forbs)	500	→ 600	1,600
	Partially Restored Grasslands (Grasses Only)	1,300	→ 500	700
	Non-native Grasses	800	→	300
Alternative 5	Restored Grasslands (Grasses and Forbs)	500	→ 600	1,600
	Partially Restored Grasslands (Grasses Only)	1,300	→ 500	700
	Non-native Grasses	800	→	300
Alternative 6	Restored Grasslands (Grasses and Forbs)	500	→ 600	1,600
	Partially Restored Grasslands (Grasses Only)	1,300	→ 500	700
	Non-native Grasses	800	→	300

Chapter 3: Affected Environment and Current Management

In this chapter

- 3.1 Introduction
- 3.2 Physical Environment
- 3.3 Biological Environment
- 3.4 Socioeconomic Environment

3.1 Introduction

This chapter describes the environmental resources of the planning area that would be affected by the alternatives if they were implemented. Despite the word “affected” in the title, this chapter does not present effects. Instead, the environments described—physical, biological, and socioeconomic—are the baseline for the comparisons in Chapter 4: Environmental Consequences. Chapter 3: Affected Environment and Current Management also describes present Refuge management.

3.2 Physical Environment

3.2.1 Climate

The climate in Big Stone and Lac qui Parle Counties is temperate and is characterized by warm-to-hot summers and cold winters.

Average annual precipitation is 24.08 inches, with about 63 percent falling during the growing season.

The annual average snow fall is approximately 40 inches. Summer temperatures average



81.6 degrees Fahrenheit with occasional highs above 100 degrees Fahrenheit (maximum recorded temperature of 108 degrees Fahrenheit). Daylight winter temperatures average 20 degrees Fahrenheit with occasional lows below -30 degrees Fahrenheit (minimum recorded temperature of -36 degrees Fahrenheit). Winds average about 12 miles per hour but have been noted greater than 40 miles per hour in any month of the year. The growing season varies annually from 110 days to 140 days. The first killing frosts occur in late September to mid-October, and the soils usually freeze in late November.

3.2.2 Soils

The highly fertile soils in western Minnesota are a result of glacial till, glacial windblown sediment, and centuries of decomposed, deep rooted, tallgrass prairie plants. These soils were created over the past 10,000 years as the minerals in the glacial sediment were broken down. Ten thousand years' worth of root activity, frost, fire, burrowing, and acid leaching from leaf litter have all played a role in forming the soils in the Minnesota River watershed.

The various soil types have characteristic properties that determine their potential and limitations for specific land uses. Most of the Refuge soils are loams formed from calcareous glacial drift. Although some soils are clayey and sandy and gravelly, these are localized and account for only a small percentage of the Refuge soils.

Soils in the upland ridgelines range from loam to sandy and gravelly loam; these soils are well-to-excessively drained. Loam soil characteristics vary greatly in the upland plateaus ranging from well drained to poorly drained. This soil diversity exemplifies the "Prairie Pothole Region" with thousands of temporary and seasonal wetlands that are interspersed throughout the prairie.

Soil diversity is also prevalent in the river bottoms. The most prevalent features in the river bottoms are the granite outcroppings. Most of the floodplain soils are rich fertile loams and are moderate-to-well drained. The wetland soils are primarily silt and clay loams, which are poorly drained soils. However, there are gravel and sand lenses inter-laced throughout these soils. Thirty-seven soil series have been identified on the Refuge.

3.2.3 Geology

The upper reaches of the Minnesota River Valley have an interesting geological history. Glacial activity was the vector for landform creations in this geographic area.

The last ice age ended about 20,000 years ago, but during its peak, the massive Laurentide ice sheet covered over 5 million square miles of North America and stretched from the Arctic through eastern Canada to the northern half of the United States. One of the lobes of the ice sheet called the Des Moines Lobe blanketed portions of western Minnesota and extended down to Des Moines, Iowa. As temperatures warmed, the ice sheet began to melt and as it receded a huge lake was formed, called Lake Agassiz. During its existence, Lake Agassiz may have been the largest freshwater lake to ever have existed.

When the lake levels rose, Lake Agassiz would overtop the glacial moraine at its south boundary and flow southward. Approximately 9,000 years ago, these torrents of water called the glacial River Warren eroded down through the landscape and created the Minnesota River Valley. At maximum size and depth, the River Warren was 2 miles wide and 130 feet deep. As the river cut down through the landscape three terraces were created. These terraces are better developed on the north side of the river valley. As waters receded, sediment dropped out and large granite boulders were left behind. The lowest terrace has the most spectacular boulder

field. Over time water elevations in Lake Agassiz diminished, and the flows were cutoff near Browns Valley, Minnesota. Only a remnant of this great glacial river remains and is now called the Minnesota River. The river valley is 1.5 miles wide on the west end of the Refuge and 4 miles wide on the east end.

The extensive erosion also exposed the granite bedrock in several areas. The granite bedrock “granite outcrops” in this valley is of Precambrian origin and is estimated to be approximately 2.7 billion years old. These “crystalline” rocks first formed as igneous rocks from molten magma that cooled very slowly deep below the earth’s surface billions of years ago (Grant, 1972). Once formed, these early rocks underwent extreme heat and pressure over the next one to 1.5 billion years, which altered their crystalline structure and transformed them into metamorphic “gneiss and biotite” rock (Minnesota County Biological Survey, 2007).

Lichens quickly covered the exposed granite outcrops. Over time thin layers of soil formed on portions of the granite outcrops, which created conditions for the establishment of plants. However, because of the thin soils (0.5 to 3 inches), only certain types of plants can grow in this unique habitat. The vegetation on the outcrops consists of remnant native shortgrass prairie plant species.

On both sides of the river valley vast plateaus existed that were reshaped. Thousands of small wetlands (prairie potholes) were created as the glaciers receded. The small wetlands were highly productive and helped sustain the historic migratory bird populations.

3.2.4 Hydrology and Water Quality

The Refuge receives drainage from multiple river systems including: the Minnesota River, the Little Minnesota River (into Big Stone Lake), the Whetstone River and Yellow Bank River originating from South Dakota, and Stony Run Creek. The combined drainage area covers a total of 1,356 square miles. Most of these water bodies are listed as impaired by the Environmental Protection Agency (EPA) for water quality impairments, including bacteria, dissolved oxygen, turbidity, and mercury. Land use practices within the Refuge’s watershed, as well as stream alterations and dam construction both within and beyond the Refuge boundary strongly influence hydrology and water quality within the Refuge. The following description is focused on the drainage from Big Stone Lake and Whetstone River.

The origins of Refuge hydrology—like area’s geological formations—go back to the end of the last ice age, more than 9,000 years ago, when the River Warren began draining Lake Agassiz, an immense body of meltwater produced by the retreating ice sheet. The force and volume of the Glacial River Warren carved a wide, flat valley that today is known as the Minnesota River Valley. After the retreat of the glaciers, Glacial Lake Agassiz and Glacial River Warren ceased to exist and the Minnesota River watershed was formed. With less drainage area and a greatly reduced source of water, the Minnesota River has historically occupied a portion of the valley floor in the form of meandering braided channels. Hydrology and water distribution was dictated by run-off induced streamflow, which likely ranged from shallow flows across much of the valley during flood events to a single meandering channel during dry periods. This variation

in hydrology helped to drive morphological processes, such as scour and fill, which in turn resulted in channel formation and abandonment.

Areas just upstream and downstream of the Refuge were the sites of tributary confluences with the Minnesota River where sediment deposition and scour would have created alluvial fans and ever-dynamic channel morphology. Snowmelt-driven flood events in the spring months typically produced the highest flows, which pushed water levels over banks, filling abandoned channels and low lying areas of the valley. These riverine processes resulted in a wide riparian corridor comprised of a myriad of habitats, including bottomland woodlands, wetlands, and wet prairies. Vegetation within these habitats was dependent upon topography (depth of water) and frequency of inundation (duration). Flooding recharged wetlands and oxbow lakes providing important spring habitat for migrating waterbirds and spawning areas for fish species, while dry periods helped to sustain prairie habitats and species within the valley.

Today the river and many of its processes have been altered. Minnesota River streamflow entering what is now the Refuge has been regulated by the Big Stone Lake Dam since 1937, while all streamflow exiting the Refuge has been regulated by the U.S. Army Corp of Engineers (USACE) Highway 75 Dam at the downstream end of the Refuge since 1974. Refuge staff works with the USACE to meet Refuge management objectives, but flood control remains the purpose of the dam and the highest priority for the USACE. During high flows much of the Refuge is inundated for extended periods, often for weeks at a time. The purpose of the Big Stone Lake Dam is to regulate the level of Big Stone Lake within a relatively narrow range of water levels to meet the recreational, industrial, and residential water use needs of the local area. These strict requirements result in maximum discharge from the dam during wet periods to prevent flooding along the lake and a near shutdown of the dam during dry periods to ensure adequate water levels for the above uses. The Upper Minnesota River Watershed District, which operates the Big Stone Lake Dam is obligated to maintain a minimum flow rate of 5 cubic feet per second (cfs) if there is sufficient water within the lake. In combination the two dams strongly influence water delivery, storage, and movement within the Refuge, altering many of the river's natural cycles, processes, and historical interaction with valley habitats. Hydrographs of streamflow entering the Refuge display sharp fluctuations, as well as prolonged periods of low and high streamflow, which may negatively impact species dependent upon gradual variations and inconsistency in water levels.

Water impoundment on the Refuge reduces velocity, sediment transport and distribution, and dynamic channel morphology; and it increases the depth and duration of inundated areas under many streamflow scenarios. Additionally, land use changes within the watershed that converted forest and prairie to agriculture increased surface runoff, erosion, and contaminant concentrations in the Minnesota River and many of its tributaries. 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 Minnesota Pollution Control Agency (MPCA), South Dakota Department of Environment and Natural Resources, and the EPA because of high levels of mercury, turbidity, and bacteria.

Historically the Minnesota River occupied numerous channels within the river corridor. Since construction of the Big Stone Dam in 1937, streamflow immediately downstream has been confined to a single ditched channel under most flow conditions. Due to water shortages and a desire to regulate levels on Big Stone Lake more intensively, the Whetstone River was diverted into the outlet of the lake, just upstream of the dam. The sediment-laden waters of the Whetstone River accelerated silt deposition in the lower end of Big Stone Lake. To alleviate this problem the US ACE conducted an investigation that verified several flood-related problems on Big Stone Lake and in the immediate vicinity. The Big Stone Lake-Whetstone River Project of Minnesota and South Dakota was authorized under the Flood Control Act of 1965 (Public Law 89-298). The project was designed to improve conditions on Big Stone Lake by severing inflows from the Whetstone River and redirecting those flows into the Minnesota River; provide flood control benefits to lands downstream on the Minnesota River; create a siltation barrier downstream; and provide a major national wildlife refuge for migratory birds and other wildlife. The Highway 75 Dam was completed in 1974, and the USACE transferred the project lands to the Service in 1975 creating Big Stone National Wildlife Refuge. Refuge lands serve as the siltation barrier for downstream flows.

The Minnesota River was straightened and widened (ditched) from Big Stone Lake to the Refuge to facilitate downstream flows. As part of these efforts, a series of structures were installed at the present day Refuge boundary and approximately 1.2 miles upstream with the intended purpose of deflecting low flows up to 400 cubic feet per second into the historic channel of the Minnesota River. During highwater events the excess flows would overtop the weir and flow through Pool 10 into West Pool on the Refuge via a diversion channel that extends the ditch system onto the Refuge. Due to sedimentation and design limitations these structures have failed to operate as intended, and all but the highest of flows are confined to the ditch.

These hydrologic alterations resulted in the segregation of over 6 miles of the historic Minnesota River channel, 4.5 miles of which is now part of the Refuge, due to a lack of streamflow and a degradation of riverine habitats. Dynamic riverine processes that once balanced streamflow, sediment transport, and erosion were replaced with the linear and static conditions typical of a ditch system. The loss of these processes likely impacted downstream habitats dependent upon the variability of the Minnesota River. However the most significant impact to the hydrology and habitats to this portion of the Minnesota River occurred with the construction of the Highway 75 Dam in 1974. The large flood retention dam, along with smaller scale impediments to flow such as levees, roads, and water control structures impounded large portions of the Minnesota River reducing flow velocity, while increasing water depth, duration, and extent under most conditions.

The ditch system intended to expedite flows downstream of Big Stone Dam now empties into the impounded waters resulting from Refuge water control and the Highway 75 Dam. These areas are depositional zones that are prone to sediment and contaminant accumulation. Other impacts associated with the failure of these structures are the continuous delivery of flow into

West Pool and the direct transport pathway for water quality contaminants to enter the wetland, most noticeable of which is an apparent high concentration of sediments. Sedimentation within wetlands increases turbidity, decreases native plant and invertebrate growth, increases the production of undesirable or invasive plant species (such as hybrid cattail), and decreases wetland volume. In addition to sedimentation, other water quality contaminants, such as high concentrations of nutrients and heavy metals, are suspected to be impacting one or more wetlands on the Refuge. The Minnesota River, upstream of the Refuge, was listed by the MPCA in 2010 as impaired due to mercury contamination.

Within this framework, the Refuge manages several smaller impoundments that are strongly influenced by streamflow into the Refuge and the path water takes through the Refuge. Numerous dikes, levees, and roads exist on the Refuge, many of which that have been constructed perpendicular to the river corridor with the purpose of water impoundment.

3.2.5 Administrative Facilities

The administrative facilities are located approximately one-half mile west of Odessa, Minnesota on Big Stone County Highway 19. The compound consists of the Refuge office and attached shop; two large pole shed buildings used for equipment storage; and a pole shed used for seed cleaning purposes. Several smaller storage buildings are also on the compound grounds. The office portion of the building was added on to the existing shop building in 1997. The office/maintenance shop building is currently going through an energy retrofit to install a geothermal heating/cooling system. Other renovations planned as part of this project include a new roof, new windows, an enlarged visitor contact area and multipurpose room, the redesign/realignment of current office space, and the redesign of the visitor and staff parking areas. The existing shop area will be incorporated into the design and become part of the staff office space. A new shop building will be constructed as part of this energy retrofit project.

3.3 Biological Environment

3.3.1 Wetlands

There are about 4,500 acres of wetlands within the Refuge, mostly within the floodplain of the Minnesota River (figure 3-1 Current Land Cover, Big Stone NWR). Typically, floodplain wetlands are strongly influenced by both seasonal and annual wet and dry cycles coupled to streamflow, in this case the Minnesota River and its tributaries. In natural systems the interplay of these long- and short-term wet/dry cycles in turn affects the amount and types of vegetation within the wetlands. The construction of dams along the Minnesota River as well as land use changes within the watershed altered numerous factors including: water delivery and storage within the floodplain; frequency, duration and extent of inundation; water chemistry; and composition of wetland vegetation.

Within the Refuge, several dikes with water control structures allow water level manipulations on about 3,500 acres of wetlands. Varying water levels helps produce optimum conditions for the growth of aquatic invertebrates and vegetation used as food and cover by migrating birds in the spring and fall. Throughout the rest of the year, wetlands serve as production and

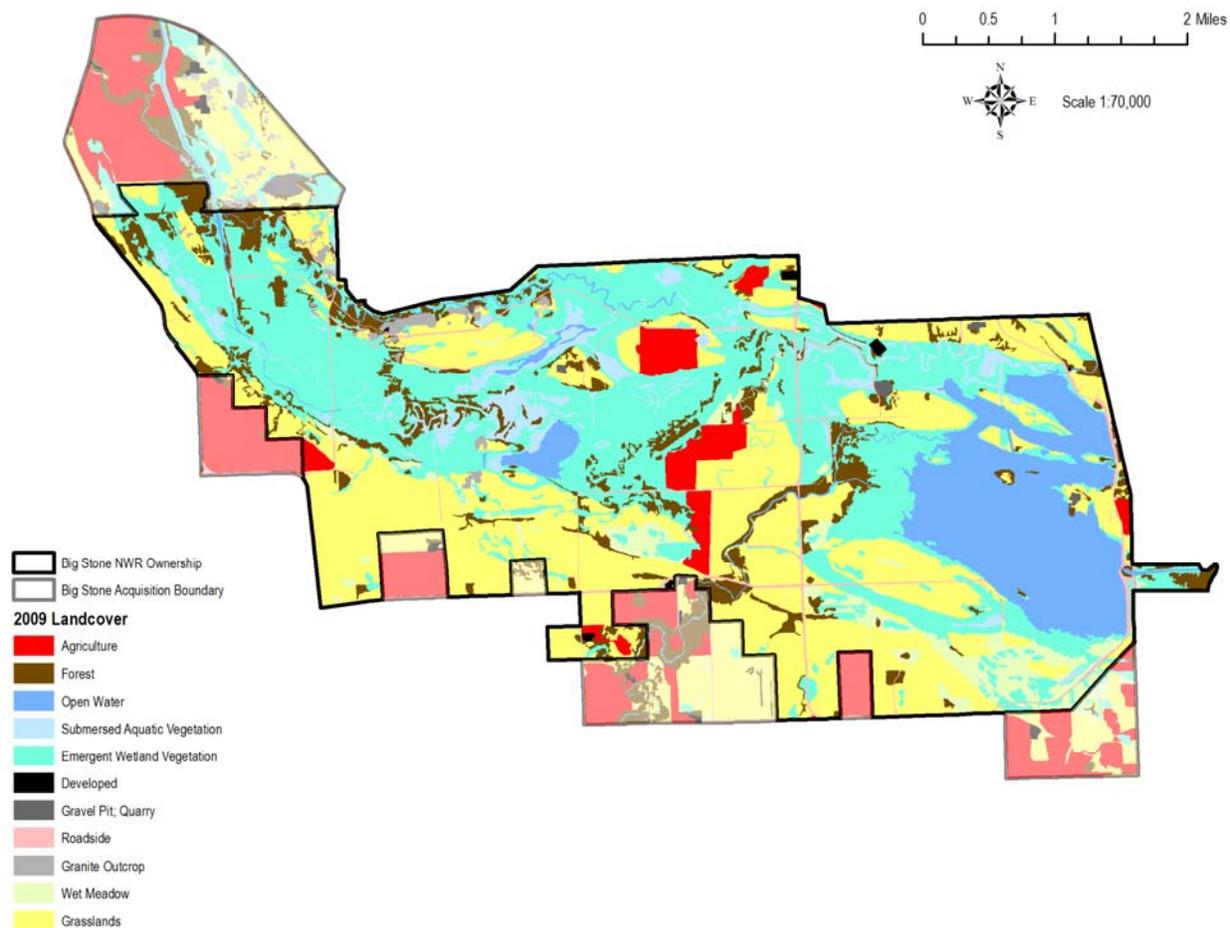
maintenance habitat for waterfowl, other migratory birds, and resident wildlife. In addition to water level management, prescribed fire is used as a disturbance agent within a number of Refuge wetlands to set back vegetative succession. The ability to meet Refuge objectives related to wetlands is strongly influenced by water management of Big Stone Lake dam and the Highway 75 dam as well as water movement patterns across the Refuge. The impoundments (managed wetlands) average two to five feet in depth and are identified as West Pool, East Pool, and Pools 3, 4, 4a, 5, and 6.

The two main impoundments, West Pool and East Pool, total 3,200 acres. The two pools, once interconnected, are now separated by a dike and water control structure built in 2007 to allow water management of each pool independently. West Pool is about 1,400 acres; much of it covered by a dense stand of cattail and willow with some moist soil plants along the backwater edges. East Pool contains 1,800 acres of open water and emergent marsh over a gravel and boulder substrate that, when exposed, provides high quality feeding habitat for shorebirds. Available open water within each pool is used as roosting habitat by migrating waterfowl and waterbirds.

The other five impoundments are much smaller in size and collectively encompass approximately 285 acres of primarily emergent marsh habitats. They were constructed in 1988–89 with funding provided by Ducks Unlimited for the purpose of increasing the amount of available nesting, brood-rearing, and foraging habitat for waterfowl. Pools 3, 4, 4a, 5, and 6 are located within the Minnesota River floodplain and are greatly influenced by the water levels and conditions of the river. Most of the water that fills these impoundments occurs from rainfall. All of these impoundments have stoplog water control structures located within their dikes that have been strategically located in a manner that connects them to the Minnesota River, Yellow Bank River, or East Pool. Water levels are increased within these impoundments primarily by backflow through these structures during highwater events. The impoundments are drained by releasing water into the rivers or West and East Pools. This system does not provide consistency or precision in managing the water levels within these pools. Supplemental water can be added to Pools 3 and 4 by pumping water out of the Yellow Bank and Minnesota Rivers.

There are also approximately 270 temporary and/or seasonally flooded depressions totaling approximately 260 acres. Most of these are shallow sedge meadow basins or depressions ranging from 0.1 to 1.5 acres in size. Some depressions stay wet into the growing season while others are only temporarily wet. The presence of these temporary wetlands promotes waterfowl production by providing greater area for the establishment of territories by breeding pairs. Substantial emergent and submergent vegetation occur in wetlands on the Refuge. Other water features on the Refuge include three abandoned quarry ponds. No active management occurs with them.

Figure 3 1 C urrent Land Cover, Big Stone NWR



3.3.2 Grasslands

Based on soil conditions and floristic composition, the 5,500 acres of Refuge grasslands are categorized as wet meadow, remnant prairie, restored and partially restored grasslands, and areas dominated by non-native grasses (figure 3-1 Current Land Cover, Big Stone NWR). Historically, fire and grazing influenced the structure, function, and composition of prairie. Currently, the Refuge relies on prescribed burning, haying, chemicals, and more recently grazing to manage Refuge grasslands. Many unwanted species are encroaching on Refuge grasslands, notably: Kentucky bluegrass, smooth brome, Canada thistle, leafy spurge, sweet clover, and reed canarygrass.

3.3.2.1 Wet Meadow

Wet meadows occur on poorly drained soils and are treeless areas dominated by broadleaved herbaceous plants including sedges and grasses. There are about 1,000 acres of wet meadow habitat across the Refuge that serves as a transition from wetlands to grass-dominated upland habitats (figure 3-1 Current Land cover, Big Stone NWR). Areas dominated by sedges and prairie cordgrass are still intact in some areas of the Refuge, but most of the wet meadows have been invaded by reed canarygrass.

3.3.2.2 Remnant Prairie

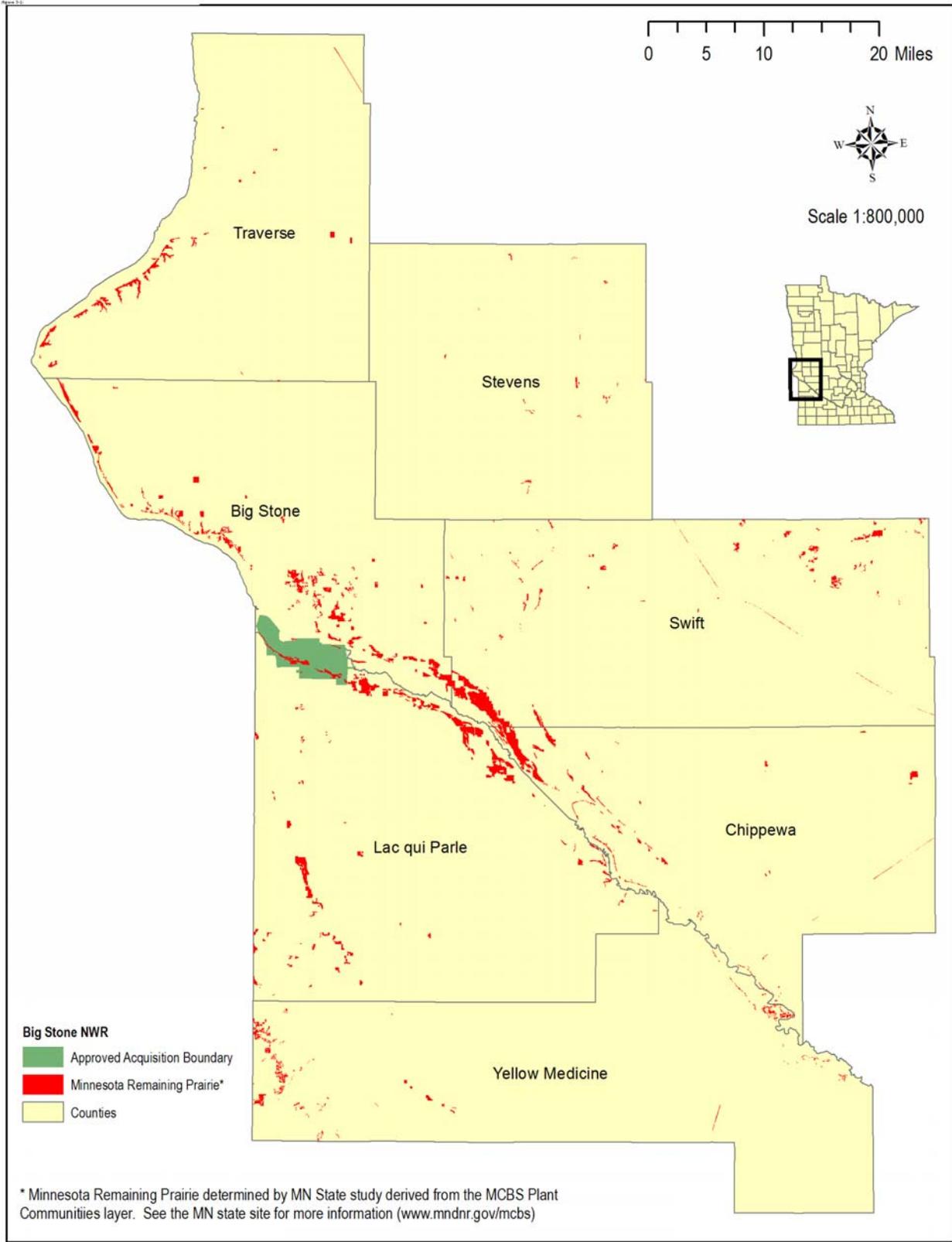
Sites dominated by native grasses and with untilled intact soils are considered remnants of the once expansive tallgrass prairie. About 1,700 acres of these remnants are within the Refuge (figure 3-2 Remnant Prairie in Big Stone NWR and Surrounding Minnesota Counties). Remnant prairie sites were intact prior to establishing the Refuge and were primarily used as pastureland. Remnant prairie is dominated by short- to mid-height, native prairie grasses with scattered clumps and pockets of tallgrass species and a suite of forbs. The wide range of species found with remnant prairie makes it the most floristically and structurally diverse Refuge grasslands.

Remnant prairie is dominated by short- to mid-height, native prairie grasses with scattered clumps and pockets of tallgrass species and a suite of forbs such as yellow coneflower (*Ratibida columnifera*), purple coneflower (*Echinacea angustifolia*), beardtongues (*Penstemon spp.*), false gromwell (*Onosmodium molle*), purple prairie clover (*Dalea purpureum*), wild bergamot (*Monarda fistulosa*, blazingstars *Liatris spp.*), and leadplant (*Amorpha canescens*). The native cool-season grasses include Junegrass (*Koeleria pyramidata*), needle and thread (*Stipa comata*, porcupine grass (*Stipa spartea*), and western wheatgrass (*Elytrigia smithii*). The warm season grass component consists of side oats grama (*Bouteloua curtipendula*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), indiagrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), prairie sandreed (*Calamovilfa longifolia*), prairie and tall dropseed (*Sporobolus heterolepis*, *Sporobolus asper*, respectively), plains muhly grass (*Muhlenbergia cuspidata*), and blue grama (*Bouteloua gracilis*). Many unwanted species are encroaching on Refuge grasslands. Kentucky bluegrass, smooth brome, Canada thistle, leafy spurge, and reed canarygrass are the primary exotic species. The wide range of species found with remnant prairie makes it the most floristically and structurally diverse Refuge grasslands.

3.3.2.3 Restored Grasslands

Restored grasslands, presently about 500 acres, are located on sites that at one time were prairie, but that had been converted to agriculture or some other cover type. Although they lack the intact soils of the remnant prairies, restored grasslands include many of the native grasses and forbs found in the remnants. Up to 11 cool and warm season grass species and 40 forb species exist in these grasslands. Dominant grass and forbs species include big bluestem, little bluestem, switch grass, Canada wildrye (*Elymus canadensis*), sideoats grama, prairie and tall dropseed, yellow and purple coneflowers, purple prairie clover, thimbleweed (*Anemone cylindrical*), blazingstars, and goldenrods (*Solidago spp.*).

Figure 3-2 Remnant Prairie in Big Stone NWR and Surrounding Minnesota Counties



3.3.2.4 Partially Restored Grasslands

Partially restored grasslands are an intermediate stage dominated by grasses but that lack many or all of the forbs found in fully restored grasslands. These grasslands are dominated with tall (up to six feet) warm season native grasses including big bluestem, Indian grass, switchgrass, and Canada wildrye. The lack of forbs makes these areas less floristically and structurally diverse than either restored grasslands or remnant prairie. At present there are about 1,300 acres of partially restored grasslands on the Refuge.

3.3.2.5 Non-native Grasslands

There are about 800 acres dominated by non-native grasses. Much of this persists from plantings of non-native grasses done in the 1970s to increase the amount of dense nesting cover available for waterfowl. About 500 acres of this grassland type were planted with non-indigenous Nebraska origin cultivars. Species include big bluestem, Indian grass, and switchgrass. These grasses produce significant amounts of biomass but are infertile. Some fields were planted to non-native Dense Nesting Cover (DNC) and include species such as alfalfa (*Medicago sativa*), red clover (*Trifolium pretense*), orchard grass (*Dactylis glomerata*), intermediate wheatgrass (*Thinopyrum intermedium*), and smooth brome. These areas are the least floristically and structurally diverse of Refuge grasslands.

3.3.2.6 Cropland

Presently, there is about 280 acres of cropland on the Refuge; it is the first stage in grassland restoration. Farming future grassland sites for three to four consecutive years helps prepare a favorable seed bed. Corn and soybeans are the primary crops. The amount and location of cropland changes as sites ready for restoration are planted with native grasses and additional restoration sites are planted to crops.

3.3.3 Granite Outcrops

The most unique habitat on the Refuge is the lichen-covered granite outcrops. The Refuge has approximately 100 acres of granite outcrop habitat, which contains shallow fragile soils that can be easily disturbed. Several of the granite outcrops have become covered with trees and shrubs and have an open grass understory. Some native tree and shrub species like oak exist on the outcrops; however, most of the trees are exotic species. The only population of ball cactus in the State of Minnesota is located on the outcrops that lie in the upper portion of the Minnesota River Valley. Approximately 2,000 ball cacti exist on Refuge outcrops. The cacti are monitored by Refuge staff. The primary threat for this species is from human poachers that collect the cacti, typically for use in home landscaping. Several other interesting species include brittle cactus (*Opuntia fragilis*), mudworts, ferns, fameflower (*Talinum parviflorum*), and mousetail (*Myosurus minimus*). Most of the native vegetation found on the outcrops is reflective of shortgrass prairie and is rich in forb diversity.

3.3.4 Forests and Shrubs

Approximately 1,050 acres of forest-shrub habitat exist on the Refuge (figure 3-1 Current Land Cover, Big Stone NWR). Riparian woodlands concentrated along the Minnesota River and Yellow Bank River corridors account for about 660 acres. Much of this area is not formally

managed although some areas have been included in past prescribed burns. Seasonal and at times prolonged flooding hamper the growth of understory vegetation including young trees. The remainder of the forest and shrub habitat is scattered trees and lowland shrubs found in the prairie coulees, old farmstead sites, wetlands, and grasslands. Primary bottomland and upland forest-tree species include plains cottonwood (*Populus deltoids*), elm (*Ulmus spp.*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), willow (*Salix spp.*), boxelder (*Acer negundo*), and oak (*Quercus spp.*). Tree invasion is a major threat to remnant prairie and grasslands on the Refuge.

3.3.5 Birds

More than 250 species of birds have been recorded at the Refuge. The full range of passerine and other birds common to the Plains states are found on the Refuge at some time during the year. The Refuge serves as an important migration stopover. Refuge habitats are managed for the benefit of migratory bird species. Upland and wet meadow habitats are managed to provide nesting and brood rearing cover for waterfowl, some shorebird species, and grassland-dependent passerine species. Wetlands are managed through drawdowns, fire treatments, and disking (site dependent) to create quality habitat for waterfowl, marshbirds, shorebirds, wetland dependent passerines, and raptors. The only active management for tree nesting raptor species occurs with bald eagle nest tree protection.

In 2007, Audubon Minnesota designated the Upper Minnesota River Valley from Montevideo, MN to Big Stone Lake as an Important Birding Areas (IBA) under the name Lac qui Parle – Big Stone IBA. The entire Refuge is included in this designated area.

Waterfowl and Waterbirds

Forty-six species of waterfowl and waterbirds use the Refuge for migration and/or nesting. During the spring and fall migrations waterfowl numbers have peaked at 75,000 ducks and 84,000 geese (2006). The Refuge provides habitat for more than 7 percent of the eastern prairie population of Canada geese during fall migration. It also provides habitat for large numbers of mallards during fall migration. Because the Refuge is positioned between the Mississippi flyway and Central flyway, it hosts western and eastern bird species.

Breeding waterfowl pair counts are conducted every spring on the Refuge. The pair count data is used to generate waterfowl production estimates. Waterfowl are monitored weekly during the spring and fall migrations. Over 20 species of ducks, geese, and swans are surveyed to evaluate migration progress and population estimates. The fall migration data are provided to the MN DNR to be incorporated into their state-wide migration reports. Dominant species include Canada geese, mallards, blue-winged teal, gadwall, green-winged teal, lesser scaup, and ring-necked ducks.

Marshbird and other waterbird species are monitored during the spring and fall migration periods at the same time as waterfowl. Refuge staff conducts weekly surveys during these timeframes and record presence/absence and numbers of birds by species. Although there is much variation and many missing species in these counts due to the secretive nature of many

of these birds, documentation of species occurrence is still considered important. Throughout the summer months the waterbird species are monitored by casual observations. The most frequently observed waterbird species include American white pelican, great egret, great blue heron, double-crested cormorant, American coot, pied-billed and western grebes, black-crowned night heron, sora, Virginia rail, and American bittern.

Shorebirds

Shorebirds are very common during the migration periods in the spring and fall. Forty-six species of rails, plovers, sandpipers, terns, and gulls have been documented on the Refuge. Sandpipers, terns, and gulls are the most prominent during the migration periods. Although rare in most parts of the State, black terns nest on the Refuge and are easily observed during the summer. Based on the availability of highly qualified volunteer birders, weekly shorebird migration monitoring is done during spring and fall migration periods. Woodcock are not surveyed on the Refuge but are present around the wetland complex and occasionally observed.

Landbirds

Twenty-three species of raptors use the Refuge. Of those, seven species of owls and seven hawk species have been documented at the Refuge. Red-tailed hawk, Swainson's hawk, northern harrier, American kestrel, great-horned owl, and eastern screech-owl are some of the more common species seen on the Refuge. Four bald eagle nests are located on the Refuge. Two bald eagle pairs nest on the Refuge and are commonly observed from February through November each year. Peregrine and prairie falcons are occasionally observed during fall migration. Raptor species are monitored weekly in the spring and fall while conducting the waterfowl migration surveys. Species and numbers of birds are recorded. Bald eagle nests are monitored during the breeding season to evaluate eaglet production.

Approximately 50 species of passerines have been documented from point count surveys on the Refuge. Point count surveys were conducted on the Refuge from 1994–1999, 2001, and 2007. The point count transects were focused on the remnant native prairie portions of the Refuge and designed to evaluate songbird species presence and abundance.

Several species of non-migratory birds are found at the Refuge. Ring-necked pheasants, though an introduced species, have a stable population. Gray partridge can be observed during the winter months. Eastern wild turkeys were reintroduced to the Refuge in 1995. The population has been slowly growing since then, and turkey sightings are now common on the Refuge. The greater prairie chicken was reintroduced into west-central Minnesota in 1999–2005. A total of 58 prairie chickens have been released on the Refuge. Most of the birds settled off the Refuge; however, prairie chickens are occasionally observed. Sharp-tailed grouse were documented on the Refuge during the winter of 2006. During the spring of 2007 a sharp-tailed grouse lek was located in the Lee Habitat Unit on the south side of the Refuge. See appendix C for a complete Refuge bird list.

3.3.6 Fish and Other Aquatic Species

Refuge marshes are natural spawning areas for northern pike and European carp. Ruby Red Quarry is a spawning area for bass, crappie, and bluegill. Catfish, bullhead, northern pike, walleye, white bass, and carp are the predominant river species. The Minnesota River is a common travel lane for numerous species that originate in Big Stone Lake. A fishery survey conducted shortly after the Refuge was established documented 36 species of fish in Refuge waters. Test nettings have shown that a viable fishery exists on the Refuge in the major wetlands and river systems. It appears that water level fluctuations through management manipulations have been instrumental in controlling rough fish populations such as European carp.

Currently, there is no active management of fish or other aquatic species on the Refuge. The MN DNR Fisheries personnel and Service Fisheries Biologists conduct formal surveys approximately every four years to assess the current fish populations. These surveys are usually done in the Minnesota River and East Pool using electrofishing, hoop netting, and gill netting techniques. The Refuge annually coordinates with the Minnesota DNR to stock fish in the Ice-Block pond also known as the “Fishing Pond.” Fish are stocked in preparation for “Youth Fishing Day” a special event held each May. See appendix C for a complete fish list for the Refuge.

Fifteen species of freshwater mussels have been identified on the Refuge. Surveys in 1999 revealed the most common species to be the fat mucket. Most of the species exist in the wetlands and rivers on the Refuge. However, three of the species—Wabash pig-toe, pink papershell, and creek heel-splitter—were found only in the Yellow Bank River. See appendix C for a complete list of mollusks documented on the Refuge.

3.3.7 Butterflies

Butterfly surveys conducted in 1988, 1999, and 2000 documented a total of 46 species. See appendix C for a complete list of butterflies documented on the Refuge.

3.3.8 Threatened and Endangered Species

Threatened and Endangered Flora

No federally threatened and endangered plant species have been found on the Refuge. The state endangered ball cactus (*Escobaria vivipara*) exists on the Refuge. Approximately, 2,000 cacti are in the population and doing well. Mud plantain (*Heteranthera limosa*) is a state threatened species. Species of special concern for the State include brittle cactus (*Opuntia fragilis*), disk waterhyssop (*Bacopa rotundifolia*), and water mudwort (*Limosella aquatica*). Threestamen waterwort (*Elatine triandra*) is not currently listed but has been proposed for state threatened status. All of these species exist on and are confined to the granite outcrops. Management actions around the granite outcrops have focused on minimizing negative impacts to all of these species. The greatest threat to these species on the Refuge is the encroachment of woody species on the outcrops. Efforts have been made to remove the woody vegetation.

Threatened and Endangered Fauna

The Dakota skipper butterfly is a candidate species for federal listing. Candidate species are plants and animals for which the Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act of 1973 but for which development of a listing regulation is precluded by other higher priority listing activities. The Dakota skipper was identified during butterfly surveys in 1988, 1999, and 2000. It was found in one remnant native prairie habitat unit on the northwest end of the Refuge. Two state species of concern have been found on the Refuge during the surveys: the poweshiek skipperling and regal fritillary. A 2009 butterfly survey found no occurrences of Dakota skipper or poweshiek skipperling and one occurrence of regal fritillary.

Management actions in the remnant prairie have focused on minimizing negative impacts to prairie-obligate butterfly species. The Dakota skipper butterfly is the species of greatest concern for management. Prescribed burns are used to treat skipper habitat. A number of mitigation measures are used to reduce adverse impacts to butterfly populations. The poweshiek skipperling and regal fritillary are managed under the Dakota skipper management guidelines.

3.3.9 Invasive and Nuisance Species

Exotic and invasive plant species pose one of the greatest threats to the maintenance and restoration of the diverse habitats found on the Refuge. They threaten biological diversity by causing population declines of native species and by altering key ecosystem processes such as hydrology, nitrogen fixation, and fire regimes. Left unchecked, these plants have come to dominate areas on some habitat units and have reduced the value of the land as wildlife habitat.

The primary invasive exotic species include smooth brome, Kentucky bluegrass, reed canarygrass, Canada thistle, and leafy spurge. Fire is currently used to set back the cool-season exotic grasses. Late spring burns during the bolt stage of growth on Kentucky bluegrass and smooth brome injure the grasses and delay seed head development. Setting back these species at the right time benefits the native warm season grasses and forbs. Occasionally, areas dominated by these species are hayed to prevent seed maturation. Reed canarygrass is another exotic cool-season grass that is associated with wetlands. Currently the only means of controlling this species is to flood the plants for an extended period of time.

The encroachment of invasive woody species, namely trees, also have negative impacts on the prairie landscape. Very few trees were present prior to European settlement. As settlers homesteaded the area, they planted trees around their houses and created shelterbelts. Shelterbelts dotted the landscape. Over time the trees gradually spread throughout the prairie. Most of the species were not native to this area. Granite outcrops have shallow fragile soils and were too dry to support trees. However, over time boxelder and exotic elm trees became established and have continued to invade the outcrops. They threaten the endemic shortgrass plant species on the outcrops by shading them out.

European carp is the primary pest species invading and degrading Refuge wetlands. Carp retard the growth of aquatic vegetation by consuming it and by causing turbidity in the water, which reduces photosynthetic efficiency, an essential component of wetland food chains. Pools are occasionally drawn down to provide waterfowl and shorebird habitat, an action that temporarily reduces carp abundance. Once water levels within Refuge wetlands are restored, carp numbers are restocked from the population in the adjoining Minnesota River. No other active management occurs for this species.

On occasion, beaver dams obstruct water flow through water control structures. Beaver have also constructed lodges beside Refuge interior dike roads, which can jeopardize dike integrity. Beaver are removed under these circumstances by a trapping permit and the dams and lodges removed by Refuge staff. Muskrat can become a pest species when it burrows into the impoundment dikes. The burrows jeopardize dike integrity. Nuisance muskrats are trapped as a part of the Refuge's trapping program.

3.3.10 Mammals

A variety of mammal species inhabit the Refuge. White-tailed deer, coyotes, rabbits, squirrels, and chipmunks are the most visible mammals of the Refuge's 45 species. Beaver, muskrat, mink, and raccoon are observable along river corridors and cattail marshes. The prairie supports the greatest wildlife diversity, and less observable but common species include: shrews, moles, weasels, ground squirrels, pocket gopher, mice, and voles. River otters were reintroduced to the Refuge in 1981, and a viable population continues to thrive today. Refuge grasslands and marshes are important for all of these species for forage and cover. See appendix C for a complete list of mammals documented on the Refuge.

3.3.11 Amphibians and Reptiles

Seventeen species of amphibians and reptiles have been documented on the Refuge. The most commonly observed species are western painted turtle, western plains garter snake, bull snake, and northern leopard frog. Five-lined skinks are occasionally seen on the granite outcrops, and western spiny softshell and snapping turtles can be observed along the banks of the Minnesota River and Yellow Bank River. See appendix C for a complete list of amphibians and reptiles documented on the Refuge.

3.4 Socioeconomic Environment

3.4.1 Demand and Supply for Wildlife-Dependent Recreation

In order to estimate the potential market for visitors to the Refuge, we looked at 2007 consumer behavior data within approximately 30- and 60-mile drives of the Refuge. The data were organized by zip code areas. The 30-mile area extended beyond the communities of Ortonville and Appleton, Minnesota and Milbank, South Dakota. The 60-mile area included Montevideo, Benson, and Morris, Minnesota and Watertown, South Dakota. The consumer behavior data that we used in the analysis are derived from Mediamark Research Inc. data. The company collects and analyzes data on consumer demographics, product and brand usage, and exposure to all forms of advertising media. The consumer behavior data were projected by

Tetrad Computer Applications Inc. to new populations using Mosaic data. Mosaic is a methodology that classifies neighborhoods into segments based on their demographic and socioeconomic composition. The basic assumption in the analysis is that people in demographically similar neighborhoods will tend to have similar consumption, ownership, and lifestyle preferences. Because of the assumptions made in the analysis, the data should be considered as relative indicators of potential not actual participation.

We looked at potential participants in birdwatching, fishing, and hunting with shotgun. In order to estimate the general environmental orientation of the population, we also looked at the number of people who might contribute to an environmental organization. The consumer behavior data apply to persons more than 18 years old. Table 3-1 displays the consumer behavior numbers for two distances to the Refuge. The projections represent the maximum audience that we might expect to make a trip to the Refuge for approximate drives of half-hour (30 miles), and 1 hour (60 miles). Actual visitors will be fewer, because the estimate is a maximum, and we expect less than that will travel to the Refuge.

Table 3-1 Maximum Adult Audiences Within 30 and 60 Miles of Big Stone NWR for Activities and Environmental Contributions

Activities	Population within 30 miles	Population within 60 miles
Birdwatching	5,986	19,196
Hunting	6,856	20,661
Fishing	13,019	41,119
Contribute to Environmental Organization	1,743	6,060

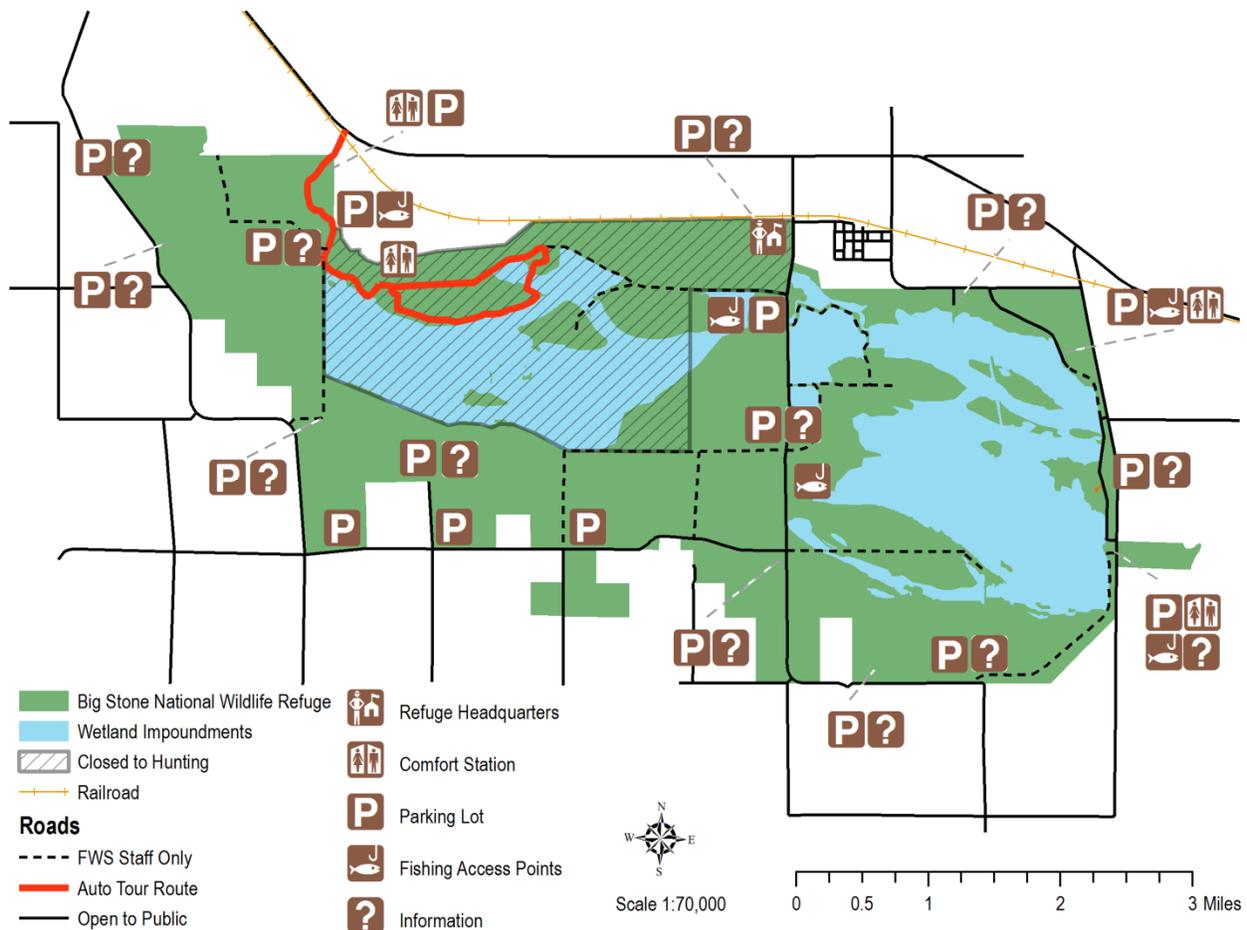
3.4.2 Wildlife-Dependent Recreation

Hunting

The Refuge maintains hunting programs for small, upland, and big game species in accordance with state seasons and regulations. No special permits are needed to participate in any of the hunting seasons other than what may be required by the State, such as a turkey permit. Currently, species that can be hunted include rabbits, squirrels, fox, raccoon, skunk, ring-necked pheasant, gray partridge, turkey, and deer. Deer hunting is permitted during archery, shotgun, and muzzleloader seasons. No migratory game bird hunting is allowed on the Refuge.

The Refuge maintains a zone, approximately 2,850 acres, where all hunting is prohibited (figure 3-3 Current Visitor Services Facilities Big Stone NWR). The zone is not closed to other uses, such as hiking and wildlife observation. In the past the zone was temporarily open to deer hunting. This was done for deer herd management purposes and may be applied again in the future if excessive deer numbers cause depredation problems outside the Refuge and no other viable alternative exists.

Figure 3-3 C urrent Visitor Services Facilities Big Stone NWR



Fishing

The entire Refuge is open to fishing wherever foot access is possible (figure 3-3 Current Visitor Services Facilities Big Stone NWR). Boating is limited to the natural channel of the Minnesota River. The quarries, once popular local fishing sites, are currently closed to public access due to safety issues.

Game fish such as walleye, northern pike, largemouth bass, white bass, drum, perch, crappie, catfish, sunfish, and bullheads are all abundant and sought throughout the year by local fishermen. The Minnesota River and Yellow Bank River are both fished frequently during the open water seasons. Ice fishing also occurs on the Refuge, but access, quality of fishing, and available water usually limit it to East Pool.

Wildlife Observation and Photography

Wildlife observation activities account for a majority of the visitation that occurs on the Refuge each year. Four developed facilities enhance this use: the Auto Tour Route, Granite Outcrop

Hiking Trail, Highway 75 Dam Drive, and Minnesota River Headwaters Trail (figure 3-3 Current Visitor Services Facilities Big Stone NWR).

The Auto Tour Route is a 5-mile paved roadway that winds through an interior portion of the Refuge. Visitors can view wildlife and plant life associated with riparian woodlands, native and restored prairie grasslands, granite outcrops, and prairie floodplain associated pothole wetlands and managed wetlands. White-tailed deer as well as a variety of waterfowl and waterbirds are commonly seen. Associated with the Auto Tour Route is a hiking trail that winds along the granite outcrops offering visitors a close up experience with outcrop plant and animal life as well as a scenic view of the Minnesota River corridor.

The Highway 75 Dam Drive is a 1-mile paved road found on top of the USACE Dam. This drive offers a view of East Pool, flood control facilities, and the remains of a historic granite quarry operation. Seasonally, visitors can view large concentrations of migrating waterfowl from this site. The Minnesota River Headwaters Trail links the foot of Big Stone Lake in Ortonville to the Refuge Auto Tour Route. The Refuge portion of this multi-use trail is 1.3 miles and unpaved. It offers a trip through riparian woodland and floodplain wetland habitats.

Interpretation

The Refuge Auto Tour Route and Granite Outcrop Trail include interpretation of the Refuge's habitats, wildlife, management, and unique features. The renovated Refuge headquarters also will include an expanded area of interpretive displays.

Environmental Education

There are no facilities specifically designed for environmental education purposes nor are there any staff dedicated to full-time outreach or environmental education activities. Refuge personnel provide tours on request and occasionally assist teachers on site with outdoor classroom activities. Various Refuge locations are available for independent environmental education programs and projects.

3.4.3 Other Recreation

Canoeing and Kayaking

Approximately 11.5 miles of the Minnesota River wind through the Refuge. A portion of this river is accessible to canoes and kayaks and offers a scenic river experience. There is a developed boat ramp located near the Refuge headquarters that provides access. The upper portion of the river is inaccessible due to the extensive log jams, while the mid and lower portions provide good canoeing and kayaking conditions during times when river flows are higher.

3.4.4 Volunteers

Volunteers have always been an important part of the Refuge workforce. Individuals, more than organized groups, have come forward to offer their time and services for Refuge needs. Projects where volunteers have been involved include: wildlife surveys, monitoring, wildlife

research projects, seed collecting, assisting with public events, and even routine maintenance duties.

3.4.5 Archeological and Cultural Values

Much of what is known about the prehistoric human occupations or visitations of the Refuge and surrounding area is drawn from a 1987 cultural resources survey report (Roetzel et al., 1987). Human activity is documented in the present day Minnesota River Valley in Western Minnesota to at least 9,000 years ago. Early peoples, called “Paleoindians” by archaeologists, were highly mobile and followed the migratory habits of the big game animals present at the end of the last ice age, such as mammoths and ancient bison. This cultural group is largely known by the large, chipped stone spearpoints used to kill and butcher these animals. One such spearpoint, identified as an Agate Basin type, was recovered in nearby Clay County, and chalcedony knives and fluted projectiles were recovered from the Brown’s Valley burial site in Traverse County. Although Paleoindians did occur in the area, the low amount of recovered artifacts suggests the population density was low. To date, no evidence of Paleoindian sites have been found within the Refuge boundary.

As the climate became closer to today’s range, the ice age big game animals became extinct and, as such, humans adapted and became less mobile and used a much broader range of plant and animals resources. These people, called “Archaic” by archaeologists, were foragers that while still somewhat nomadic, returned year after year to favorite hunting and gathering spots. As such, they left behind a wide range of stone tools including smaller spearpoints and plant grinding implements. The archaeological sites for this time period are more numerous suggesting the human population began to increase and expand. A broken spearpoint, likely from this time period, was found on the Refuge.

By around 2,000 years ago, the introduction of new technologies from the east such as clay pottery and the bow and arrow set off a change in the subsistence and social structure of the people in the area. These peoples, called “Plains Woodland” by archaeologists, settled down in year-around residences in small villages exploiting local resources. Pottery has been found in and around the Refuge which suggests occupations by or contact with other Post-Archaic peoples such as Mississippian, Plains Village, Cambria, and Oneota. To date, no evidence of Plains Woodland sites have been found within the Refuge boundary.

3.4.6 Cultural Resource Management

Cultural resources (archaeological sites, historic structures, and Native American traditional cultural properties) are important parts of the nation’s heritage. The Service strives to preserve evidence of these human occupations, which can provide valuable information regarding not only human interactions with each other, but also with the natural environment. Protection of cultural resources is accomplished in conjunction with the Service’s mandate to protect fish, wildlife, and plant resources.

The Service is charged with the responsibility, under Section 106 of the National Historic Preservation Act of 1966 (NHPA), of identifying historic properties (cultural resources that are

potentially eligible for listing on the National Register of Historic Places) that may be affected by our actions. The Service is also required to coordinate these actions with the State Historic Preservation Office, Native American tribal governments, local governments, and other interested parties. Cultural resource management in the Service is the responsibility of the Regional Director and is not delegated for the Section 106 process when historic properties could be affected by Service undertakings, for issuing archaeological permits, and for Indian tribal involvement.

The Archaeological Resources Protection Act of 1979 (ARPA) Section 14 requires plans to survey lands and a schedule for surveying lands with “the most scientifically valuable archaeological resources.” This Act also affords protection to all archeological and historic sites more than 100 years old (not just sites meeting the criteria for the National Register) on federal land, and requires archeological investigations on federal land be performed in the public interest by qualified persons.

The Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of these and other cultural resource laws. The actual determinations relating to cultural resources are to be made by the RHPO for undertakings on Service fee title lands and for undertakings funded in whole or in part under the direct or indirect jurisdiction of the Service, including those carried out by or on behalf of the Service, those carried out with federal financial assistance, and those requiring a federal permit, license, or approval.

The responsibility of the Refuge Manager is to identify undertakings that could affect cultural resources and coordinate the subsequent review process as early as possible with the RHPO and state, tribal, and local officials. Also, the Refuge Manager assists the RHPO by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archaeological investigations by contractors and permittees, and by reporting ARPA violations.

3.4.7 Socioeconomic Setting

Big Stone National Wildlife Refuge is located in Big Stone and Lac qui Parle Counties, Minnesota. Other nearby Minnesota counties are Chippewa, Stevens, Swift, Traverse, and Yellow Medicine. Each of the seven counties within this region decreased in population from 2000 to 2009. During this same time the population of the State of Minnesota grew. On average, the area’s population has a lower median household income and less high school and college education than the State’s population.

Population

The 2009 estimated total population of the seven counties was 58,574. Compared to 2000 estimates, the population decreased 9.6 percent while the State’s population increased 7 percent. Traverse County decreased the most at minus 13.6 percent, and Stevens County the least at minus 4.2 percent. Table 3-2 Percentage of Population by Race for Seven-county Area and Minnesota (2009) compares the racial composition of the seven-county area with that of

Minnesota as a whole. In Minnesota, 8.5 percent of people five years and older speak a language other than English at home; in the seven-county area the figure is 4-3 percent (U.S. Census Bureau, 2010).

Table 3-2 Percentage of Population by Race for Seven-county Area and Minnesota (2009)

	Seven-County Area	Minnesota
White persons	95.3	88.60
Black persons	1.0	4.70
American Indian and Alaska Native persons	1.6	1.30
Asian persons	0.8	3.80
Native Hawaiian and Other Pacific Islander	0.5	0.10
Persons of Hispanic or Latino origin	2.5	4.30
Persons reporting two or more races	1.0	1.60

Employment

In the period from 2005 to 2009, the educational services, health care, and social assistance industry was the largest economic and employment sector in the seven-county area, accounting for 27.1 percent of employment. Agriculture, forestry, fishing and hunting, and mining accounted for about 12 percent of the jobs across the area. Retail trade, manufacturing, and construction were also important economic sectors (U.S. Census, undated).

Income and Education

Average per-capita income in the seven-county area was \$22,809 in 2009; in Minnesota it was \$29,431. The median household income of the seven-county area was \$42,581 in 2009; in the State it was \$57,007 (U.S. Census Bureau, undated).

In the seven-county area, 16.1 percent of persons over 25 years of age hold a bachelor's degree or higher. The comparable figure in the State is 31.2 percent. This discrepancy is typical of the difference between largely rural areas like these seven counties and entire state populations, which include large numbers of more urban residents who are professionals and have higher educational attainment on average (U.S. Census Bureau, undated).

3.4.8 Current Staffing

List of current staffing for the Refuge:

- Project Leader
- Wildlife Refuge Specialist
- Wildlife Refuge Specialist
- Wildlife Biologist
- Administrative Support Assistant
- Prescribed Fire Specialist
- Range Technician (Fire)
- Maintenance Mechanic

Chapter 4: Environmental Consequences

In this chapter

- 4.1 Introduction
- 4.2 Effects Common to all Alternatives
- 4.3 Physical Environment
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4.1 Introduction

This chapter describes the probable environmental consequences of each alternative on selected environmental resources. Environmental consequences for some resources are



described more generally, but in most cases, analysis factors are identified for each resource and the effects of the alternatives on the analysis factors are summarized. Analysis factors are requirements or limiting factors important to each of the resources considered.

4.2 Effects Common to all Alternatives

4.2.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Clinton on February 11, 1994. Its purpose was to focus the attention of federal agencies on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment.

None of the management alternatives for the Big Stone National Wildlife Refuge (NWR, Refuge) described in this Environmental Assessment (EA) would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The percentage of minorities in west-central Minnesota counties is lower than greater Minnesota (and much lower than the United States) as a whole. Average incomes and poverty rates within the counties are comparable to other rural counties in the State. Public use activities that would be offered under each of the alternatives would be available to any visitor regardless of race, ethnicity, or income level.

4.2.2 Archeological and Cultural Values

The consequences of each action alternative in terms of cultural resources are the same. Lands administered by the Service come under the several federal cultural resources laws (and executive orders and regulations), in addition to policies and procedures established by the U.S. Department of the Interior (DOI) and the U.S. Fish and Wildlife Service (FWS, Service) to implement the laws. Cultural resources on these lands receive protection and consideration that would not normally apply to private or local and state government lands.

Nevertheless, undertakings accomplished on the Refuge have the potential to impact cultural resources. The presence of cultural resources including historic properties cannot stop a federal undertaking; the several laws require only that adverse impacts on historic properties be considered before irrevocable damage occurs.

The Refuge Manager will, during early planning, provide the Regional Archeologist a description and location of all undertakings (projects, activities, routine maintenance and operations that affect ground and structures, and requests for permitted uses) and of alternatives being considered. The Regional Archeologist will analyze these undertakings for potential to affect historic properties and enter into consultation with the State Historic Preservation Officer and other parties as appropriate. The Refuge Manager will notify the public and local government officials to identify concerns about impacts by the undertaking; this notification will be at least equal to, preferably with, public notification accomplished for the National Environmental Policy Act of 1969 (NEPA) and the compatibility determination process.

4.2.3 Climate Change

Factors Considered in the Analysis:

- Annual Temperature Change Rate (historic)
- Projected Annual Average Temperature
- Projected Annual Average Precipitation

This analysis considers the rate of historic temperature change for the Refuge derived from a 2011 study of the National Wildlife Refuge System (NWRS, Refuge System) documented in Magness and others (2011). This analysis also projects future changes to temperature and precipitation and the likely effects of these changes for two landscape regions in western Minnesota that encompass the Refuge. The projections and likely effects are drawn from a separate assessment of climate effects documented in Galatowitsch and others (2009). The

projected changes are not specific to the Refuge and do not account for management actions and infrastructure that could help mitigate such changes. Also, throughout the history of the Refuge, water availability has been regulated in large part by two dams, one upstream of the Refuge and the other at the downstream end. This is expected to continue despite projected changes to temperature and precipitation for the larger landscape regions.

Temperature change has been linked with very high confidence to changes in natural systems (Intergovernmental Panel on Climate Change [IPCC], 2007). Among others, this includes changes to seasonal precipitation, flood frequencies, and soil moisture all of which in turn can affect fish, wildlife, and plants. The annual temperature has increased on the Refuge over the past 50 years. As part of an analysis to assess the vulnerability of Refuge System units to the effects of climate change, Magness and others (2011) calculated annual temperature change for most units of the Refuge System using historic climate data for the time period from 1950 to 2006. Their analysis shows an annual temperature change rate of 0.023 degrees Celsius (0.041 degrees Fahrenheit) for Big Stone NWR. This translates to an increase in annual temperature of 1.31 degrees Celsius (2.36 degrees Fahrenheit) for the 57-year period analyzed. This rate of temperature change in conjunction with other model inputs for sensitivity and adaptive capacity produced a finding of moderate vulnerability to climate change for the Refuge relative to other Refuge System units.

In a separate effort Galatowitsch and others (2009) projected climate change and associated impacts within eight Minnesota landscape regions. Figure 4-1 shows the two landscape regions, Agassiz Lake Plain and Southwest Prairie (dark shaded areas), that encompass the Refuge and areas (light shaded areas) with present day climate conditions similar to those projected to occur in each Minnesota landscape for the time period 2060–2069. The authors go on to describe the expected effects to wetlands, prairie, and forest habitats from the projected climate change. Wetlands and prairie are the predominate habitats on the Refuge.

Figure 4-1 Analog Climate Envelopes for two Minnesota Landscape Regions Based on Predictions for 2060-2069



Modified from Galatowitsch et al. 2009

Minnesota is projected to experience a 3 degree Celsius (5.4 degree Fahrenheit) rise in temperature by the time period 2060–2069. This would increase the amount of water lost from wetlands to the atmosphere through evapotranspiration, and future precipitation rates are not expected to offset the loss. That means wetlands would have a shorter hydroperiod, the amount of time they hold water. This would favor a number of invasive species including reed canarygrass. Currently, potential evapotranspiration rates exceed average annual precipitation in the two landscape regions that encompass the Refuge. This difference is expected to increase. This trend would further reduce wetland hydroperiods and likely increase the transition of freshwater wetlands to alkaline wetlands. Alkaline wetlands support a lower diversity of wildlife and plants.

Existing grasslands are likely to persist, but the complement of species is likely to shift to those that thrive in drier conditions. Grasslands with greater species richness are likely to have higher response diversity (Elmqvist et al., 2003) and to make this transition smoothly. Wet prairies are likely to become drier with an increased risk of extinction for species dependent on this habitat. Drier conditions within wetlands and forest edges could favor the expansion of grasslands, but any colonization of these areas would be limited by seed availability and competition from invasive species.

4.2.4 Trapping

Trapping is used as both a management tool and a permitted recreational use. Recreational trapping is allowed seasonally by Special Use Permit to interested trappers. Trapping is also used to remove beavers responsible for plugging water control structures and to remove muskrats, beavers, or woodchucks that damage dikes with tunnels. While the direct impact upon the animal trapped is fatal, the overall impacts to the population in the area are negligible due to the small number of animals taken and the limited number of areas trapped.

4.2.5 Economics

Implementation of any of the alternatives is expected to generate positive economic impacts. Past economic studies at refuges suggest a positive correlation between a refuge's economic impact on an area and the number of visitors to that refuge (Caudill and Henderson, 2005; Carver and Caudill, 2007). While the mix of uses and recreational opportunities varies across the alternatives, all alternatives propose actions that would maintain or increase visitation, which is expected to benefit the local economy.

4.3 Physical Environment

4.3.1 Soils: Direct and Indirect Effects

Factors considered in the analysis:

- Soil fertility

This analysis considers the effects of the alternatives on soil fertility, which in turn affects the abundance, diversity, and composition of vegetation within wetland and upland areas. Some invasive plant species, such as smooth brome, are known to alter soil conditions to favor

further spread. In the case of smooth brome, the altered soils favor another invasive species, leafy spurge, and also suppress growth of native species. This reduces plant diversity and results in grasslands dominated by one or two species. Disturbing soils followed by native plantings increases plant diversity and enhances soil fertility.

Alternative 1, No Action

Under this alternative, soil fertility would improve on 500 acres converted from non-native grasses to partially restored grasslands.

Alternative 2

Under this alternative soil fertility would improve on 500 acres converted from non-native grasses to partially restored grasslands. Forbs would be added to existing partially restored grasslands to create an additional 600 acres of restored grasslands.

Alternative 3

Under this alternative soil fertility would improve on 1,100 acres due to conversion of 800 acres of partially restored grasslands and 300 acres of non-native grasses to restored grasslands (forbs and grasses).

Alternative 4, 5, and 6

Under these alternatives soil fertility would improve on 1,100 acres due to conversion of 600 acres of partially restored grasslands and 500 acres of non-native grasses to restored grasslands (forbs and grasses).

4.3.2 Hydrology and Water Quality: Direct, Indirect, and Cumulative Effects

Factors considered in the analysis:

- Water delivery (source, amount, rate, distribution)
- Water movement (pathways)
- Water storage (duration and frequency of inundation)
- Water quality (sedimentation, turbidity, nutrients, heavy metals)

One focus of this analysis is the effects of the alternatives on water delivery, water movement, and water storage within the Refuge. These interrelated factors drive aquatic and wetland ecology. Within the Refuge these factors are influenced by stream channel characteristics, dikes, levees, roads, and vegetation. These factors are more strongly affected at a broader scale by the presence and management objectives of the Highway 75 Dam and Big Stone Lake Dam. A second focus of the analysis is the effects of the alternatives on the delivery, movement, and storage of sediment and contaminants, and the implications for Refuge hydrology and water quality. See Chapter 3: Affected Environment and Current Management for additional information on hydrology and water quality.

Alternative 1, No Action

Under this alternative, water delivery, movement, and storage within the Refuge would remain in their present relationship. Under most flow conditions, the Minnesota River would follow a

southerly route through the Refuge passing through the diversion channel and West Pool impoundment and have few qualities of a natural river system. Channel dynamics responsible for producing diverse riverine habitat characterized by meanders, oxbow lakes, pools, and riffles would remain largely absent. Sediment and nutrients would continue to accumulate upstream of West Pool promoting further growth of cattails, which would further impede water flow and lead to additional sediment and nutrient deposition. West Pool would continue to receive continuous flow from the Minnesota River, which would limit water management within the impoundment. Water quality within Refuge wetlands would likely continue to decline because of the continuous accumulation of contaminants and sediments. Water delivery, movement, storage, and quality would 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 U.S. Army Corps of Engineers (USACE) flood control objectives. The timing, duration, and frequency of these events would continue to affect both short- and long-term wetland management objectives within the Refuge.

Alternatives 2, 3, 4, 5, and 6

Under these alternatives, the relationship of water delivery, movement, and storage within the Refuge would change. Under most flow conditions, the Minnesota River would follow a northerly route through the Refuge avoiding much of the diversion channel and West Pool impoundment. This would add about five miles of meandering river and channel dynamics capable of creating diverse riverine habitat. During most flow conditions, sediment and contaminant delivery would be redistributed along the northern route away from West Pool. Redirecting flow and associated sediment and contaminants through this remnant channel would improve water clarity, stem cattail growth, and provide greater management control within West Pool. During flood events, the diversion channel would carry overflow and deposit sediment in wetlands along its course. Employing best management practices on lands upstream of the Refuge would help improve water quality in the Minnesota River and its tributaries and Refuge waters by reducing the sediment and contaminant inputs in the system. Water quality within Refuge wetlands is likely to improve with the decrease in continuous flow and greater management control. Water delivery, movement, storage, and quality would 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. The timing, duration, and frequency of these events would continue to affect both short- and long-term wetland management objectives within the Refuge.

There is currently a proposal being considered by the USACE, St. Paul District, to restore the lower reach of the Whetstone River, thus rerouting a portion of the river flow into its historic channel and its eventual confluence with the Minnesota River just upstream of Big Stone NWR. The restoration of the historic Whetstone River channel is consistent with Refuge objectives to increase connectivity, increase riparian and riverine habitats, and to restore water supply dynamics to portions of the Refuge. The project would involve return flows into approximately 2.5 miles of the historic channel of the Whetstone River restoring channel sinuosity and fluvial dynamics, such as scour and fill, that have remained absent from the ditched portions of the Minnesota River downstream of Big Stone Lake. The historic channel has maintained a wooded

corridor that with return of stream-flow should provide a riparian corridor that extends from the Highway 75 Dam up into the upper Whetstone watershed. This would not only provide a riparian corridor but also an unobstructed stream corridor allowing for the movement of aquatic species into and out of the Refuge. The unregulated flows of the Whetstone River would provide an inconsistent and dynamic water supply to portions of the Refuge, which plays an important role in sustaining riverine and wetland habitats. It is likely that these dynamics would restore a more natural regime of periodic flooding to portions of the Whetstone River and Minnesota River floodplains, a process that is limited by the incised ditch systems.

It must also be recognized that the suggested reconnection of the Whetstone River with its historic channel is also likely to present some challenges and potential detrimental impacts to Refuge management. The issues associated with the Whetstone River's connection with Big Stone Lake, sedimentation, and flooding would be transferred downstream to the Refuge. To a large extent, these are issues with which the Refuge already struggles, but they are likely to be magnified with a more direct and unbuffered connection to the Whetstone River. Sediments and flood waters from the Whetstone would no longer travel through the dam at the mouth of Big Stone Lake, but would instead flow directly into the Minnesota River upstream of the Refuge. Sedimentation within the Refuge has already caused detrimental impacts to Refuge habitats, and steps would need to be taken to ensure that the restoration did not result in further damages.

4.4 Biological Environment

4.4.1 Wetlands: Direct, Indirect, and Cumulative Effects

Factors considered in the analysis:

- Water level dynamics (extent, duration, and frequency of flooding)
- Distribution, amount, and diversity of wetland vegetation

This analysis considers the effects of the alternatives on the extent, duration, and frequency of flooding within Refuge wetlands. Additionally, the analysis considers effects of water level dynamics on the distribution, amount, and diversity of emergent and submergent wetland vegetation. See Chapter 3: Affected Environment and Current Management for additional information on Refuge wetlands.

Alternative 1, No Action

Under this alternative there would be no change to water level dynamics within Refuge wetlands. Specifically, West Pool would continue to receive continuous flow from the Minnesota River, which would limit water management within the impoundment, particularly the ability to maintain stable water levels. Flooding would persist throughout the West Pool basin for much of the growing season. Without corresponding dry periods, this would continue to produce conditions that favor dense cattail growth and hinder the growth and spread of other emergent vegetation. Submerged plants would occur in some deeper portions of West Pool, but continuously fluctuating water levels would hamper growth of submerged plants in shallow areas, especially along the perimeter of the impoundment. The extent, duration, and

frequency of flooding within all Refuge wetlands would 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.

Alternatives 2, 3, 4, 5, and 6

Under these alternatives West Pool would no longer receive continuous flow from the Minnesota River. This would improve water management capabilities within the impoundment and would allow managers to vary water levels including seasonal or annual dry periods across much of the West Pool basin. Reintroducing dry periods would encourage growth of emergent vegetation and increase interspersed vegetation and open water when the basin is flooded. Dry periods would also allow greater access to the basin and potentially permit the use of prescribed fire or mechanical means to reduce the amounts of invasive species or dense stands of monotypic vegetation such as cattails. Stable water levels would permit consistent penetration of sunlight and favor growth of submerged plants in shallow areas. Stable water levels across a fully flooded West Pool would encourage muskrats to feed and lodge in cattail stands currently unavailable to them. Muskrat activity creates areas of open water in otherwise dense cattail stands, which increases structural diversity of the habitat and improves access for other wildlife. The extent, duration, and frequency of flooding within all Refuge wetlands would 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.

4.4.2 Grasslands: Direct, Indirect, and Cumulative Effects

Factors considered in the analysis:

- Floristic and structural diversity
- Invasive species

This analysis considers the effects of the alternatives on floristic and structural diversity of upland Refuge grasslands. Wet meadow, a grassland that occurs as a transition between wetlands and upland grasslands, is not included in this analysis. Upland grasslands include remnant prairie, restored grasslands (areas with native grasses and forbs), partially restored grasslands (areas with native grasses), and non-native grasslands (see Chapter 3: Affected Environment and Current Management). Floristic and structural diversity is greatest in remnant prairie and least in non-native grasslands. In this analysis the floristic and structural diversity of remnant prairie, restored grasslands, partially restored grasslands, and non-native grasslands are described as very high, high, moderate, and low, respectively. This information is summarized in table 4-1. Additionally, this analysis considers the effects of the alternatives on the number and extent of invasive plant species that compete with native species and often decrease floristic and structural diversity of grasslands.

Table 4-1 Floristic and Structural Diversity of Refuge Grasslands at Present and for Each Alternative

Floristic and Structural Diversity	Index Value	Present	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Very High (remnant prairie)	4	1,700	1,700	1,700	1,700	1,700	1,700	1,700
High (native grasses and forbs)	3	500	500	1,100	1,600	1,600	1,600	1,600
Moderate (native grasses)	2	1,300	1,800	1,200	500	700	700	700
Low (monotypic non-native grasses)	1	800	300	300	500	300	300	300

Alternative 1, No Action

Under this alternative the floristic and structural diversity would be maintained or increased within 1,700 acres of remnant prairie. The number and extent of native plant species would remain at present levels or increase creating a mosaic of grasses and forbs that vary in height across the entire extent as well as at individual sites. This variation of structure would increase habitat diversity and provide for a wider range of wildlife species. Under this alternative, the floristic and structural diversity would increase from low to moderate on 500 acres of grasslands presently dominated by monotypic stands of non-native grasses. The amount of contiguous grasslands with high to very high floristic and structural diversity would remain at 2,200 acres (see table 4-1). Invasive plant species would be minimized through active eradication as well as creating conditions favorable to natives species, but invasive species would continue to persist at some level on the Refuge. In these areas, invasive species would continue to affect the floristic and structural diversity of grasslands.

Alternative 2

Under this alternative the floristic and structural diversity would be maintained or increased within 1,700 acres of remnant prairie. The number and extent of native plant species would remain at present levels or increase creating a mosaic of grasses and forbs that vary in height across the entire extent as well as at individual sites. This variation of structure would increase habitat diversity and provide for a wider range of wildlife species. The floristic and structural diversity would increase from moderate to high on 600 acres through the addition of forbs to existing native grasses and from low to moderate on 500 acres converted from monotypic stands of non-native grasses to a mixture of native grasses (see table 4-1). This would increase the total amount of contiguous grassland with high to very high floristic and structural diversity from 2,200 acres to 2,800 acres (see table 4-1). Invasive plant species would be minimized through active eradication as well as creating conditions favorable to natives species, but invasive species would continue to persist at some level on the Refuge. Where invasive species occur would adversely affect the floristic and structural diversity of grasslands.

Alternative 3

Under this alternative the floristic and structural diversity would be maintained or increased within 1,700 acres of remnant prairie. The number and extent of native plant species would remain at present levels or increase creating a mosaic of grasses and forbs that vary in height across the entire extent as well as at individual sites. This variation of structure would increase habitat diversity and provide for a wider range of wildlife species. The floristic and structural diversity would increase from low to high on 300 acres converted from monotypic stands of non-native grasses to a mixture of native grasses and forbs and from moderate to high on 800 acres through the addition of forbs to existing native grasses (see table 4-1). This would increase the total amount of contiguous grassland with high to very high floristic and structural diversity from 2,200 acres to 3,300 acres (see table 4-1). Invasive plant species would be minimized through active eradication as well as creating conditions favorable to natives species, but invasive species would continue to persist at some level on the Refuge. Where invasive species occur would adversely affect the floristic and structural diversity of grasslands.

Alternative 4, 5, and 6

Under this alternative the floristic and structural diversity would be maintained or increased within 1,700 acres of remnant prairie. The number and extent of native plant species would remain at present levels or increase creating a mosaic of grasses and forbs that vary in height across the entire extent as well as at individual sites. This variation of structure would increase habitat diversity and provide for a wider range of wildlife species. The floristic and structural diversity would increase from low to high on 500 acres converted from monotypic stands of non-native grasses to a mixture of native grasses and forbs and from moderate to high on 600 acres through the addition of forbs to existing native grasses (see table 4-1). This would increase the total amount of contiguous grassland with high to very high floristic and structural diversity from 2,200 acres to 3,300 acres (see table 4-1). Invasive plant species would be minimized through active eradication as well as creating conditions favorable to natives species, but invasive species would continue to persist at some level on the Refuge. Where invasive species occur would adversely affect the floristic and structural diversity of grasslands.

4.4.3 Granite outcrop plant community: Direct and Indirect Effects

Factors considered in the analysis:

- Granite outcrop non-native shrub and tree cover

Granite outcrops are scattered within the Refuge and dot the landscape in various locations throughout the Minnesota River Valley. The xeric conditions and thin fragile soils of the outcrops harbor plant and animal species not found in the surrounding landscape such as short grass prairie plants, ball cactus, and the five-lined skink. Some native trees and shrubs do occur on granite outcrops and are part of the plant community, but the addition of non-native trees and shrubs increases canopy cover and root density to levels that alter temperature, moisture, and soil conditions and adversely affect native plants and animals. This analysis considers the effects of the alternatives on the amount of non-native tree and shrub cover on granite outcrops. See Chapter 3: Affected Environment and Current Management for more information on granite outcrops.

All Alternatives

The amount of tree and shrub cover from non-native species is expected to decrease under all alternatives. This would maintain or improve conditions that favor native species associated with granite outcrops.

4.4.4 Waterfowl: Direct, Indirect, and Cumulative Effects

Factors considered in the analysis:

- Seasonal availability of high energy foods
- Seasonally available loafing habitat free of disturbance
- Availability of nesting cover

Waterfowl primarily use the Refuge as stopover habitat during annual migrations, although some species do nest on the Refuge. Migrating waterfowl require high energy foods, which are found in Refuge wetlands in the form of seeds, rhizomes, and tubers produced by wetland plants. Invertebrates, often closely associated with wetland plants, are also a high energy food source for waterfowl. Migrating waterfowl also require loafing habitat, areas largely free of disturbance with adequate hiding cover and water depth. Breeding waterfowl require nesting cover, typically dense vegetation near water. This analysis considers the effects of the alternatives on the seasonal availability of high energy foods and loafing habitat for migrating waterfowl and the availability of nesting cover for breeding waterfowl. See Chapter 3: Affected Environment and Current Management for additional information on waterfowl use of the Refuge.

Alternative 1, No Action

Under this alternative, the seasonal availability of high energy foods would remain at present levels. Refuge impoundments would continue to be managed to encourage the growth of wetland plants, but West Pool, which comprises about 30 percent of total wetlands and 40 percent of managed wetlands on the Refuge, would continue to receive constant flow from the Minnesota River. This constant but fluctuating flow would cause frequent changes to water levels in West Pool constraining the amount of high energy foods by slowing or eliminating growth of emergent and submergent plants and decreasing the amount of invertebrates. Annually and cumulatively the Refuge would provide less high energy food and provide for fewer migrating waterfowl, although the number of waterfowl using the Refuge in any given year would also be affected by annual migration patterns. Loafing and breeding habitat would remain at present levels. The extent, duration, and frequency of flooding within all Refuge wetlands would 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.

Alternatives 2, 3, 4, 5, and 6

Under these alternatives, the seasonal availability of high energy foods is expected to increase above present levels. Constant flow into West Pool would end and the ability to manage water levels would increase. Increased water management capabilities would produce additional high

energy foods (see section 4.4.1 Wetlands: Direct, Indirect, and Cumulative Effects in this chapter), and allow seasonal flooding to provide migrating waterfowl access to those foods. Annually and cumulatively the Refuge would provide more high energy food and provide for more migrating waterfowl than under present conditions, although the number of waterfowl using the Refuge in any given year would continue to be affected by annual migration patterns. Increased plant growth within the West Pool basin would also create greater interspersions of open water and vegetation, which provides hiding cover for duck broods. Water levels within West Pool would be more stable without continuous flow from the Minnesota River, but the water level elevation would change periodically dependent on management objectives. Higher water levels would provide more loafing habitat and lower water levels less, but in most years loafing habitat would continue to be available during seasonal migrations. Stable water levels would mean fewer flooded waterfowl nests. Increased amounts of restored grasslands as well as improved quality of remnant prairie would provide additional nesting cover. The extent, duration, and frequency of flooding within all Refuge wetlands would 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.

4.4.5 Waterbirds: Direct, Indirect, and Cumulative Effects

Factors considered in the analysis:

- Dense marsh vegetation
- Stable water levels during breeding season (marshbirds)
- Variety of water depths (wading birds)
- Wetlands with abundant food resources (e.g., fish, reptiles, amphibians, seeds)

The Refuge provides habitat for both migrating and nesting waterbirds including bitterns, rails, grebes, herons, egrets, and cormorants. Many marsh nesting birds require dense vertical cover and stable water levels. The type of vegetation and water depth varies by species. Wading birds feed in shallow waters and require abundant prey and various water depths to accommodate a range of bird species. This analysis considers the effects of the alternatives on the amount of dense marsh vegetation, stable water levels, water depths, and food resources.

Alternative 1, No Action

Under this alternative, waterbird use of the Refuge is expected to remain at present levels. Present dynamics of wetland systems on the Refuge produce dense marsh vegetation, and this would continue. Water management capabilities exist in many Refuge wetlands and would continue to enable managers to adjust water levels to meet wetland objectives. West Pool, which comprises about 30 percent of total wetlands and 40 percent of managed wetlands on the Refuge, would continue to receive constant flow from the Minnesota River. This constant but fluctuating flow would cause frequent changes to water levels in West Pool and reduce nesting success of marshbirds due to water inundating nests. There would continue to be a variety of water depths and abundant prey available across the 4,500 acres of Refuge wetlands. Food from plants would continue to be available, but would be limited, especially in West Pool, by an inability to manage water levels. The extent, duration, and frequency of flooding within all Refuge wetlands would continue to be affected by periodic releases of low, medium, and

high volumes of water from upstream and the impoundment of these waters on the Refuge to meet USACE flood control objectives.

Alternatives 2, 3, 4, 5, and 6

Under these alternatives, waterbird use of the Refuge is expected to remain at present levels or increase. Wetland system dynamics would continue to produce dense marsh vegetation. The enhanced ability to manage water levels within West Pool would alter the distribution and quality of dense marsh vegetation increasing interspersion of vegetation and open water, creating conditions suitable for a variety of waterbirds such as terns, rails, and herons. Stable water levels within West Pool would improve the nesting success of ground nesting marshbirds and provide conditions suitable for reptiles and amphibians. There would continue to be a variety of water depths and abundant prey available across the 4,500 acres of Refuge wetlands. The addition of riverine habitat and channel dynamics (see section 4.3.2 Hydrology and Water Quality: Direct, Indirect, and Cumulative Effects in this chapter) would create habitat for reptiles, amphibians, and fish used as prey by some waterbirds. The extent, duration, and frequency of flooding within all Refuge wetlands would 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.

4.4.6 Shorebirds: Direct, Indirect, and Cumulative Effects

Factors considered in the analysis:

- Amount and seasonal availability of mudflats with hiding cover and abundant and diverse invertebrates
- Suitable water depths
- Disturbance

Presently, migrating shorebirds primarily utilize the Refuge for stopover feeding habitat. Most migration occurs from mid-April through mid-May and again from July through October. Invertebrates found in seasonally exposed mudflats within some managed wetlands provide a high energy food source. Shorebirds require low levels of disturbance as well as specific amounts of hiding cover and water depths that vary by species. This analysis considers the effects of the alternatives on the amount and availability of mudflats, suitable water depths, and disturbance.

Alternative 1, No Action

Under this alternative, shorebird use of the Refuge is expected to remain at present levels. Managed wetlands, approximately 3,500 acres, occasionally would be drawn down to expose mudflats during fall migration of shorebirds. The ability to maintain exposed mudflats within West Pool would continue to be constrained by continuous flow from the Minnesota River. Mudflats in conjunction with other Refuge wetlands would continue to provide a variety of water depths for feeding shorebirds. Human disturbance would remain at present low levels. The extent, duration, and frequency of flooding within all Refuge wetlands would 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. This periodic flooding would continue to affect the amount of mudflats available for shorebirds.

Alternatives 2, 3, 4, 5, and 6

Under these alternatives shorebird use of the Refuge is expected to remain at present levels or increase. Managed wetlands, approximately 3,500 acres, occasionally would be drawn down to expose mudflats during fall migration of shorebirds. The ability to maintain exposed mudflats within West Pool would improve because of the absence of continuous flow from the Minnesota River. Mudflats in conjunction with other Refuge wetlands would continue to provide a variety of water depths for feeding shorebirds. Human disturbance would remain at present low levels. The extent, duration, and frequency of flooding within all Refuge wetlands would continue to be affected by periodic releases of high volumes of water from upstream and impoundment of these waters on the Refuge to meet USACE flood control objectives. This periodic flooding would continue to affect the amount of mudflats available for shorebirds.

4.4.7 Grassland birds: Direct, Indirect, and Cumulative Effects

Factors considered in the analysis:

- Structural diversity of grasslands
- Amount of woody vegetation

Migratory grassland birds use the Refuge for breeding, arriving in spring and departing in late summer or fall, while resident grassland birds are present year round. Large contiguous grasslands with a variety of plant species create structural diversity that provides habitat for a range of grassland birds. Woody vegetation, including lone trees, occurring within grasslands makes the habitat less attractive to grassland birds, particularly for nesting, because they provide cover or aerial perches for predators. This analysis considers the effects of the alternatives on the structural diversity and amount of woody vegetation within grasslands.

Alternative 1, No Action

Under this alternative, grassland bird use of the Refuge is expected to remain the same or slightly increase compared to present levels. Maintaining or increasing plant species diversity and minimizing woody vegetation within 1,700 acres of remnant prairie as well as converting 500 acres of non-native grasses to native grasses would increase structural diversity and the amount of habitat available for grassland birds. The amount of contiguous grassland with high to very high floristic and structural diversity would remain at 2,200 acres (see section 4.4.2 Grasslands: Direct, Indirect, and Cumulative Effects in this chapter). Increased grassland diversity would provide habitat for a wider range of grassland bird species.

Alternative 2

Under this alternative, grassland bird use of the Refuge is expected to remain the same or increase compared to present levels and to be greater than levels expected in Alternative 1. Maintaining or increasing plant species diversity and minimizing woody vegetation within 1,700 acres of remnant prairie, increasing the amount of restored grasslands (those areas with grasses and forbs) to 1,100 acres, and reducing the amount of grassland with low diversity by

converting 500 acres of non-native grasses to native grasses would increase structural diversity and the amount of habitat available for grassland birds. This would increase the amount of contiguous grassland with high to very high structural diversity from 2,200 acres to 2,800 acres (see section 4.4.2 Grasslands: Direct, Indirect, and Cumulative Effects in this chapter). Increased grassland diversity would provide habitat for a wider range of grassland bird species.

Alternative 3

Under this alternative, grassland bird use of the Refuge is expected to increase compared to present levels and to be greater than levels expected in Alternative 1 and 2. Maintaining or increasing plant species diversity and minimizing woody vegetation within 1,700 acres of remnant prairie, increasing the amount of restored grasslands (those areas with grasses and forbs) to 1,600 acres, and reducing the amount of grassland with low diversity by converting 300 acres of non-native grasses to restored grasslands would increase structural diversity and the amount of habitat available for grassland birds. This would increase the amount of contiguous grassland with high to very high structural diversity from 2,200 acres to 3,300 acres (see section 4.4.2 Grasslands: Direct, Indirect, and Cumulative Effects in this chapter). Increased grassland diversity would provide habitat for a wider range of grassland bird species.

Alternatives 4, 5, and 6

Under these alternatives, grassland bird use of the Refuge is expected to increase compared to present levels and be greater than levels expected in Alternatives 1, 2, and 3. Maintaining or increasing plant species diversity and minimizing woody vegetation within 1,700 acres of remnant prairie, increasing the amount of restored grasslands (those areas with grasses and forbs) to 1,600 acres, and reducing the amount of grassland with low structural diversity by converting 500 acres of non-native grasses to restored grasslands would increase overall structural diversity and the amount of habitat available for grassland birds. This would increase the amount of contiguous grassland with moderate to high structural diversity from 2,200 acres to 3,300 acres (see section 4.4.2 Grasslands: Direct, Indirect, and Cumulative Effects in this chapter). Increased grassland diversity would provide habitat for a wider range of grassland bird species.

4.4.8 Raptors: Direct and Indirect Effects

Factors considered in the analysis:

- Amount of prey
- Amount of suitable nesting habitat

Raptors require adequate prey and nesting habitat that varies by species.

All Alternatives

Under all alternatives use of the Refuge by raptors is expected to remain at present levels or increases slightly. Removal of woody vegetation within grasslands would mean fewer perch sites, but nesting habitat would be available in forested areas especially along stream corridors. Each alternative calls for increasing the amount and structural diversity of grasslands to varying

degrees, which in general would improve conditions for many wildlife species preyed on by raptors.

Alternatives 2, 3, 4, 5, and 6

In addition to the effects described above, under these alternatives changes in Refuge wetlands (see section 4.4.1 Wetlands: Direct, Indirect, and Cumulative Effects in this chapter), water quality, and the addition of riverine habitat and channel dynamics (see section 4.3.2 Hydrology and Water Quality: Direct, Indirect, and Cumulative Effects in this chapter) would create habitat for reptiles, amphibians, and other wetland wildlife used as food by raptors.

4.4.9 Fish and Mollusks: Direct and Indirect Effects

Factors considered in the analysis:

- Water quality
- In-stream diversity
- Available food

Mollusks are found in Refuge streams. Fish are found in Refuge streams and wetlands. Water quality, diversity of in-stream habitat, and food availability affect the abundance and diversity of fish, and water quality affects the presence and abundance of mollusks. This analysis will consider the effects of the alternatives on these factors. See Chapter 3: Affected Environment and Current Management for additional information on fish and mollusks found on the Refuge.

Alternative 1, No Action

Under this alternative fish and mollusk abundance may decrease below present levels. There would be no change to in-stream habitat diversity, but water quality, which also affects food availability within Refuge streams and wetlands would likely continue to decline because of the continuous accumulation of contaminants and sediments (see section 4.3.2 Hydrology and Water Quality: Direct, Indirect, and Cumulative Effects in this chapter).

Alternatives 2, 3, 4, 5, and 6

Under these alternatives, fish and mollusks are expected to remain at present levels or increase. The addition of riverine habitat and channel dynamics and other actions are expected to increase in-stream habitat diversity and improve water quality (see section 4.3.2 Hydrology and Water Quality: Direct, Indirect, and Cumulative Effects in this chapter), which would benefit mollusks and fish. Changes in Refuge wetlands (see section 4.4.1 Wetlands: Direct, Indirect, and Cumulative Effects in this chapter) would increase wetland vegetation and associated invertebrates which are a food source for fish.

4.4.10 Dakota skipper and other prairie butterflies: Direct and Indirect Effects

Factors considered in the analysis:

- Floristic composition and structural diversity

The Dakota skipper, like many prairie butterflies, has specific associations with plant species. Many of these plants are closely associated with remnant prairie (areas with native grasses and

forbs as well as untilled soils), which has the greatest floristic and structural diversity among Refuge grasslands (see section 4.4.2 Grasslands: Direct, Indirect, and Cumulative Effects in this chapter). This analysis considers the effects of the alternatives on the floristic composition and structural diversity of remnant prairie occurring on the Refuge. See Chapter 3: Affected Environment and Current Management for additional information on Refuge butterflies and grasslands.

All Alternatives

Under all alternatives, the floristic and structural diversity of the 1,700 acres of remnant prairie is expected to remain the same or increase and would create habitat conditions favorable for the Dakota skipper and other prairie butterflies. Despite a stable amount of habitat, the Dakota skipper or other prairie butterflies may not be present on the Refuge. Other factors including the amount of habitat patches available beyond the Refuge and annual weather patterns affect populations and breeding success of prairie butterflies.

4.4.11 Beaver and muskrat: Direct and Indirect Effects

Factors considered in the analysis:

- Suitable water depth
- Stable water levels

Beaver and muskrat strongly affect wetland habitat. Beavers build dams that impound water and create wetland habitat. Wetland vegetation is used by both muskrats and beavers for food and lodging, which affects its amount and distribution and influences the availability and use of wetlands by other wildlife. This analysis considers the effect of the alternatives on water levels and depths and their influence on the extent of beaver and muskrat activity.

Alternative 1

A discussion of the effects of this alternative on water levels and depths is included under 4.4.1 Wetlands: Direct, Indirect, and Cumulative Effects in this chapter. Cattails and other emergent plants used by beavers and muskrats would remain at present levels or increase, but unstable water levels would prevent continuous access to these plants and hamper lodge or hurt construction. Beaver and muskrat activity would be confined to areas where it presently occurs.

Alternatives 2, 3, 4, 5, and 6

A discussion of the effects of these alternatives on water levels and depths is included under section 4.4.1 Wetlands: Direct, Indirect, and Cumulative Effects in this chapter. Stable water levels would increase access to emergent plants, especially cattails, for muskrats and beavers, which would create openings in the otherwise dense stands. These openings would allow access and use by other wildlife. Stable water levels for longer durations would allow muskrats to colonize additional areas and create additional wetland habitat. The extent of beaver and muskrat activity would increase beyond present levels.

4.5 Social Environment

4.5.1 Wildlife Disturbance Effects

Factors considered in the analysis:

- Proportion of Refuge affected

Big Stone NWR offers opportunities for six priority wildlife-dependent public uses: hunting, fishing, wildlife observation, wildlife photography, environmental education, and environmental interpretation. In addition the Refuge also offers opportunities for the following compatible and appropriate uses: wild edibles gathering, trapping, firewood cutting, periodic special events, farming, haying, and grazing in support of land management objectives. The potential to disturb wildlife is an element common to all uses occurring on the Refuge. This analysis discusses the amount of potential wildlife disturbance from these uses for all alternatives.

All Alternatives

Studies by Blumstein (2003) and Blumstein et al., (2003) show that ‘flight-initiation-distance’ varies by species and intruder starting distance as well as by things such as flock size, angle of approach, time of year, time of day, reproductive state, distance to refuge, and type of disturbance. Given these complexities, it is not possible to determine the level of disturbance generated by each activity. It is likely there is a zone of influence on either side of existing travel ways where some level of wildlife disturbance occurs from all sources. It is also likely that wildlife disturbance is more widespread for activities not confined to a corridor such as a road or trail.

There are no specific studies regarding wildlife disturbance at Big Stone NWR, but a study conducted in and around Boulder, Colorado, Miller et al., (1998) found that composition and abundance of birds were altered adjacent to trails in both grassland and forest ecosystems. The authors noted the cause could be the physical presence of the trail, associated human disturbance, or both factors acting in concert. These effects, for most bird species, were largely confined to a zone of influence extending approximately 250 feet on either side of trails and may be less pronounced in areas with less human development and recreational use than the study area.

We applied this concept as one measure of potential wildlife disturbance from activities that occur along specified travel ways on the Refuge. This analysis method shows that a little more than 1,000 acres, about 8.6 percent of the total Refuge area, are potentially affected. This would remain the same under Alternatives 1, 2, 4, and 6, and would increase under Alternatives 3 and 5, which each include a proposal to increase the amount of access to the Refuge.

Appendix A: Implementation of the Preferred Alternative (Draft CCP)

The purpose of this appendix is to make it easier for the reader to understand the preferred alternative and what would be required to implement it. U.S. Fish and Wildlife Service (FWS, Service) policy directs that certain elements be included in a Comprehensive Conservation Plan (CCP). Most of those elements are included in the Draft Comprehensive Conservation Plan/Environmental Assessment (CCP/EA). Elements dealing with the implementation of the plan, not included in the Draft CCP/EA, are included in this appendix. Also included are the goals, objectives, and rationale. Following public review and comment of the Draft CCP/EA, we will produce a stand-alone CCP that draws on much of the information in the EA.

Goals, Objectives, and Rationale

Goals, objectives, rationale, and strategies comprise the management direction described in the preferred alternative below. Goals are descriptive broad statements of desired future conditions that convey a purpose. There are three goals for Big Stone National Wildlife Refuge (NWR, Refuge), one each for habitat, wildlife, and people. Goals are followed by objectives, specific statements that describe management intent. Objectives provide detail and are supported by rationale statements that describe background, history, assumptions, and technical details to help understand how the objective was formulated. Finally, beneath each objective are lists of potential strategies—specific actions, tools, and techniques that could be used to fulfill the objective.

Habitat Goal

Big Stone National Wildlife Refuge (NWR, Refuge) 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.

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 and Minnesota Pollution Control Agency 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 Minnesota Pollution Control Agency 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 Minnesota Pollution Control Agency, South Dakota Department of Environment and Natural Resources, and the Environmental Protection Agency 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 its 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 interspersed 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 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.

Wildlife Goal

The Refuge 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 interspersed 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 (currently estimated at 275 pairs) within Refuge grassland habitats by 10 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, we analyzed 10 years of data from the Refuge's Breeding Bird Survey (BBS). The 10 year average for bobolink was 28.2 males/BBS route. The breeding population estimate was derived from formulas that were used in Rosenberg and Blancher, 2005. This study focused on setting numerical population objectives for priority landbird species. Population estimates were developed from BBS data. Attributes for the formulas included: BBS average number of birds/route, pair correction, detection area correction, and time of day correction

factors. For bobolinks: 28.2 males/route X 2 (pair correction) X 4 (detection area correction) X 1.21 (time of day correction) = 273 pairs.

When evaluating datasets to develop a population objective for bobolink, we reviewed the habitat model for bobolink developed and provided by HAPET. Refuge data was clipped out of the regional data layer of bobolink pairs. The data indicate that approximately 3,000 pairs of bobolink 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 a refuge. The density estimates in the model have not been verified on the ground. So 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. With the habitat enhancements that are planned we could expect at least a 10% increase in the breeding bobolink population.

Potential Strategy

- Annually monitor bobolink breeding pairs within Refuge grasslands.

People Goal

The Refuge 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.

Implementation

This section summarizes the actions, funding, coordination, and monitoring to implement the CCP. As noted on the inside cover of this document, this plan does not constitute a commitment for staffing increases or operational and maintenance increases. These decisions

are at the discretion of Congress in overall appropriations and in budget allocation decisions made at the Washington and Regional levels of the Service.

New and Existing Projects

This CCP outlines an ambitious course of action for the future management of Big Stone NWR. It will require considerable staff commitment as well as funding commitment to actively manage the wildlife habitats and to add, improve, and maintain public use facilities. The Refuge will continually need appropriate operational and maintenance funding to implement the objectives in this plan. A full listing of unfunded Refuge projects and operational needs can be found in appendix E along with a brief description of the highest priority Refuge projects.

Staffing

Implementing the vision set forth in this CCP will require changes in the organizational structure of the Refuge. Existing staff will direct their time and energy in new directions, and new staff members will be added to assist in these efforts. Table A-1 presents current staffing and the increases proposed for the Refuge in this plan.

Table A-1 Current and Proposed Staffing Under the CCP

Current Staff	Proposed Additions
Project Leader	Law Enforcement Officer
Wildlife Refuge Specialist	Park Ranger
Wildlife Refuge Specialist	Maintenance Worker
Wildlife Biologist	Tractor Operator
Administrative Technician	
Prescribed Fire Specialist	
Range Technician (Fire)	
Maintenance Mechanic	

Partnership Opportunities

Partnerships are an essential element for the successful accomplishment of goals, objectives, and strategies at Big Stone NWR. The objectives outlined in this CCP need the support and the partnerships of federal, state and local agencies, non-governmental organizations, and individual citizens. Refuge staff will continue to seek creative partnership opportunities to achieve the vision of the Refuge.

We expect to continue to work with the following notable partners, while developing new partnerships:

- U.S. Army Corps of Engineers
- Minnesota Department of Natural Resources
- Ducks Unlimited
- Upper Minnesota River Watershed District
- Pheasants Forever
- The Nature Conservancy

Step-Down Management Plans

The CCP is a plan that provides general concepts and specific wildlife, habitat, and people-related objectives. Step-down management plans provide greater detail to managers and employees who will carry out the strategies described in the CCP. The Refuge staff will revise or develop the following step-down plans:

Step-down Management Plan	Estimated time of completion after CCP approval
Habitat Management Plan	1 year
Visitor Services Plan	2 years
Inventory and Monitoring Plan	2 years

Monitoring and Evaluation

The direction set forth in this CCP and specifically-identified strategies and projects will be monitored throughout the life of this plan. On a periodic basis, the Regional Office will assemble a station review team whose purpose will be to visit the Refuge and evaluate current activities in light of this plan. The team will review all aspects of Refuge management, including direction, accomplishments, and funding. The goals and objectives presented in this CCP will provide the baseline for evaluation of this field station.

Plan Review and Revision

The CCP is meant to provide guidance to the Refuge Manager and staff over the next 15 years. However, the CCP is also a dynamic and flexible document, and several of the strategies contained in this plan are subject to uncontrollable events of nature. Likewise, many of the strategies are dependent upon Service funding for staff and projects. Because of all these factors, the recommendations in the CCP will be reviewed periodically and, if necessary, revised to meet new circumstances. If any revisions are major, the review and revision process will include the public.

Appendix B: Glossary

Alternative

A set of objectives and strategies needed to achieve refuge goals and the desired future condition.

Biological Diversity

The variety of life forms and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Compatible Use

A wildlife-dependent recreational use, or any other use on a refuge that will not materially interfere with or detract from the fulfillment of the mission of the Service or the purposes of the refuge.

Comprehensive Conservation Plan

A document that describes the desired future conditions of the refuge, and specifies management actions to achieve refuge goals and the mission of the National Wildlife Refuge System. Often referred to as a “CCP.”

Cultural Resources

“Those parts of the physical environment—natural and built—that have cultural value to some kind of sociocultural group . . . [and] those non-material human social institutions . . .” Cultural resources include historic sites, archeological sites and associated artifacts, sacred sites, traditional cultural properties, cultural items (human remains, funerary objects, sacred objects, and objects of cultural patrimony), and buildings and structures.

Ecosystem

A dynamic and interrelated complex of plant and animal communities and their associated non-living environment.

Ecosystem Approach

A strategy or plan to protect and restore the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.

Ecosystem Management

Management of an ecosystem that includes all ecological, social and economic components that make up the whole of the system.

Endangered Species

Any species of plant or animal defined through the Endangered Species Act of 1973 as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.

Environmental Assessment

A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.

Extirpation

The local extinction of a species that is no longer found in a locality or country but exists elsewhere in the world.

Goals

Descriptive statements of desired future conditions.

Interjurisdictional Fish

Fish that occur in waters under the jurisdiction of one or more states, for which there is an interstate fishery management plan or which migrates between the waters under the jurisdiction of two or more states bordering on the Great Lakes.

Issue

Any unsettled matter that requires a management decision. For example, a resource management problem, concern, a threat to natural resources, a conflict in uses, or in the presence of an undesirable resource condition.

National Wildlife Refuge System

All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife and plant resources. Often referred to as “NWRS” or “Refuge System.”

Objectives

A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies.

Preferred Alternative

The Service's selected alternative identified in the Draft Comprehensive Conservation Plan.

Scoping

A process for determining the scope of issues to be addressed by a comprehensive conservation plan and for identifying the significant issues. Involved in the scoping process are federal, state, and local agencies; private organizations, and individuals.

Species

A distinctive kind of plant or animal having distinguishable characteristics, and that can

interbreed and produce young. A category of biological classification.

Strategies

A general approach or specific actions to achieve objectives.

Threatened Species

Those plant or animal species likely to become endangered species throughout all of or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the Endangered Species Act of 1973 and published in the Federal Register.

Undertaking

“A project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval...,” i.e., all federal actions.

Vegetation

Plants in general, or the sum total of the plant life in an area.

Vegetation Type

A category of land based on potential or existing dominant plant species of a particular area.

Watershed

The entire land area that collects and drains water into a stream or stream system.

Wetland

Areas such as lakes, marshes, and streams that are inundated by surface or ground water for a long enough period of time each year to support, and that do support under natural conditions, plants and animals that require saturated or seasonally saturated soils.

Wildlife-dependent Recreational Use

A use of refuge that involves hunting, fishing, wildlife observation and photography, or environmental education and interpretation, as identified in the National Wildlife Refuge System Improvement Act of 1997.

Wildlife Diversity

A measure of the number of wildlife species in an area and their relative abundance.

Waterbirds

This general category includes all birds that inhabit lakes, marshes, streams and other wetlands at some point during the year. The group includes all waterfowl, such as ducks, geese, and swans, and other birds such as loons, rails, cranes, herons, egrets, ibis, cormorants, pelicans, shorebirds, and passerines that nest and rely on wetland vegetation.

Appendix C: Species Lists

In this appendix

Big Stone NWR Bird Checklist
 Big Stone NWR Butterflies
 Big Stone NWR Fish Species
 Big Stone NWR Mammal Species
 Big Stone NWR Plants
 Big Stone NWR Reptiles and Amphibians

Big Stone NWR Bird Checklist

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
Greater White-fronted Goose <i>Anser albifrons</i>	uncommon		uncommon	
Snow Goose <i>Chen caerulescens</i>	uncommon	rare	common	rare
Ross' Goose <i>Chen rossii</i>	rare		rare	
Canada Goose* <i>Branta canadensis</i>	abundant	abundant	abundant	rare
Tundra Swan <i>Cygnus columbianus</i>	occasional		occasional	
Wood Duck* <i>Aix sponsa</i>	common	common	common	
Gadwall* <i>Anas strepera</i>	abundant	common	abundant	
American Wigeon* <i>Anas americana</i>	common	uncommon	common	
American Black Duck <i>Anas rubripes</i>	rare	rare	rare	
Mallard* <i>Anas platyrhynchos</i>	abundant	abundant	abundant	rare
Blue-winged Teal* <i>Anas discors</i>	abundant	abundant	abundant	
Northern Shoveler* <i>Anas clypeata</i>	abundant	abundant	abundant	
Northern Pintail* <i>Anas acuta</i>	common	uncommon	common	
American Green-winged Teal* <i>Anas crecca</i>	common	uncommon	common	
Canvasback* <i>Aythya valisineria</i>	uncommon	uncommon	common	
Redhead* <i>Aythya americana</i>	uncommon	uncommon	common	
Ring-necked Duck* <i>Aythya collaris</i>	abundant	rare	common	rare
Lesser Scaup <i>Aythya affinis</i>	common	rare	common	rare

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
Bufflehead <i>Bucephala albeola</i>	common	rare	common	
Common Goldeneye <i>Bucephala clangula</i>	common		common	rare
Barrow's Goldeneye <i>Bucephala islandica</i>	rare		rare	
Hooded Merganser* <i>Lophodytes cucullatus</i>	common	common	common	rare
Common Merganser <i>Mergus merganser</i>	occasional		occasional	rare
Red-breasted Merganser <i>Mergus serrator</i>	rare		rare	
Ruddy Duck* <i>Oxyura jamaicensis</i>	uncommon	uncommon	common	
Gray Partridge* <i>Perdix perdix</i>	uncommon	uncommon	uncommon	uncommon
Ring-necked Pheasant* <i>Phasianus colchicus</i>	abundant	abundant	abundant	abundant
Sharp-tailed Grouse <i>Tympanuchus phasianellus</i>	uncommon	uncommon	uncommon	uncommon
Greater Prairie Chicken* <i>Tympanuchus cupido</i>	uncommon	uncommon	uncommon	uncommon
Wild Turkey* <i>Meleagris gallopavo</i>	common	common	common	uncommon
Common Loon <i>Gavia immer</i>	rare		rare	
Pied-billed Grebe* <i>Podilymbus podiceps</i>	common	common	common	
Horned Grebe <i>Podiceps auritus</i>	occasional		occasional	
Red-necked Grebe <i>Podiceps grisegena</i>	rare	rare	rare	
Eared Grebe* <i>Podiceps nigricollis</i>	uncommon	uncommon		
Western Grebe* <i>Aechmophorus occidentals</i>	occasional	rare	occasional	
American White Pelican <i>Pelecanus erythrorhynchos</i>	common	common	common	
Double-crested Cormorant* <i>Phalacrocorax auritus</i>	common	common	common	
Pelagic Cormorant <i>Phalacrocorax pelagicus</i>		rare		
American Bittern* <i>Botaurus lentiginosus</i>	uncommon	uncommon	uncommon	
Least Bittern* <i>Ixobrychus exilis</i>	uncommon	uncommon	uncommon	
Great Blue Heron* <i>Ardea herodias</i>	common	common	common	
Great Egret* <i>Ardea herodias</i>	common	common	common	

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
<i>Ardea alba</i>				
Snowy Egret* <i>Egretta thula</i>	rare		rare	
Little Blue Heron <i>Egretta caerulea</i>	occasional	occasional	occasional	
Cattle Egret <i>Bubulcus ibis</i>	rare	rare	rare	
Green Heron* <i>Butorides virescens</i>	occasional	occasional	occasional	
Black-crowned Night-Heron <i>Nycticorax nycticorax</i>	uncommon	uncommon	uncommon	
Yellow-crowned Night-Heron <i>Nyctanassa violaceus</i>	rare	rare	rare	
White-faced Ibis <i>Plegadis chihi</i>		rare		
Turkey Vulture* <i>Cathartes aura</i>	common	common	common	
Osprey <i>Pandion haliaetus</i>	rare	rare	rare	
Bald Eagle* <i>Haliaeetus leucocephalus</i>	uncommon	uncommon	uncommon	
Northern Harrier* <i>Circus cyaneus</i>	common	common	common	rare
Sharp-shinned Hawk <i>Accipiter striatus</i>	occasional	rare	occasional	rare
Cooper’s Hawk <i>Accipiter cooperii</i>	rare	rare	occasional	rare
Northern Goshawk <i>Accipiter gentilis</i>	rare	rare	rare	
Broad-winged Hawk <i>Buteo platypterus</i>	rare		rare	
Swainson’s Hawk* <i>Buteo swainsoni</i>	occasional	occasional	occasional	
Red-tailed Hawk* <i>Buteo jamaicensis</i>	common	common	common	rare
Rough-legged Hawk <i>Buteo lagopus</i>	rare		rare	rare
Golden Eagle <i>Aquila chrysaetos</i>	rare		rare	
American Kestrel* <i>Falco sparverius</i>	uncommon	uncommon	uncommon	rare
Merlin <i>Falco columbarius</i>	rare	rare	rare	rare
Peregrine Falcon <i>Falco peregrinus</i>	rare		rare	
Prairie Falcon <i>Falco mexicanus</i>	rare		rare	
King Rail <i>Rallus elegans</i>	rare	rare	rare	

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
Virginia Rail* <i>Rallus limicola</i>	common	common	common	
Sora* <i>Porzana carolina</i>	common	common	common	
Common Moorhen <i>Gallinula chloropus</i>	rare			
American Coot* <i>Fulica Americana</i>	abundant	common	abundant	
Sandhill Crane <i>Grus canadensis</i>	rare			
Black-bellied Plover <i>Pluvialis squatarola</i>	uncommon	uncommon		
American Golden-plover <i>Pluvialis dominica</i>	uncommon	uncommon		
Snowy Plover* <i>Charadrius alexandrinus</i>	rare	rare		
Semipalmated Plover <i>Charadrius semipalmatus</i>	rare	common	rare	
Piping Plover <i>Charadrius melodus</i>	rare			
Killdeer* <i>Charadrius vociferus</i>	common	common	common	
American Avocet* <i>Recurvirostra americana</i>	rare	rare	rare	
Spotted Sandpiper* <i>Actitis macularius</i>	common	common	common	
Solitary Sandpiper <i>Tringa solitaria</i>	rare	uncommon	rare	
Greater Yellowlegs* <i>Tringa melanoleuca</i>	common	common	uncommon	
Willet <i>Tringa semipalmata</i>	rare		rare	
Lesser Yellowlegs* <i>Tringa flavipes</i>	common	common	rare	
Upland Sandpiper* <i>Bartramia longicauda</i>	uncommon	uncommon	uncommon	
Hudsonian Godwit <i>Limosa haemastica</i>	rare	rare	rare	
Marbled Godwit* <i>Limosa fedoa</i>	uncommon	uncommon	uncommon	
Ruddy Turnstone <i>Arenaria interpres</i>	rare	rare		
Sanderling <i>Calidris alba</i>	rare	rare		
Semipalmated Sandpiper* <i>Calidris pusilla</i>	common	common	uncommon	
Western Sandpiper <i>Calidris mauri</i>	rare	rare		
Least Sandpiper	common	common	uncommon	

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
<i>Calidris minutilla</i>				
White-rumped Sandpiper <i>Calidris fuscicollis</i>	common	rare		
Baird’s Sandpiper <i>Calidris bairdii</i>	uncommon	rare		
Pectoral Sandpiper <i>Calidris melanotos</i>	uncommon	common	rare	
Dunlin <i>Calidris alpina</i>	uncommon	uncommon		
Stilt Sandpiper <i>Calidris himantopus</i>	rare	common	rare	
Buff-breasted Sandpiper <i>Tryngites subruficollis</i>		occasional		
Ruff <i>Philomachus pugnax</i>		rare		
Short-billed Dowitcher <i>Limnodromus griseus</i>	rare	common	rare	
Long-billed Dowitcher <i>Limnodromus scolopaceus</i>	rare	uncommon	rare	
Common Snipe* <i>Gallinago gallinago</i>	common	common	common	
American Woodcock* <i>Scolopax minor</i>	uncommon	uncommon	uncommon	
Wilson’s Phalarope <i>Phalaropus tricolor</i>	common	uncommon		
Sabine’s Gull <i>Xema sabini</i>	rare		rare	
Bonaparte’s Gull <i>Leucophaeus philadelphia</i>	uncommon	rare	uncommon	
Franklin’s Gull* <i>Leucophaeus pipixcan</i>	common	common	common	
Ring-billed Gull <i>Larus delawarensis</i>	common	common	common	rare
Herring Gull <i>Larus argentatus</i>	uncommon	uncommon	uncommon	rare
Caspian Tern <i>Sterna caspia</i>	rare	rare	rare	
Black Tern* <i>Chlidonias niger</i>	common	common	rare	
Common Tern* <i>Sterna hirundo</i>	common	common	common	
Forster’s Tern* <i>Sterna forsteri</i>	common	common	uncommon	
Rock Pigeon* <i>Columbia livia</i>	uncommon	uncommon	uncommon	uncommon
Mourning Dove* <i>Zenaida macroura</i>	abundant	abundant	abundant	
Yellow-billed Cuckoo <i>Coccyzus americanus</i>	uncommon	uncommon	uncommon	

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i>	uncommon	uncommon	uncommon	
Eastern Screech-owl* <i>Otus asio</i>	uncommon	uncommon	uncommon	uncommon
Great Horned Owl* <i>Bubo virginianus</i>	uncommon	uncommon	uncommon	uncommon
Snowy Owl <i>Nyctea scandiaca</i>	rare			rare
Barred Owl <i>Strix varia</i>	occasional	occasional	occasional	occasional
Long-eared Owl <i>Asio otus</i>			rare	
Short-eared Owl <i>Asio flammeus</i>	occasional	occasional	occasional	occasional
Northern Saw-whet Owl <i>Aegolius acadicus</i>			rare	
Common Nighthawk* <i>Chordeiles minor</i>	common	common	common	
Chimney Swift* <i>Chaetura pelagica</i>	uncommon	occasional	uncommon	
Ruby-throated Hummingbird* <i>Archilochus colubris</i>	uncommon	uncommon	rare	
Belted Kingfisher* <i>Megaceryle alcyon</i>	uncommon	uncommon	uncommon	rare
Red-headed Woodpecker* <i>Melanerpes erythrocephalus</i>	uncommon	common	rare	
Red-bellied Woodpecker* <i>Melanerpes carolinus</i>	rare	rare	rare	rare
Yellow-bellied Sapsucker* <i>Sphyrapicus varius</i>	uncommon	uncommon	occasional	
Downy Woodpecker* <i>Picoides pubescens</i>	common	common	common	common
Hairy Woodpecker* <i>Picoides villosus</i>	common	common	common	common
Northern Flicker* <i>Colaptes auratus</i>	common	common	common	rare
Pileated Woodpecker <i>Dryocopus pileatus</i>	uncommon	uncommon	uncommon	uncommon
Eastern Wood-pewee* <i>Contopus virens</i>	rare	rare	rare	
Willow Flycatcher <i>Empidonax traillii</i>	uncommon	uncommon	uncommon	
Least Flycatcher <i>Empidonax minimus</i>	uncommon	uncommon	uncommon	
Eastern Phoebe* <i>Sayornis phoebe</i>	uncommon	rare	rare	
Say's Phoebe <i>Sayornis saya</i>	rare		rare	
Great Crested Flycatcher	uncommon	rare	rare	

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
<i>Myiarchus crinitus</i>				
Western Kingbird* <i>Tyrannus verticalis</i>	uncommon	uncommon	uncommon	
Eastern Kingbird* <i>Tyrannus tyrannus</i>	common	common	uncommon	
Loggerhead Shrike <i>Lanius ludovicianus</i>	occasional			
Northern Shrike <i>Lanius excubitor</i>	occasional		occasional	rare
Cassin’s Vireo <i>Vireo cassinii</i>	uncommon			
Warbling Vireo <i>Vireo gilvus</i>	common	uncommon	uncommon	
Philadelphia Vireo <i>Vireo philadelphicus</i>	occasional			
Red-eyed Vireo <i>Vireo olivaceus</i>	uncommon	common		
Blue Jay* <i>Cyanocitta cristata</i>	uncommon	uncommon	uncommon	uncommon
Back-billed Magpie <i>Pica hudsonia</i>	rare		rare	rare
American Crow* <i>Corvus brachyrhynchos</i>	common	common	common	uncommon
Horned Lark* <i>Eremophila alpestris</i>	common	uncommon	common	common
Purple Martin* <i>Progne subis</i>	uncommon	uncommon	rare	
Tree Swallow* <i>Tachycineta bicolor</i>	common	common	common	
Northern Rough-winged Swallow* <i>Stelgidopteryx serripennis</i>	common	uncommon	common	
Bank Swallow* <i>Riparia riparia</i>	common	common	common	
Cliff Swallow* <i>Petrochelidon pyrrhonota</i>	common	common	common	
Barn Swallow* <i>Hirundo rustica</i>	common	common	common	
Black-capped Chickadee* <i>Poecile atricapillus</i>	common	common	common	uncommon
Red-breasted Nuthatch <i>Sitta canadensis</i>				rare
White-breasted Nuthatch* <i>Sitta carolinensis</i>	common	common	common	common
Brown Creeper <i>Certhia americana</i>	uncommon		uncommon	uncommon
House Wren* <i>Troglodytes aedon</i>	common	common	common	rare
Winter Wren <i>Troglodytes troglodytes</i>	rare			

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
Sedge Wren* <i>Cistothorus platensis</i>	common	common	common	
Marsh Wren* <i>Cistothorus palustris</i>	common	common	common	
Golden-crowned Kinglet <i>Regulus satrapa</i>	uncommon		uncommon	rare
Ruby-crowned Kinglet <i>Regulus calendula</i>	common		common	
Eastern Bluebird* <i>Sialia sialis</i>	uncommon	uncommon	uncommon	
Veery <i>Catharus fuscescens</i>	occasional		occasional	
Gray-cheeked Thrush <i>Catharus minimus</i>	rare		rare	
Swainson’s Thrush <i>Catharus ustulatus</i>	uncommon		uncommon	
Hermit Thrush <i>Catharus guttatus</i>	uncommon		uncommon	
Wood Thrush <i>Hylocichla mustelina</i>	rare		rare	
American Robin* <i>Turdus migratorius</i>	common	common	common	rare
Gray Catbird* <i>Dumetella carolinensis</i>	common	common	common	
Brown Thrasher* <i>Toxostoma rufum</i>	common	common	common	
European Starling* <i>Sturnus vulgaris</i>	common	common	common	common
Cedar Waxwing <i>Bombycilla cedrorum</i>	uncommon	uncommon	uncommon	rare
Golden-winged Warbler <i>Vermivora chrysoptera</i>	rare			
Tennessee Warbler <i>Vermivora peregrina</i>	uncommon			
Orange-crowned Warbler <i>Vermivora celata</i>	uncommon		common	
Nashville Warbler <i>Vermivora ruficapilla</i>	uncommon		uncommon	
Yellow Warbler* <i>Dendroica petechia</i>	common	common	common	
Chestnut-sided Warbler <i>Dendroica pensylvanica</i>	rare			
Magnolia Warbler <i>Dendroica magnolia</i>	occasional			
Cape May Warbler <i>Dendroica tigrina</i>	occasional			
Black-throated Green Warbler <i>Dendroica virens</i>	occasional			
Yellow-rumped Warbler	common		common	

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
<i>Dendroica coronata</i>				
Pine Warbler <i>Dendroica pinus</i>	rare			
Palm Warbler <i>Dendroica palmarum</i>	rare			
Blackpoll Warbler <i>Dendroica striata</i>	rare			
Black-and-white Warbler <i>Mniotilta varia</i>	common	rare	uncommon	
American Redstart <i>Setophaga ruticilla</i>	uncommon	uncommon		
Ovenbird <i>Seiurus aurocapillus</i>	uncommon			
Northern Waterthrush <i>Seiurus noveboracensis</i>	rare		occasional	
Mourning Warbler <i>Oporornis philadelphia</i>	rare			
Common Yellowthroat* <i>Geothlypis trichas</i>	common	common	common	
Wilson’s Warbler <i>Wilsonia pusilla</i>	rare		occasional	
Canada Warbler <i>Wilsonia canadensis</i>	uncommon		uncommon	
Yellow-breasted Chat <i>Icteria virens</i>	occasional	rare	occasional	
Eastern Towhee <i>Pipilo erythrophthalmus</i>	uncommon	rare	rare	
American Tree Sparrow <i>Spizella arborea</i>	common	common	common	uncommon
Chipping Sparrow* <i>Spizella passerina</i>	common	common	common	uncommon
Clay-colored Sparrow* <i>Spizella pallida</i>	common	common	occasional	
Field Sparrow* <i>Spizella pusilla</i>	common	common	uncommon	
Vesper Sparrow* <i>Poocetes gramineus</i>	common	common	common	
Lark Sparrow <i>Chondestes grammacus</i>	occasional			
Savannah Sparrow* <i>Passerculus sandwichensis</i>	uncommon	uncommon	uncommon	
Grasshopper Sparrow* <i>Ammodramus savannarum</i>	common	common	common	
Henslow’s Sparrow <i>Ammodramus henslowii</i>	rare	rare	rare	
Le Conte’s Sparrow <i>Ammodramus leconteii</i>	rare		rare	
Fox Sparrow <i>Passerelia iliaca</i>	uncommon		uncommon	

Common Name <i>Scientific name</i>	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
Song Sparrow* <i>Melospiza melodia</i>	common	common	common	rare
Lincoln’s Sparrow <i>Melospiza lincolnii</i>	common		common	
Swamp Sparrow <i>Melospiza georgiana</i>	uncommon	uncommon	uncommon	
White-throated Sparrow <i>Zonotrichia albicollis</i>	common		common	
Harris’ Sparrow <i>Zonotrichia querula</i>	uncommon		common	rare
White-crowned Sparrow <i>Zonotrichia leucophrys</i>	uncommon		uncommon	
Dark-eyed Junco <i>Junco hyemalis</i>	uncommon		uncommon	uncommon
Lapland Longspur <i>Calcarius lapponicus</i>	rare			rare
Snow Bunting <i>Plectrophenax nivalis</i>	rare		uncommon	uncommon
Summer Tanager <i>Piranga rubra</i>	occasional	rare		
Scarlet Tanager <i>Piranga olivacea</i>	occasional	rare	rare	
Northern Cardinal* <i>Cardinalis cardinalis</i>	occasional	occasional	rare	rare
Rose-breasted Grosbeak* <i>Pheucticus ludovicianus</i>	uncommon	uncommon	rare	
Indigo Bunting* <i>Passerina cyanea</i>	rare	occasional	rare	
Dickcissel* <i>Spiza americana</i>	uncommon	common	uncommon	
Bobolink* <i>Dolichonyx oryzivorus</i>	common	common	common	
Red-winged Blackbird* <i>Agelaius phoeniceus</i>	common	common	common	rare
Western Meadowlark* <i>Stumella neglecta</i>	common	common	common	rare
Yellow-headed Blackbird* <i>Xanthocephalus xanthocephalus</i>	common	common	common	rare
Rusty Blackbird <i>Euphagus carolinus</i>	common		common	rare
Brewer’s Blackbird <i>Euphagus cyanocephalus</i>	uncommon	uncommon	uncommon	rare
Common Grackle* <i>Quiscalus quiscula</i>	common	common	common	rare
Brown-headed Cowbird* <i>Molothrus ater</i>	common	common	common	rare
Orchard Oriole* <i>Icterus spurius</i>	uncommon	rare		
Baltimore Oriole* <i>Icterus baltimorensis</i>	uncommon	uncommon	uncommon	

Common Name Scientific name	Spring (March–May)	Summer (June–August)	Fall (Sept. –Nov.)	Winter (Dec. –Feb.)
<i>Icterus galbula</i>				
Pine Grosbeak <i>Pinicola enucleator</i>				rare
Purple Finch <i>Carpodacus purpureus</i>	rare		uncommon	uncommon
Red Crossbill <i>Loxia curvirostra</i>	rare		rare	uncommon
White-winged Crossbill <i>Loxia leucoptera</i>			rare	rare
Common Redpoll <i>Acanthis flammea</i>	uncommon		rare	uncommon
Hoary Redpoll <i>Acanthis hornemanni</i>				rare
Pine Siskin <i>Acanthis pinus</i>	rare		rare	rare
American Goldfinch <i>Acanthis tristis</i>	common	common	common	uncommon
Evening Grosbeak <i>Coccothraustes vespertinus</i>			uncommon	rare
House Sparrow* <i>Passer domesticus</i>	common	common	common	common
Note: * - nests locally				

Big Stone NWR Butterflies

Common Name		
<i>Scientific name</i>		
Dakota Long Dash <i>Polites mystic dacotah</i>	Great Spangled Fritillary <i>Speyeria cybele</i>	Eastern-tailed Blue <i>Everes comyntas</i>
Tawny-edged Skipper <i>Polites themistocles</i>	Buckeye <i>Junonia coenia</i>	European Cabbage Butterfly <i>Artogela rapae</i>
Dakota Skipper <i>Hesperia dacotae</i>	Alfalfa Sulfur <i>Colias eurytheme</i>	Arge Tiger Moth <i>Grammia arge</i>
Poweshiek Skipperling <i>Oarisma poweshiek</i>	American Painted Lady <i>Vanessa virginiensis</i>	Eyed Brown <i>Lethe eurydice</i>
Lagus Skipper <i>Atrytone logan lagus</i>	Variiegated Fritillary <i>Euptoieta claudia</i>	Mulberry Wing <i>Poanes massasoit massasoit</i>
Least Skipper <i>Ancyloxypha numitor</i>	Sulfur <i>Eurema lisa</i>	Tiger Swallowtail <i>Pterourus glaucus glaucus</i>
Checkered Skipper <i>Pyrgus communis</i>	Common Wood Nymph <i>Cercyonis pegala</i>	Grey-veined White <i>Pieris napi oleracea</i>
Silver-spotted Skipper <i>Epargyreus clarus clarus</i>	Bronze Copper <i>Hylolycaena hyllus</i>	Cabbage Butterfly <i>Pieris rapae</i>
Pearl Crescent Skipper <i>Phycloides tharos</i>	Eight-spotted Forester <i>Alypia octomaculata</i>	Clouded Sulphur <i>Colias philodice</i>
Regal Fritillary <i>Speyeria idalia</i>	Coral Hairstreak <i>Harkenclenus titus</i>	Spring Azure <i>Celastrina argiolus</i>
Mourning Cloak <i>Nymphalis antiopa</i>	Todd's Meadow Fritillary <i>Clossiana bellona toddi</i>	Question Mark <i>Polygonia interrogationis</i>
Black Swallowtail <i>Papilio polyxenes asterius</i>	Little Wood Satyr <i>Megisto cymela</i>	Red Admiral <i>Vanessa atalanta rubia</i>
Melissa Blue <i>Lycaeides melissa</i>	Northern Brokan Dash <i>Wallengrenia egeremet</i>	Northern Pearly Eye <i>Enodia anhedon</i>
Viceroy <i>Basilarchia archippus</i>	Monarch Butterfly <i>Danaus plexippus</i>	Eyed Brown <i>Satyrode eurydice</i>
Northern Pearl Crescent <i>Phyciodes pascoensis</i>	Red-spotted Purple <i>Basilarchia arthemis</i>	Ringlet <i>Coenonympha tullia</i>
Carlota Checkerspot <i>Charidryas gorgone carlota</i>		

Big Stone NWR Fish Species

Common Name		
Scientific name		
Bowfin <i>Amia calva</i>	Topeka Shiner <i>Notropis topeka</i>	White Bass <i>Roccus chrysops</i>
Shortnose Gar <i>Lepisosteus platostomus</i>	Largemouth Buffalohead <i>Ictiobus cyprinellus</i>	Largemouth Bass <i>Micropterus salmoides</i>
Northern Pike <i>Esox lucius</i>	Quillback Carpsucker <i>Carpionodes cyprinus</i>	Smallmouth Bass <i>Micropterus dolomieu</i>
Central Mudminnow <i>Umbra limi</i>	Northern Redhorse <i>Moxostoma macrolepidotum</i>	Black Crappie <i>Pomoxis nigro maculatus</i>
European Carp <i>Cyprinus carpio</i>	White Sucker <i>Catostomus commersoni</i>	Rockbass <i>Ambloplites rupestris</i>
Flathead Minnow <i>Pimephales promelas</i>	Channel Catfish <i>Ictalurus punctatus</i>	Bluegill <i>Leopomis macrochirus</i>
Bluntnose Minnow <i>Pimephales notatus</i>	Yellow Bullhead <i>Ictalurus natalis</i>	Orange-spotted Sunfish <i>Leopomis humilis</i>
Northern Lake Chub <i>Couesius plumbea</i>	Brown Bullhead <i>Ictalurus nebulosus</i>	Yellow Perch <i>Perca flavescens</i>
Hornyhead Chub <i>Hybopsis biguttata</i>	Black Bullhead <i>Ictalurus melas</i>	Walleye <i>Stizostedion vitreum</i>
Common Shiner <i>Notropis cornutus</i>	Banded Killifish <i>Fundulus diaphanus</i>	Johnny Darter <i>Etheostoma nigrum</i>
Spottail Shiner <i>Notropis procne</i>	Ninespine Stickleback <i>Pungitius pungitius</i>	Iowa Darter <i>Etheostoma exile</i>
Emerald Shiner <i>Notropis atherinoides</i>	Brook Stickleback <i>Culaea inconstans</i>	Freshwater Drum <i>Aplodinotus grunniens</i>

Big Stone NWR Mammal Species

Common Name		
<i>Scientific name</i>		
Masked Shrew <i>Sorex cinereus</i>	Meadow Jumping Mouse <i>Zapus hudsonius</i>	Muskrat <i>Ondatra zibethicus</i>
Short-tailed Shrew <i>Blarina brevicauda</i>	Meadow Vole <i>Microtus pennsylvanicus</i>	Longtail Weasel <i>Mustela frenata</i>
Eastern Mole <i>Scalopus aquaticus</i>	Prairie Vole <i>Microtus ochrogaster</i>	Shorttail weasel <i>Mustela erminea</i>
Little Brown Myotis <i>Myotis lucifugus</i>	Plains Pocket Gopher <i>Geomys bursarius</i>	Mink <i>Mustela vison</i>
Silver-haired Bat <i>Lasionycteris noctivagans</i>	Richardson Ground Squirrel <i>Spermophilus richardsoni</i>	River Otter <i>Lutra canadensis</i>
Eastern Pipistrel <i>Pipistrellus subflavus</i>	Thirteen-lined Ground Squirrel <i>Spermophilus tridecemlineatus</i>	Raccoon <i>Procyon lotor</i>
Big Brown Bat <i>Eptesicus fuscus</i>	Franklin's Ground Squirrel <i>Spermophilus franklinii</i>	Striped Skunk <i>Mephitis mephitis</i>
Red Bat <i>Lasiurus borealis</i>	Eastern Chipmunk <i>Tamias striatus</i>	Spotted Skunk <i>Spilogale putorius</i>
Hoary Bat <i>Lasiurus cinereus</i>	Eastern Fox Squirrel <i>Sciurus niger</i>	Virginia Opossum <i>Didelphis virginiana</i>
White-footed Mouse <i>Peromyscus leucopus</i>	Eastern Gray Squirrel <i>Sciurus carolinensis</i>	Badger <i>Taxidea taxus</i>
Deer Mouse <i>Peromyscus maniculatus</i>	Red Squirrel <i>Tamiasciurus hudsonicus</i>	Red fox <i>Vulpes vulpes</i>
House Mouse <i>Mus musculus</i>	Woodchuck <i>Marmota monax</i>	Gray Fox <i>Urocyon cinereoargenteus</i>
Plains Pocket Mouse <i>Perognathus flavescens</i>	Eastern Cottontail <i>Sylvilagus floridanus</i>	Coyote <i>Canis latrans</i>
Western Harvest Mouse <i>Reithrodontomys megalotis</i>	Whitetail Jackrabbit <i>Lepus townsendii</i>	Bobcat <i>Lynx rufus</i>
Northern Grasshopper Mouse <i>Onychomys leucogaster</i>	Beaver <i>Castor canadensis</i>	Whitetail deer <i>Odocoileus virginianus</i>

Big Stone NWR Plants

Grasses		
Alkali grass <i>Puccinella nuttaliana</i>	Kentucky bluegrass <i>Poa pratensis</i>	Reed canarygrass <i>Phalaris arundinacea</i>
Big bluestem <i>Andropogon gerardii</i>	Large Crab-grass <i>Digitaria sanguinalis</i>	Rice cutgrass <i>Leersia oryzoides</i>
Blue grama <i>Bouteloua gracilis</i>	Little barley <i>Hordeum pusillum</i>	Salt grass <i>Distichlis stricta</i>
Bluejoint <i>Calamagrostis canadensis</i>	Little bluestem <i>Schizachyrium scoparium</i>	Sand dropseed <i>Sporobolus cryptandrus</i>
Bluejoint <i>Calamagrostis inexpansa</i>	Mat muhly <i>Muhlenbergia richardsonis</i>	Sand reedgrass <i>Calamovilfa longifolia</i>
Canada bluegrass <i>Poa compressa</i>	Needle and Thread <i>Stipa comata</i>	Side-oats grama <i>Bouteloua curtipendula</i>
Canada wild rye <i>Elymus canadensis</i>	Pale/Torrey's Manna-grass <i>Torreyochloa pallida</i>	Slender wheatgrass <i>Elymus tachycaulum</i>
Creeping bent <i>Agrostis stolonifera var. palustris</i>	Plains bluegrass <i>Poa arida</i>	Small Rush-grass <i>Sporobolus neglectus</i>
Foxtail <i>Alopecurus carolinianus</i>	Plains muhly <i>Muhlenbergia cuspidata</i>	Smooth brome grass <i>Bromus inermis</i>
Foxtail barley <i>Hordeum jubatum</i>	Plume grass <i>Phragmites australis</i>	Stinkgrass <i>Eragrostis cilianensis</i>
Green foxtail <i>Setaria viridis</i>	Porcupine grass <i>Stipa spartea</i>	Switchgrass <i>Panicum virgatum</i>
Green needlegrass <i>Stipa viridula</i>	Prairie cordgrass <i>Spartina pectinata</i>	Tall dropseed <i>Sporobolus asper</i>
Hairy chess <i>Bromus commutatus</i>	Prairie dropseed <i>Sporobolus heterolepis</i>	Timothy <i>Phleum pratense</i>
Hairy grama <i>Bouteloua hirsute</i>	Quackgrass <i>Agropyron repens</i>	Tufted hairgrass <i>Deschampsia caespitosa</i>
Indiangrass <i>Sorghastrum nutans</i>	Red threeawn <i>Aristida purpurea</i>	Virginia wild-rye <i>Elymus virginicus</i>
Junegrass <i>Koeleria macrantha</i>	Red top <i>Agrostis alba</i>	Witchgrass <i>Panicum capillare</i>
Kalm's Brome/Prairie Brome <i>Bromus kalmii</i>		

Aquatic Monocots		
American lotus <i>Nelumbo lutea</i>	Hardstem bulrush <i>Scirpus acutus</i>	Slender sedge <i>Carex tenera</i>
Arrowhead/Duck potato <i>Sagittaria latifolia</i>	Marsh marigold <i>Caltha palustris</i>	Slough sedge <i>Carex atherodes</i>
Blunt spikerush <i>Eleocharis obtusa</i>	Mudwort <i>Limosella aquatica</i>	Softstem bulrush <i>Scirpus validus</i>
Broad-leaved cattail <i>Typha latifolia</i>	Narrow-leaved cattail <i>Typha angustifolia</i>	Sun sedge <i>Carex inops subs. heliophila</i>
Common duckweed <i>Lemna minor</i>	Needle spikerush <i>Eleocharis acicularis</i>	Three-square bulrush <i>Scirpus americanus</i>
Coontail <i>Ceratophyllum demersum</i>	Needleleaf sedge <i>Carex elocharis</i>	Waterwort <i>Elatine triandra</i>

Aquatic Monocots		
Cypresslike sedge <i>Carex pseudocyperus</i>	Pondweeds <i>Potamogeton spp.</i>	White water lily <i>Nymphaea spp.</i>
Dudley rush <i>Juncus tenuis var. dudley/interior</i>	River bulrush <i>Scirpus fluviatilis</i>	Wild celery <i>Vallisneria americana</i>
Giant bur-reed <i>Sparganium eurycarpum.</i>	Round-leaved hedge-hyssop <i>Bacopa rotundifolia</i>	Wild rice <i>Zizania aquatica</i>
Greater bladderwort <i>Utricularia vulgaris var. americana</i>	Rush <i>Juncus arcticus var. balticus</i>	Yellow nutsedge <i>Cyperus odoratus</i>

Trees and Shrubs		
Alder <i>Alnus spp.</i>	Common prickly-ash <i>Zanthoxylum americanum</i>	River birch <i>Betula nigra</i>
American basswood <i>Tilia americana</i>	Common red raspberry <i>Rubus idaeus var. strigosus</i>	Round-leaf Serviceberry <i>Amelanchier sanguinea</i>
American elm <i>Ulmus americana</i>	Currant <i>Ribes americanum</i>	Russian olive <i>Elaeagnus angustifolia</i>
American hazel <i>Corylus americana</i>	False indigo <i>Amorpha fruticosa</i>	Sand cherry <i>Prunus pumila</i>
Bitternut hickory <i>Carya cordiformis</i>	Frosted hawthorne <i>Crataegus priunoso</i>	Sandbar willow <i>Salix exigua</i>
Black walnut <i>Juglans niger</i>	Green ash <i>Fraxinus pennsylvanica</i>	Siberian elm <i>Ulmus pumila</i>
Black willow <i>Salix nigra</i>	Grey-stemmed dogwood <i>Cornus racemosa</i>	Silver maple <i>Acer saccharinum</i>
Bog birch <i>Betula pumila</i>	Lead plant <i>Amorpha canescens</i>	Smooth sumac <i>Rhus glabra</i>
Box elder <i>Acer negundo</i>	Northern pin oak <i>Quercus ellipsoidalis</i>	Trembling aspen <i>Populus tremuloides</i>
Buckthorn <i>Rhamnus cathartica</i>	Northern red oak <i>Quercus rubra</i>	Western snowberry <i>Symphoricarpos occidentalis</i>
Bur oak <i>Quercus macrocarpa</i>	Peach-leaved willow <i>Salix amygdaloides</i>	Wild plum <i>Prunus americana</i>
Buttonbrush <i>Cephalanthus occidentalis</i>	Plains cottonwood <i>Populus deltoides</i>	Wild rose <i>Rosa arkansana</i>
Chokecherry <i>Prunus virginiana</i>	Red-osier dogwood <i>Cornus stolonifera</i>	

Vines		
Canada moonseed <i>Menispermum canadense</i>	Riverbank grape <i>Vitis riparia</i>	Virgin's bower <i>Clematis virginiana</i>

Forbs		
Absinth wormwood <i>Artemisia absinthium</i>	Gray-headed coneflower <i>Ratibida pinnata</i>	Riddell's goldenrod <i>Solidago ridellii</i>
Alfalfa <i>Medicago sativa</i>	Green milkweed <i>Asclepias viridiflora</i>	Rough blazing star <i>Liatris aspera</i>
American deervetch	Green sagewort	Rough pennyroyal

Forbs		
<i>Lotus purshianus</i>	<i>Artemisia dracunculus</i>	<i>Hedeoma hispidum</i>
American vetch <i>Vicia americana</i>	Green-headed coneflower <i>Rudbeckia laciniata</i> var. <i>laciniata</i>	Round-headed bush clover <i>Lespedeza capitata</i>
Annual sunflower <i>Helianthus annus</i>	Groundplum milkvetch <i>Astragalus crassicaarpus</i>	Rush skeleton plant <i>Lygodesmia juncea</i>
Aromatic aster <i>Aster oblongifolius</i>	Hairy goldaster <i>Chrysopsis villosa</i>	Saw-toothed sunflower <i>Helianthus grosseserratus</i>
Asparagus <i>Asparagus officinalis</i>	Hairy Solomon's seal <i>Polygonatum pubescens</i>	Scarlet gaura <i>Gaura coccinea</i>
Balsam ragwort <i>Senecio (Packera) paupercula</i>	Hard-leaved goldenrod <i>Solidago rigida</i>	Scouring rush <i>Equisetum hyemale</i>
Bastard toadflax <i>Commandra umbellata</i>	Heartleaf Alexander <i>Zizia aptera</i>	Sharp-lobed hepatica <i>Hepatica acutiloba</i>
Beggarticks <i>Bidens cernua</i>	Heath aster <i>Aster ericoides</i>	Showy milkweed <i>Asclepias speciosa</i>
Bird's foot violet <i>Viola pedata</i>	Hedge bindweed <i>Calystegia sepium</i>	Silky aster <i>Aster sericeus</i>
Black medic <i>Medicago lupulina</i>	Hoary puccoon <i>Lithospermum canescens</i>	Silverleaf scurfpea <i>Psoralea argophylla</i>
Black nightshade <i>Solanum nigrum</i>	Hoary vervain <i>Verbena stricta</i>	Silverweed <i>Potentilla anserina</i>
Black-eyed susan <i>Rudbeckia hirta</i>	Horseweed <i>Conyza canadensis</i>	Slender beardtongue <i>Penstemon gracilis</i>
Bladder campion <i>Silene vulgaris</i>	Indian breadroot/Prairie turnip <i>Psoralea esculenta</i>	Slim knotweed <i>Polygonum tenue</i>
Bloodroot <i>Sanguinaria canadensis</i>	Indian hemp <i>Apocynum cannabinum</i>	Small-flowered fame flower <i>Talinum parviflorum</i>
Blue lettuce <i>Lactuca pulchella</i>	Indianwheat <i>Plantago patagonica</i>	Small-leaf pussytoes <i>Antennaria neglecta</i>
Blue vervain <i>Verbena hastata</i>	Ironweed <i>Veronia fasciculata</i>	Smooth horsetail <i>Equisetum laevigatum</i>
Bouncing bet <i>Saponaria officinalis</i>	Jerusalem Artichoke <i>Helianthus tuberosus</i>	Smooth Solomon's seal <i>Polygonatum biflorum</i>
Buffalo bur <i>Solanum rostratum</i>	Lance-leaved ground cherry <i>Physalis virginiana</i>	Spiny-leaved sow-thistle <i>Sonchus asper</i>
Bushy cinquefoil <i>Potentilla paradoxa</i>	Large-flowered beardtongue <i>Penstemon grandiflorus</i>	Spotted joe pye weed <i>Eupatorium maculatum</i>
Buttercup <i>Ranunculus spp.</i>	Late goldenrod <i>Solidago gigantea</i>	Spring cress <i>Cardamine bulbosa</i>
Butterflyweed <i>Asclepias tuberosa</i>	Leafy spurge <i>Euphorbia esula</i>	Square-stemmed monkey flower <i>Mimulus ringens</i>
Canada goldenrod <i>Solidago canadensis</i>	Long-leaved Houstonia/bluets <i>Hedyotis longifolia</i>	Star-flowered Solomon's seal <i>Smilacina stellate</i>
Canada milkvetch <i>Astragalus canadensis</i>	Marsh vetchling <i>Lathyrus palustris</i>	Stiff sunflower <i>Helianthus rigidus</i>
Canada thistle <i>Cirsium arvense</i>	Maximilian sunflower <i>Helianthus maximiliani</i>	Stinging nettle <i>Urtica dioica</i>
Carolina crane's-bill <i>Geranium carolinianum</i>	Meadow anemone <i>Anemone canadensis</i>	Swamp lousewort <i>Pedicularis lanceolata</i>
Carrion flower	Meadow garlic	Swamp milkweed

Forbs		
<i>Smilax herbacea</i>	<i>Allium canadense</i>	<i>Asclepias incarnata</i>
Clammy ground cherry <i>Physalis heterophylla</i>	Meadow goat's beard <i>Tragopogon dubius</i>	Tall bellflower <i>Campanula americana</i>
Closed/Bottle gentian <i>Gentiana andrewsii</i>	Missouri goldenrod <i>Solidago missouriensis</i>	Tall cinquefoil <i>Potentilla arguta</i>
Cocklebur <i>Xanthium strumarium</i>	Motherwort <i>Leonurus cardiaca</i>	Textile onion <i>Allium textile</i>
Columbine <i>Aquilegia canadensis</i>	Mousetail <i>Myosurus minimus</i>	Thimbleweed <i>Anemone cylindrica</i>
Common dandelion <i>Taraxacum officinale</i>	Mustard <i>Brassica nigra</i>	Toothed/Yellow evening primrose <i>Calylophus serrulatus</i>
Common mullein <i>Verbascum thapsus.</i>	New England aster <i>Aster novae-angliae</i>	Tumble mustard <i>Sisymbrium altissimum</i>
Common ragweed <i>Ambrosia artemisiifolia</i>	Nodding wild onion <i>Allium cernuum</i>	Violet wood-sorrel <i>Oxalis violacea</i>
Common yarrow <i>Achillea millefolium</i>	Northern bedstraw <i>Galium boreale</i>	Virginia waterleaf <i>Hydrophyllum virginicum</i>
Common/Tall boneset <i>Eupatorium perfoliatum/altissimum</i>	Oldfield goldenrod <i>Solidago nemoralis</i>	Water mouse-ear chickweed <i>Stachys aquatica</i>
Cup plant <i>Silphium perfoliatum</i>	Ox-eye sunflower <i>Heliopsis helianthoides</i>	Water parsnip <i>Sium suave</i>
Curly dock <i>Rumex crispus</i>	Pale-spiked lobelia <i>Lobelia spicata</i>	Western ragweed <i>Ambrosia psilostachya</i>
Curlycup Gumweed <i>Grindelia squarrosa</i>	Panicled aster <i>Aster lanceolatus (simplex)</i>	Western Water-Horehound <i>Lycopus asper</i>
Cutleaf ironplant <i>Haplopappus spinulosus</i>	Pasque flower <i>Anemone patens</i>	White beardtongue <i>Penstemon albidus</i>
Cut-leaved Water-Horehound <i>Lycopus americanus</i>	Perennial sow-thistle <i>Sonchus arvensis</i>	White camass <i>Zigadenus elegans</i>
Daisy fleabane <i>Erigeron strigosus</i>	Pinkweed <i>Polygonum pensylvanicum</i>	White Canada violet <i>Viola canadensis</i>
Dame's rocket <i>Hesperis matronalis</i>	Poison ivy <i>Rhus radicans</i>	White clover <i>Trifolium repens</i>
Ditch stonecrop <i>Penthorum sedoides</i>	Prairie <i>Cuscuta gronovii or pentagona</i>	White lady's slipper <i>Cypripedium candidum</i>
Dotted blazing star <i>Liatris punctata</i>	Prairie alum-root <i>Heuchera richardsonii</i>	White lettuce <i>Prenanthes alba</i>
Downy gentian <i>Gentiana puberulenta</i>	Prairie blazing star <i>Liatris pycnostachya</i>	White prairie clover <i>Dalea candida</i>
Downy painted cup/paintbrush <i>Castilleja sessiliflora</i>	Prairie blue-eyed grass <i>Sisyrinchium campestre</i>	White sage <i>Artemisia ludoviciana</i>
Downy yellow violet <i>Viola pubescens</i>	Prairie chickweed <i>Cerastium arvense</i>	White smartweed <i>Polygonum punctatum</i>
Early goldenrod <i>Solidago juncea</i>	Prairie cinquefoil <i>Potentilla pensylvanica</i>	White snakeroot <i>Eupatorium rugosum</i>
Evening primrose <i>Oenothera biennis</i>	Prairie dandelion <i>Agoseris glauca</i>	White sweet-clover <i>Melilotus alba</i>
False boneset <i>Kuhnia eupatorioides</i>	Prairie larkspur <i>Delphinium virescens</i>	White wild parsley <i>Lomatium orientale</i>

Forbs		
False gromwell <i>Onosmodium molle</i>	Prairie moonwort <i>Botrychium campestre</i>	Whorled milkweed <i>Asclepias verticillata</i>
Field bindweed <i>Convolvulus arvensis</i>	Prairie onion <i>Allium stellatum</i>	Wild bergamot <i>Monarda fistulosa</i>
Field milkvetch <i>Astragalus agrestis</i>	Prairie phlox <i>Phox pilosa</i>	Wild lettuce <i>Lactuca canadensis</i>
Field pennycress <i>Thlaspi arvense</i>	Prairie ragwort <i>Senecio plattensis</i>	Wild licorice <i>Glycyrrhiza lepidota</i>
Field thistle <i>Cirsium discolor</i>	Prairie smoke <i>Geum triflorum</i>	Wild mint <i>Mentha arvensis</i>
Floodman's thistle <i>Cirsium flodmani</i>	Prairie spiderwort <i>Tradescantia occidentalis</i>	Wild pepper-grass <i>Lepidium virginicum</i>
Four-O'clock <i>Mirabilis nyctaginea</i>	Prairie tick trefoil <i>Desmodium illinoense</i>	Wild sarsaparilla <i>Aralia nudicaulis</i>
Fringed puccoon <i>Lithospermum incisum</i>	Prairie violet <i>Viola pedatifida</i>	Wild strawberry <i>Fragaria virginiana</i>
Fringed sagewort <i>Artemisia frigida</i>	Purple coneflower <i>Echinacea angustifolia</i>	Wood betony <i>Pedicularis canadensis</i>
Giant sunflower <i>Helianthus giganteus</i>	(Purple) Meadow rue <i>Thalictrum dasycarpum</i>	Wood lily <i>Lilium philadelphicum</i> var. <i>andinum</i>
Gill over the ground <i>Glechoma hederacea</i>	Purple prairie clover <i>Dalea purpureum</i>	Woolly blue violet <i>Viola soroia</i>
Golden Alexander <i>Zizia aurea</i>	Purslane <i>Portulaca oleracea</i>	Woundwort <i>Stachys palustris</i>
Golden corydalis <i>Corydalis aurea</i>	Purslane speedwell <i>Veronica peregrina</i>	Yellow coneflower <i>Ratibida columnifera</i>
Golden ragwort <i>Senecio aereus</i>	Rattlesnake root <i>Prenanthes racemosa</i>	Yellow star grass <i>Hypoxis hirsuta</i>
Goosefoot <i>Chenopodium album</i>	Red clover <i>Trifolium pratense</i>	Yellow sweet-clover <i>Melilotus officinalis</i>

Cacti		
Ball cactus <i>Escobaria vivipara</i>		
Prickly Pear/Pencil cactus <i>Opuntia fragilis</i>		

Ferns		
Fragile fern <i>Cystopteris fragilis</i>	Hairy-lip fern <i>Cheilanthes llanosa</i>	Rusty woodsia fern <i>Woodsia ilvensis</i>

Mosses	
<i>Lycopodium</i> spp.	Sphagnum moss <i>Sphagnum</i> spp.

Big Stone NWR Reptiles and Amphibians

Common Name		
Scientific name		
Snapping turtle <i>Chelydra serpentina</i>	Western Plains Garter Snake <i>Thamnophis radix haydeni</i>	American Toad <i>Bufo americanus</i>
Western Painted Turtle <i>Chrysemys picta belii</i>	Red-sided Garter Snake <i>Thamnophis sirtalis parietalis</i>	Great Plains Toad <i>Bufo cognatus</i>
Western Spiny Softshell Turtle <i>Trionyx spinifer hartwegi</i>	Fox Snake <i>Elaphe vulpina</i>	Dakota Toad <i>Bufo hemiophrys</i>
Smooth Softshell Turtle <i>Apalone mutica</i>	Western Hognose Snake <i>Heterodon nasicus</i>	Western Chorus Frog <i>Pseudacris triseriata triseriata</i>
Bluetailed or Five-lined Skink <i>Eumeces fasciatus</i>	Bull Snake <i>Pituophis melanoleucus sayi</i>	Upland Chorus Frog <i>Pseudacris triseriata feriarum</i>
Northern Prairie Skink <i>Eumeces septentrionalis septentrionalis</i>	Mudpuppy <i>Necturus maculosus</i>	Northern Leopard Frog <i>Rana pipiens pipiens</i>
Northern Red-bellied Snake <i>Storeria occipitomaculata occipitomaculata</i>	Eastern Tiger salamander <i>Ambystoma tigrinum trigrinum</i>	

Appendix D: Focal Species

The planning team identified 17 focal species from a larger set of Resource Conservation Priorities identified for the Midwest Region of the U.S. Fish and Wildlife Service (FWS, Service). The process used to identify focal species is described in *Identifying Refuge Resources and Management Priorities* (FWS 2010). Focal species are highly associated with important habitat attributes or conditions that represent the needs of larger guilds of species and that use habitats and respond to management similarly. The individual Refuge focal species, their habitat associations, and other considerations are summarized in table D-1 below.

Table D-1 Focal Species Summary

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Mallard	Grassland and wetland complexes	Grasses and forbs, emergent and submergent wetland vegetation	Forage in open to interspersed emergent cover, nest in dense upland vegetation about 60 cm high	Wetland-upland complex >240 ha is best for waterfowl production	<ul style="list-style-type: none"> • Tolerates less crowding than other dabblers • Breeding populations closely tied to wetland conditions
Blue-winged Teal	Grassland and wetland complexes	Grasses and forbs, emergent and submergent wetland vegetation	Forage in open to interspersed emergent cover, nest in moderate to dense upland grassland vegetation, height-density >50 cm	Wetland-upland complex >240 ha is best for waterfowl production	Nesting cover is more important than availability of water in limiting the size of breeding populations

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Redhead	Wetlands (semi-permanent and permanent)	Hardstem bulrush, with cattail a second choice and sedges a third for nesting; submergent aquatic vegetation also important	Nest over open water in interspersed dense stands of persistent emergent vegetation; also nest on islands and waterside vegetation within 2 m of water's edge	Wetland-upland complex >240 ha is best for waterfowl production	<ul style="list-style-type: none"> • Water levels should be kept constant during laying and incubation • Access to deeper water is important for maturing broods and molting • Increase in redhead numbers may be at the expense of other species due to their parasitic nature

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Pied-billed Grebe	Wetlands (semi-permanent and permanent)	Open water and emergent vegetation in shallow water	<ul style="list-style-type: none"> • Nests on marshy ponds with nest attached to reeds in shallow water • Open water provides cover for the grebe; they dive and can remain concealed just below the water surface • Feeds in open water or in emergent vegetation-opportunistic feeder crustaceans, frogs, fish, insects • Aggressively territorial will chase off grebes and other birds; both parents involved with nest building, incubation, and young rearing 	5–15 ha in semi-perm and seasonal wetlands	<ul style="list-style-type: none"> • Susceptible to pesticide toxins • Preservation of relatively large (>10 ha) wetlands with a mixture of dense, robust emergents, submergent vegetation, and open

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
American Bittern	Wetlands	Tall dense grasslands, semi-permanent and permanent wetlands	<ul style="list-style-type: none"> • Prefer dense upland vegetation >60 cm high or floating platforms in shallow (5–20 cm) water for nesting • Prefer vegetation fringes and shorelines for foraging; may avoid even-aged stands of older, dense or dry vegetation • During molting, bitterns need relatively deep, stable waters to provide adequate food and protection from predators 	Wetland/upland complex with wetlands > 15 ha	<ul style="list-style-type: none"> • Maintain water levels < 61 cm (April–August) • Sensitive to grazing tend to avoid grazed areas • Avoid quick drawdowns

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Western Meadowlark	Grasslands	>90% herbaceous cover comprised of a mix of grasses (25–75% cover) and forbs	<ul style="list-style-type: none"> • Use a wide range of vegetation heights and densities, but avoid extremely sparse or tall cover • Only a limited amount (<5% cover) of scattered woody vegetation above 1 m tall is tolerated; fencelines, forbs, and posts, etc. used for perches • Low to moderate litter cover 	Male territory size 3–13 ha	Responds positively to light to moderate grazing and negatively to heavy grazing

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Marbled Godwit	Wetland complexes, native grasslands	Native grasses and variety of wetland types	<ul style="list-style-type: none"> • Short/sparse to moderately vegetated; tall, dense cover is avoided; height-density at nests lower (<10–15 cm) than broods (15–60 cm) • Avoid dense emergent wetland vegetation, prefer shallow water areas with short, sparse to moderately dense shoreline vegetation • Forage in 5–13 cm water depths • Prefer minimal shrub cover • Moderate to high litter (3.8–9.1 cm) 	Mean territory size >90 ha of contiguous grassland, with high percentage of grass cover, many wetlands, and high wetland diversity	<ul style="list-style-type: none"> • Grazing, fall burning or haying could provide nesting habitat the following spring, and the denser, taller regrowth (15–60 cm) could provide suitable brood habitat • Prefer temporary and seasonal wetlands during breeding season and move toward semi-permanent wetlands in summer
Sedge Wren	Grasslands and wetlands	Grasses and forbs	<ul style="list-style-type: none"> • Tall, dense grasslands and wetland edges with vegetation 20–150 cm, dry land or over shallow water • Abundant litter cover with little bare ground 	Will use small areas, but favors large prairies	Vegetation structure seems to be more important than patch size in predicting occurrence

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Grasshopper Sparrow	Grasslands	Grasses and forbs	<ul style="list-style-type: none"> • Short to intermediate vegetation (20–60 cm vegetative height) with diverse structure and clumped vegetation; will use taller grass if vegetation is patchy and not overly dense • Stiff-stemmed forbs used for song perches • Sparse woody cover, and avoid woody edges • Moderately deep litter, but areas with bare soil required 	8 ha	<ul style="list-style-type: none"> • Susceptible to brown-headed cowbird nest parasitism • Vulnerable to early mowing; light to moderate grazing, infrequent and post-season burning or mowing can be beneficial • Low abundance following a burn, increasing 2–4 years post-burn

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Bobolink	Grasslands	Grasses and Forbs	<ul style="list-style-type: none"> • Prefer habitat with moderate to tall vegetation (vegetation height 25-45 cm), moderate to dense vegetation, and moderately deep litter (3-5 cm) without the presence of woody vegetation; stiff-stemmed forbs used for song perches • Typically uses areas with a higher ratio of grass to forb cover 	30 ha	<ul style="list-style-type: none"> • Nest productivity increase with distance from trees; minimal distance from trees 45 meters • Graze at moderate levels to provide diverse grass heights and densities
Northern Harrier	Extensive emergent wetlands or grasslands	Herbaceous vegetation and low shrubs such as western snowberry, with abundant residual vegetation	<ul style="list-style-type: none"> • Dense vegetation with much residual cover and a height 25 to 80 cm tall • Most nests are in vegetation >60 cm tall 	Large (>40 ha), with extensive wetlands and grassland	<ul style="list-style-type: none"> • Prefer undisturbed areas • Frequently nest over water on platforms built from nearby vegetation

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Upland Sandpiper	Grasslands	Grasses	<ul style="list-style-type: none"> • Vegetation height at nests ranges from 10 to 65 cm (rarely uses vegetation >70 cm tall) but feed in vegetation <10 cm tall • Minimal woody cover • Moderate to high litter depth (4-9 cm) 	100 ha	Will forage in recently burned areas
Yellow-throated Vireo	Riparian woodlands	Trees, bottomland woodlands	<ul style="list-style-type: none"> • Woodland habitat with large trees closed canopy (>10m) and open sub-canopy (3-10 m) with forbs and shrubs (0-0.5m) • Gleans prey off tree bark on branches located on upper 2/3 of tree • Searches for prey in central portion of trees • Average nest height 13 m 	7.8 ha	<ul style="list-style-type: none"> • Prefers on average 60 % canopy cover • Tendency to forage on dead trees or large trees with dead branches, such as oaks

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Willow Flycatcher	Wet, shrubby grasslands and wetlands	Willow, dogwoods	Prefer moist, shrubby areas, often with standing or running water; high foliage-volume willow cover preferred but with willow clumps separated by openings	0.7 ha	<ul style="list-style-type: none"> • Susceptible to cowbird nest parasitism, will make efforts to avoid incubating cowbird eggs • Habitat destruction and degradation and overgrazing by livestock are major causes of decline • Fire during nesting season can destroy nest sites and residual willow habitat
Dakota Skipper	Dry to mesic native prairie	<ul style="list-style-type: none"> • High forb diversity, especially purple coneflower, blanketflower, ground plum • Fine stemmed, short stature bunchgrasses, especially little bluestem 	<ul style="list-style-type: none"> • Stubble heights ≥ 20 cm in tallgrass prairies • Low to moderate litter 	Unknown, but the need to break suitable habitat into management units makes it difficult to sustain the species on small, isolated patches	<ul style="list-style-type: none"> • Needs native grass; smooth brome and Kentucky bluegrass not adequate larval habitat (because of phenology and structure of stems) • Management prescriptions (timing, configuration) must account for vulnerable life stages

Species	Conservation Focus	Key Habitat Relationships			
		Vegetative Composition	Vegetative Structure	Patch Size	Special Considerations
Poweshiek Skipperling	Dry to wet native prairie, but not sand prairie	<ul style="list-style-type: none"> • High forb diversity, especially false sunflower/purple coneflower (dry sites) or black-eyed Susan/spike lobelia (wet sites) • Fine stemmed, short stature bunchgrasses: prairie dropseed/little bluestem (dry sites) or Carex/spikerush (wet sites) 		Unknown, but the need to break suitable habitat into management units makes it difficult to sustain the species on small, isolated patches	<ul style="list-style-type: none"> • Less known about primary larval food sources than other species, but appears to need fine-stemmed native bunchgrasses • Management prescriptions (timing, configuration) must account for vulnerable life stages • Overwinters as larva on ground surface or in litter
Granite Outcrop	Granite outcrops	Short grass prairie, high forb diversity	<ul style="list-style-type: none"> • Granite bedrock, lichen covered, shallow 0-3 inch soils, short grass vegetation, high in forb diversity • State endangered and threatened species • Only habitat available for ball cactus (<i>Escobaria vivipara</i>) 		<ul style="list-style-type: none"> • Woody species encroachment and exotic cool season grasses • Human disturbance, threat for ball cactus theft

Appendix E: Literature Cited

- Blumstein, D.T. 2003. Flight initiation distance in birds is dependent on intruder starting distance. *J. Wildl. Manage.* 67:852-857.
- Blumstein, D.T., L.L. Anthony, R.G. Harcourt, and G. Ross. 2003. Testing a key assumption of wildlife buffer zones: is flight initiation distance a species-specific trait? *Biological Conservation* 110:97-100.
- Carver, Erin and James Caudill. 2007. BANKING ON NATURE 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. Division of Economics, U.S. Fish and Wildlife Service, Washington, DC.
- Caudill, James and Erin Henderson. 2005. Banking on Nature 2004: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. Division of Economics, U.S. Fish and Wildlife Service. Washington, DC. 435 pp.
- Dale, M. 1916. History of Chippewa and Lac Qui Parle Counties, Minnesota. B. F. Bowen and Company, Inc. Vol. 1, 481 pp.
- Department of Energy (DOE). 1999. Carbon Sequestration Research and Development. Washington, D.C.: U.S. Department of Energy, Office of Science and Office of Fossil Energy.
- Easterling, D.R. and T.R. Karl 2000. Potential consequences of climate variability and change for the Midwestern United States. In *Climate Change Impacts on the US: The Potential Consequences of Climate Variability and Change*. National Assessment Synthesis Team, US Global Change Research Program. Cambridge University Press, Cambridge, UK; 167–188. <http://www.gcrio.org/NationalAssessment/6MW.pdf>
- Elmqvist, T., C. Folke, M. Nystrom, G. Peterson, J. Bengtsson, B. Walker, and J. Norberg. 2003. Response diversity, ecosystem change, and resilience. *Frontiers in Ecology and the Environment* 1:488-494.
- England, R. E. & DeVos, A., 1969. Influence of animals on pristine conditions on the Canadian grasslands. *J. Range Manage.* 22: 87–94.
- Galatowitsch, S., Frelich, L. & Phillips-Mao, L. 2009. Regional climate change adaptation strategies for biodiversity conservation in a midcontinental region of North America. *Biological Conservation*, 142, 2012–2022.
- Grant, J.A. 1972. Minnesota River valley, south-western Minnesota. In *Geology of Minnesota: A centennial volume*, ed. P.K. Sims and G.B. Morey, 177-96. St. Paul: Minnesota Geological Survey, University of Minnesota.

- Higgins, K. F. 1984. Lightning fires in grasslands in North Dakota and in pine-savanna lands in nearby South Dakota and Montana. *Journal of Range Management*. 37: 100-103.
- Higgins, K. F. 1986. *Interpretation and compendium of historical fire accounts in the northern Great Plains*. U.S. Fish and Wildlife Service, Resource Publication 161. 39 pp.
- IPCC 2007. Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.
- Johnson, Douglas H. 1996. Management of northern prairies and wetlands for the conservation of neotropical migratory birds. Pages 53-67 in F. R. Thompson, III, ed. *Management of Midwestern Landscapes for the Conservation of Neotropical Migratory Birds*. U.S. Department of Agriculture, Forest Service, General Technical Report NC-187. North Central Forest Experiment Station, St. Paul. Jamestown, ND: Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/habitat/neobird/index.htm> (Version 17NOV2000).
- Kratz, T.K. and G.L. Jensen. 1983. Minnesota's landscape regions. *Nat. Areas J.* 3:33-44.
- Magness, Dawn R., John M. Morton, Falk Huettmann, F. Stuart Chapin, and A. David McGuire. 2011. A climate-change adaptation framework to reduce continental-scale vulnerability across conservation reserves. *Ecosphere* 2:art112.
- Marschner, F.J. 1974. *The Original Vegetation of Minnesota*. Compiled from U.S. General Land Office Survey Notes. United States Department of Agriculture, North Central Forest Experiment Station, St. Paul.
- McNicholl, M. K. 1988. Ecological and human influences on Canadian populations of grasslands. Pages 1-25 in P. D. Goriup, ed. *Ecology and conservation of grassland birds*. *Internat. Council Bird Preserv. Tech. Pub.* 7. Norfolk, England.
- Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of Recreational Trails on Breeding Bird Communities. *Ecological Applications* Vol. 8, No. 1 (Feb., 1998), pp. 162-169. Available URL: <http://www.jstor.org/stable/2641318>
- Minnesota County Biological Survey. 2007. Native plant communities and rare species of the Minnesota River valley counties. *Biological Report No. 89*. St. Paul: Division of Ecological Resources, Minnesota Department of Natural Resources.
- Murkin, H. R. 1989. The basis for food chains in prairie wetlands. Pages 316-338 in A. van der Valk, ed. *Northern prairie wetlands*. Iowa State Univ. Press, Ames.

Noss, R. F., E. T. LaRoe III, and J. M. Scott. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. *Biol. Rep.* 28. Natl. Biol. Serv., Washington, D.C. 58pp.

Olsen, B.M., and Mossler, J.H., 1982, Geological map of Minnesota—Depth to bedrocks: Minnesota Geological Survey State map series S-12.

Roetzel, K. A., R. A. Strachan, and J.A. O’Gorman. 1987. A Cultural Resources Survey of Selected Areas Within The Big Stone National Wildlife Refuge, Big Stone and Lac Qui Parle Counties, Minnesota. U.S. Department of the Interior, Fish and Wildlife Service.

Ryan, M. G.; Archer, S. R.; Birdsey, R. A.; Dahm, C. N.; Heath, L. S.; Hicke, J. A.; Hollinger, D. Y.; Huxman, T. E.; Okin, G. S.; Oren, R.; Randerson, J. T.; Schlesinger, W. H. 2008. Chapter 3 – Land resources: Forest and arid lands. In: Backlund, Peter; Janetos, Anthony; Schimel, David. 2008. The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States. *Synthesis and Assessment Product 4.3*. Washington, DC: U.S. Environmental Protection Agency, Climate Change Science Program: 75-120.

Samson, F., and Knopf, F. 1994. Prairie conservation in North America. *BioScience* 44:418-421.

Samson FB, Knopf FL, Ostlie WR. 1998. Grasslands. Pages 437–472 in Mac MJ, Opler PA, Puckett-Haecker CE, Doran PD, editors. *Status and trends of the nation’s biological resources. Volume 2*. U.S. Department of the Interior, U.S. Geological Survey.

Sparrow, M. R. 1981. Big Stone County, Minnesota 1881-1981. *Big Stone County Historical Society*. 104 pp.

Stewart, R. E., and Kantrud, H. A. (1971). Classification of natural ponds and lakes in the glaciated prairie region. U.S. Fish and Wildlife Service, Resource Publication 92.

Umbanhowar, C. E. Jr. 1996. Recent fire history of the northern Great Plains. *American Midland Naturalist*. 135: 115-121.

U.S. Census Bureau. 2010, November 4. State and county Quickfacts: Big Stone, Chippewa, Lac qui Parle, Stevens, Swift, Traverse, and Yellow Medicine Counties, Minn. Retrieved May 5, 2011 from <http://quickfacts.census.gov>.

U.S. Census Bureau. Undated. 2005-2009 American Community Survey. Big Stone, Chippewa, Lac qui Parle, Stevens, Swift, Traverse, and Yellow Medicine Counties, Minn. Retrieved May 5, 2011 from <http://factfinder.census.gov>.

U. S. Fish and Wildlife Service. 2000. Comprehensive Conservation Planning Process. 602 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/602fw3.html>

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

U. S. Fish and Wildlife Service. 2006. National Wildlife Refuge System Mission and Goals and Refuge Purposes. 601 FW 1. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/601fw1.html>

U. S. Fish and Wildlife Service. 2006a. General Guidelines for Wildlife-Dependent Recreation. 605 FW 1. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw1.html>

U. S. Fish and Wildlife Service. 2006b. Wildlife-Dependent Recreation: Hunting. 605 FW 2. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw2.html>

U. S. Fish and Wildlife Service. 2006c. Wildlife-Dependent Recreation: Fishing. 605 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw3.html>

U. S. Fish and Wildlife Service. 2006d. Wildlife-Dependent Recreation: Wildlife Observation. 605 FW 4. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw4.html>

U. S. Fish and Wildlife Service. 2006g. Wildlife-Dependent Recreation: Interpretation. 605 FW 7. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw7.html>

U. S. Fish and Wildlife Service. 2008. General Overview of Wilderness Stewardship Policy. 610 FW 1. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/610fw1.html>

U.S. Fish and Wildlife Service. 2010. Identifying Refuge Resources of Concern and Management Priorities: A Handbook.

U. S. Fish and Wildlife Service. 2011. Visitor Service Standards: A Handbook for Evaluating Visitor Services Programs.

Weller, M. W., and C. S. Spatcher. 1965. Role of habitat in the distribution and abundance of marshbirds. Special Report Number 43, Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa, USA.

Wheeler, G.A.; Cushing, E.J.; Gorham, W.; Morley, T.; Ownbey, G.B. 1992. A major floristic boundary in Minnesota: an analysis of 280 taxa occurring in the western and southern portions of the state. *Canadian Journal of Botany*. 70: 319-333.

Wulff, L. 1959. Big Stone County History. *Minnesota Centennial Publication*. 122 pp.

Appendix F: Priority Projects

Demolition of Boundary Fence
Reconstruct Quarry/Ruby Red Fence
Reconstruct Fence LaCombe Quarry
Reconstruct Fence Chain Link – around Highway 75 Quarry
Replace Paved Trail Highway 75 Overlook
Repair WCS Diversion Channel
Big Stone Repair Erosion on Hunter Access Road
Big Stone Road Service Koch Road General Rehab
Repair Erosion on Gravel Pit Service Road
Big Stone WCS Pool 4 General Rehab
Big Stone WCS Pool 4/4A General Rehab
Big Stone WCS Pool 4A General Rehab
Big Stone Road Service Mews Driveway
Big Stone Road Service Yellow Bank General Rehab
Big Stone WCS Banding Site General Rehab
Big Stone Road Service Klepel Road General Rehab
Big Stone Road Service Syndicate General Rehab
Big Stone Parking HQ Gravel Lot General Rehab
Big Stone Construct Yellow Bank River Moist Soil Unit
Big Stone Construct Sellin Moist Soil Unit
Repairs to Building Tool/Fuel Storage
Upgrade Lighting and Replace Door Seal on Seed Cleaning Facility
Repairs on Bridge with Stoplog Water Control – Pool 7 Dike, Double 10' x 8' Concrete Box
Replace Steel Frame Gate
Rehab Kiosk Single Panel
Replace Signs Boundary
Big Stone Parking Public FHWA Route 926 General Rehab

Appendix G: Compliance Requirements

American Indian Religious Freedom Act, 42 U.S.C. 1996, 1996a (1976)

Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve American Indian religious cultural rights and practices.

Americans with Disabilities Act of 1990, 42 U.S.C. 12101 et seq.

Prohibits discrimination in public accommodations and services.

Antiquities Act of 1906, 16 U.S.C. 431 et seq.

Authorizes the scientific investigation of antiquities on federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Archaeological and Historic Preservation Act, 16 U.S.C.469-469c

Directs the preservation of historic and archaeological data in federal construction projects.

Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa et seq.

Protects materials of archaeological interest from unauthorized removal or destruction, and requires federal managers to develop plans and schedules to locate archaeological resources.

Architectural Barriers Act of 1968, 42 U.S.C. 4151 et seq.

Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act of 1977, 33 U.S.C. 1251

Requires consultation with the USACE (404 permits) for major wetland modifications.

Cultural Resources and Historic Preservation

The National Wildlife Refuge System Improvement Act of 1997, Section 6, requires the Service to make a determination of compatibility of existing, new and changing uses of refuge land; and Section 7 requires the Service to identify and describe the archaeological and cultural values of the refuge.

The National Historic Preservation Act of 1966 (NHPA), Section 106, requires federal agencies to consider impacts their undertakings could have on historic properties; Section 110 requires

federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; Section 101 requires federal agencies consider Indian tribal values in historic preservation programs and requires each federal agency to establish a program leading to inventory of all historic properties on its land.

The Archaeological Resources Protection Act of 1979 (ARPA) prohibits unauthorized disturbance of archeological resources on federal and Indian land; and other matters. Section 10 requires establishing “a program to increase public awareness” of archeological resources. Section 14 requires plans to survey lands and a schedule for surveying lands with “the most scientifically valuable archaeological resources.” This Act requires protection of all archeological sites more than 100 years old (not just sites meeting the criteria for the National Register) on federal land, and requires archeological investigations on federal land be performed in the public interest by qualified persons.

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) imposes serious delays on a project when human remains or other cultural items are encountered in the absence of a plan.

The American Indian Religious Freedom Act (AIRFA) iterates the right of Native Americans to free exercise of traditional religions and use of sacred places.

Executive Order 13007, Indian Sacred Sites (1996), directs federal agencies to accommodate access to and ceremonial use, to avoid adverse effects and avoid blocking access, and to enter into early consultation.

DOI Secretarial Orders 3226 and 3289

Establishes a Department-wide approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and on the land, water, ocean, fish and wildlife and cultural resources that the Department manages.

Emergency Wetlands Resources Act of 1986, 16 U.S.C. 3901 et seq.

Promotes the conservation of migratory waterfowl, and offsets or prevents the serious loss of wetlands by the acquisition of wetlands and other essential habitats.

Endangered Species Act of 1973, 16 U.S.C. 1531 et seq.

Requires all federal agencies to carry out programs for the conservation of endangered and threatened species.

Executive Order 11988, Floodplain Management (1977)

Each federal agency shall provide leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 11990, Protection of Wetlands (1977)

Executive Order 11990 directs federal agencies to (1) minimize destruction, loss, or degradation of wetlands, and (2) preserve and enhance the natural and beneficial values of wetlands when a practical alternative exists.

Executive Order 12372, Intergovernmental Review of Federal Programs (1982)

Directs the Service to send copies of the Environmental Assessment to state planning agencies for review.

Executive Order 12898, Environmental Justice for Low Income and Minority Populations (1994)

Establishes environmental justice as a Federal Government priority and directs all federal agencies to make environmental justice part of their mission. Environmental justice calls for fair distribution of environmental hazards.

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)

Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the System.

Executive Order 13007, Indian Sacred Sites (1996)

Directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Farmland Protection Policy Act, Public Law 97-98, 7 U.S.C. 4201 (1981)

Minimizes the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

Federal Noxious Weed Act, 7 U.S.C. 2801 et seq. (1975)

Requires the use of integrated management systems to control or contain undesirable plant species and an interdisciplinary approach with the cooperation of other federal and state agencies.

Federal Records Act of 1950, 44 U.S.C. 31

Directs the preservation of evidence of the Government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Act of 1956, 16 U.S.C. 742a et seq.

Established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq. (1934)

Requires that the U.S. Fish and Wildlife Service (FWS, Service) and state fish and wildlife agencies be consulted whenever water is to be impounded, diverted or modified under a federal permit or license. The Service and state agency recommend measures to prevent the loss of biological resources, or to mitigate or compensate for the damage. The project proponent must take biological resource values into account and adopt justifiable protection measures to obtain maximum overall project benefits. A 1958 amendment added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs. It also authorized the Secretary of Interior to provide public fishing areas and accept donations of lands and funds.

Fish and Wildlife Improvement Act of 1978, 16 U.S.C. 742a

Improves the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary of Interior to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

Historic Sites, Buildings and Antiquities Act (also known as the Historic Sites Act of 1935), 16 U.S.C. 461 et seq.

Declares it a national policy to preserve historic sites and objects of national significance, including those located on refuges. Provides procedures for designation, acquisition, administration, and protection of such sites.

Land and Water Conservation Fund (1965), 16 U.S.C. 460 et seq.

Uses the receipts from the sale of surplus federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

Migratory Bird Conservation Act, 16 U.S.C. 715 et seq.

Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting Stamp Act (also known as the Duck Stamp Act), 16 U.S.C. 718 et seq. (1934)

Requires every waterfowl hunter 16 years of age or older to carry a stamp and earmarks proceeds of the Duck Stamps to buy or lease waterfowl habitat. A 1958 amendment authorizes the acquisition of small wetland and pothole areas to be designated as 'Waterfowl Production Areas,' which may be acquired without the limitations and requirements of the Migratory Bird Conservation Act.

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703 et seq.

Designates the protection of migratory birds as a federal responsibility. This Act enables the setting of seasons and other regulations including the closing of areas, federal or non-federal, to the hunting of migratory birds.

National Environmental Policy Act of 1969, 42 U.S.C. 4321 et seq.

Requires the disclosure of the environmental impacts of any major federal action significantly affecting the quality of the human environment.

National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq.

Establishes as policy that the Federal Government is to provide leadership in the preservation of the nation's prehistoric and historic resources. Section 106 requires federal agencies to consider impacts their undertakings could have on historic properties; Section 110 requires federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; Section 101 requires federal agencies to consider Indian tribal values in historic preservation programs, and requires each federal agency to establish a program leading to inventory of all historic properties on its land.

National Trails System Act, 16 U.S.C. 1241 et seq. (1968)

Assigns responsibility to the Secretary of Interior and thus the Service to protect the historic and recreational values of congressionally-designated National Historic Trail sites.

National Wildlife Refuge System Administration Act of 1966, 16 U.S.C. 668dd, 668ee

Defines the National Wildlife Refuge System and authorizes the Secretary of Interior to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The National Wildlife Refuge System Improvement Act of 1997 clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of Interior for managing and protecting the Refuge System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd

Considered the “Organic Act of the National Wildlife Refuge System.” Defines the mission of the Refuge System, designates priority wildlife-dependent public uses, and calls for comprehensive refuge planning. Section 6 requires the Service to make a determination of compatibility of existing, new and changing uses of refuge land; and Section 7 requires the Service to identify and describe the archaeological and cultural values of the refuge.

The Act also directs the administration of the Refuge System to ensure the biological integrity, diversity, and environmental health of the Refuge System. According to the U.S. Fish and Wildlife Service Manual (601 FW3) this refers to the maintenance of existing elements, and where appropriate, the restoration of lost or severely degraded elements. Integrity pertains to biotic composition, structure, and function at genetic, organismal, and community levels. Diversity includes protection of the broad variety of living organisms, genetic distinctions, and community compositions. Environmental health recognizes the importance of both biotic and abiotic features and processes in the Refuge System. The standard of measure for each of these terms is defined using historic conditions or conditions and processes present prior to substantial anthropogenic changes, as indicated by the best available science and sound professional judgment.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998, 16 U.S.C. 742a

Amends the Fish and Wildlife Act of 1956 to promote volunteer programs and community partnerships for the benefit of national wildlife refuges, and for other purposes.

Native American Graves Protection and Repatriation Act, 25 U.S.C. 3001 et seq. (1990)

Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Refuge Recreation Act, 16 U.S.C. 460k et seq. (1962)

Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Refuge Revenue Sharing Act, 16 U.S.C. 715s (1935)

Requires revenue sharing provisions to all fee-title ownerships that are administered solely or primarily by the Secretary of Interior through the Service.

Rehabilitation Act of 1973, 29 U.S.C. 701 et seq.

Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the Federal Government to ensure that anybody can participate in any program.

Rivers and Harbor Appropriation Act of 1899, 33 U.S.C. 403

Section 10 of this Act requires the authorization by the U.S. Army Corps of Engineers (USACE) prior to any work in, on, over, or under a navigable water of the United States.

Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. 1201 et seq.

Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating certain areas as unsuitable for coal mining operations.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act, 16 U.S.C. 667b-667d (1948)

Provides that upon a determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred without reimbursement to the Secretary of Interior if the land has particular value for migratory birds or to a state agency for other wildlife conservation purposes.

Treasury and General Government Appropriations Act, Pub. L. 106-554, §1(a)(3), Dec. 21, 2000, 114 Stat. 2763, 2763A-125

In December 2002, Congress required federal agencies to publish their own guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information that they disseminate to the public (44 U.S.C. 3502). The amended language is included in Section 515(a). The Office of Budget and Management directed agencies to develop their own guidelines to address the requirements of the law. The U.S. Department of the Interior instructed bureaus to prepare separate guidelines on how they would apply the Act. The Service has developed "Information Quality Guidelines" to address the law.

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, 42 U.S.C. 4601 et seq.

Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.

Wilderness Act of 1964, 16 U.S.C. 1131 et seq.

Directed the Secretary of Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System.

Appendix H: Mailing List

The following is an initial list of government offices, private organizations, and individuals who will receive notice of the availability of this Draft Comprehensive Conservation Plan. We continue to add to this list.

Federal Officials

- Senator Amy Klobuchar
- Senator Al Franken
- Representative Collin Peterson

Federal Agencies

- U. S. Army Corps of Engineers

State Officials

- Senator Lyle Koenen
- Representative Andrew Falk

State Agencies

- Minnesota Department of Natural Resources

City/County/Local Governments

- Lac Qui Parle County Commissioners
- Big Stone County Commissioners
- City of Ortonville
- City of Odessa

Libraries

- Grant County Public Library
- Madison Public Library
- Ortonville Public Library

Organizations

- Appleton Sportsman's Club
- Pheasants Forever
- Big Stone Historical Society
- Big Stone Lake Chamber of Commerce

- Citizens for Big Stone Lake
- Clean Up the River Environment (CURE)
- Upper Minnesota Valley Regional Development Commission
- Ducks Unlimited
- Big Stone County Soil and Water Conservation District
- Lac Qui Parle Chamber of Commerce
- Lac Qui Parle Historical Society
- Lac Qui Parle River/Yellow Bank River Watershed Districts
- Bonanza Education Center
- Minkota Archery Club
- Minnesota Ornithologist Union
- Minnesota Deer Hunters Association
- Minnesota Trappers Association
- Minnesota Waterfowl Hunters Association
- Moose Lodge 407
- The Nature Conservancy
- Upper Minnesota River Watershed District
- Wild Turkey Federation
- Wildlife Forever

Media

- Local Radio and TV Stations; Refuge Media Contacts

Individuals

- Individuals who participated in open house sessions or who requested to be on the Comprehensive Conservation Plan mailing list.

Appendix I: Draft Compatibility Determinations

In this Appendix

Collection of Edible Wild Plant Foods for Personal Use
Environmental Education
Farming
Firewood Cutting and Timber Removal
Fishing
Grazing
Haying
Hunting
Interpretation
Non-Refuge Sponsored Events
Scientific Studies and Research Projects by Third Parties
Trapping of Furbearers
Wildlife Observation and Photography

Compatibility Determination

Use: Collection of Edible Wild Plant Foods for Personal Use

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 161664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 16460k-10 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 16460k-2 (Refuge Recreation Act (16 U.S.C. 16460k-460k-4), as amended).

. . . the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions . . . 6 16 U.S.C. I:l 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

. . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . 6 16 U.S.C. I:l 742f(a)(4) 0 . . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . . 6 16 U.S.C. I:l 742f(b)(1) (Fish and Wildlife Act of 1956).

. . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds . . . 6 16 U.S.C. I:l 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: Allow visitors to collect various plant food products such as wild berries and nuts on Refuge land for personal use.

Is the use a priority public use?

No, this is not a priority public use of the Refuge System.

Where would the use be conducted?

Harvest would occur throughout the Refuge in the uplands and along river and wetland edges. Areas where edible plants are found are a small percentage of the total upland acreage and are often found at abandoned building sites, which have been reclaimed by the Service.

When would the use be conducted?

Collection would occur during daylight hours and be of short duration in the spring for asparagus and mushrooms, and in the late summer and fall for berries, plums, and nuts.

How would the use be conducted?

These foods are hand-harvested by picking the products from the plant or gathering what has fallen to the ground. Mushrooms, asparagus, and wild mint are examples of plants that are collected and consumed or used as tea. These are cut by hand during harvest.

Access to harvest sites is by walking from a designated parking area or public roadway. Collection of these foods is not a wildlife-dependent recreational use and occurs infrequently. For a small number of people, this is a traditional, family-oriented activity, which provides an

opportunity for those participating to collect wholesome, healthy foods while enjoying the beauty of the natural environment.

Why is this use being proposed?

This use has historically been allowed on the Refuge and has become a custom of the local community. The Refuge is open to the public during the time periods that the use is allowed so no additional disturbance is created by allowing this use. Gathering allows the public to build a connection to the Refuge through personal outdoor experiences that engage the senses and foster an appreciation of the outdoors.

There is a paucity of other public lands in west-central Minnesota, which could provide this opportunity for the public. Private lands located in this area are intensively managed for row crop production. Due to farming practices, these areas typically do not contain any edible wild plants.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Access trails, parking lots, informational signs, and other facilities, as well as staff to enforce regulations and maintain these facilities have been provided by the Service. These facilities will be maintained to meet the needs of the public and will be used incidentally by those who are collecting edible wild plant foods. This use will not require any increase in additional maintenance, enforcement staff, or administrative expenditures. There will be no Special Use Permits issued for this use, and the Service will not have to provide any special equipment or services.

Are existing Refuge resources adequate to properly and safely administer the use?

Existing Refuge resources are adequate to ensure this activity is safely administered and carried out according to compatibility requirements.

Anticipated Impacts of the Use:

How does the collection of edible wild plant foods affect Refuge purposes and the Refuge System mission?

The Refuge was established to provide for the needs of migratory birds and other wildlife. Gathering does not adversely affect the ability of the Refuge to fulfill this purpose.

How does the collection of edible wild plant foods affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge and the Refuge System?

Disturbance

Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations (DeLong, 2002) includes a summary of effects on wildlife from disturbance from

various forms of recreation. The author documents that disturbance can alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife. It is probable that gathering would cause some or all of these effects to some degree on Refuge wildlife, but present and expected future levels are not expected to adversely affect wildlife populations on the Refuge. A number of measures mitigate these effects.

Habitat

No adverse impacts to Refuge habitats are expected from this activity. Presently, the level of this use is estimated at 25 visits annually and is not expected to increase much above present rates in the future. The use occurs for short durations during spring and late summer/fall when nuts, berries, and mushrooms are most likely available. Gathering occurs in the same areas as other public uses, and practiced at prescribed levels is not expected to harm Refuge habitats.

Biological Integrity, Diversity, and Environmental Health

Gathering of nuts, berries, and mushrooms conducted in accordance with Refuge regulations is not expected to adversely affect fish and wildlife populations or the biological integrity, diversity, and environmental health of the Refuge as it is defined in Service policy (FWS, 2001). Historically, public participation in the collection of nuts, berries, and mushrooms on the Refuge is estimated at about 25 visits per year, and future participation is also expected to be at or slightly above the current level. This is not anticipated to adversely impact the biological integrity, diversity, or environmental health of the Refuge.

Other Uses and Public Safety

Gathering is not expected to adversely affect other Refuge uses or public safety. Experience on many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of gathering on priority wildlife-dependent recreation activities or public safety at Big Stone NWR is expected to be minor.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Collection of Edible Wild Food Plants for Personal Use

___ Use is Not Compatible

___ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Motor vehicle is restricted to designated roads.
2. Camping, overnight use, and fires will be prohibited.
3. Digging, destruction, and/or removal of plants or their roots are prohibited.
4. Collection is for personal use only, and wild food products cannot be sold commercially.

Justification: In view of the above and with the stipulations previously described, gathering wild edible plant foods will not materially interfere with or detract from the purposes of the Refuge or the mission of the Refuge System. This use also fosters an appreciation of our natural resources by the public and is a means of allowing the Refuge to more effectively connect people to nature as per the Service’s “Let’s Go Outside-Connecting People With Nature” initiative.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds—a literature review of impacts and mitigation measures—prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) *in* Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR.

Compatibility Determination

Use: Environmental Education

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

Is the use a priority public use?

Environmental education is a priority use of the Refuge System.

Where would the use be conducted?

Environmental education activities occur in various habitats within the Refuge based upon the request.

When would the use be conducted?

Assistance to teachers for environmental education is provided upon request if staff time is available.

How would the use be conducted?

Refuge staff provides assistance to teachers for environmental education upon request. Teacher-led school groups, youth groups, or other organized groups involved in learning activities visit the Refuge and may visit one or more habitats to conduct small studies, make observations, or other activities in support of educational objectives.

Why is this use being proposed?

Environmental education is a priority general public use of the Refuge System. Environmental education programs promote understanding and appreciation of natural and cultural resources and their management on all lands and waters of the Refuge System.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

The present Refuge environmental education program requires minimal Refuge resources. It is provided upon request and as time allows.

Are existing Refuge resources adequate to properly and safely administer the use?

At the present level of use there are adequate Refuge resources to implement the environmental education program.

Anticipated Impacts of the Use:

How does environmental education affect Refuge purposes and the Refuge System mission?

No adverse impacts on Refuge resources are expected from implementation of the Refuge environmental education program.

How does environmental education affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Wildlife and Wildlife Habitat

Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations (DeLong, 2002) includes a summary of effects on wildlife from disturbance from various forms of recreation. The author documents that disturbance can alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife. It is probable that environmental education could cause some or all of these effects to some degree on Refuge wildlife. However, due to the extremely small amount of environmental education activity, this disturbance would be minimal and the affects would not last much longer than the visit. Much of the Refuge is not affected, because environmental education is concentrated along the Wildlife Drive, roads and trails and at observation facilities. These areas have been established areas of use. Damage to habitat by walking is minimal and temporary. Large groups typically use established foot trails or the local roads with little to no impact on vegetation. There is some temporary disturbance to wildlife due to human activities on trails; however, the disturbance is generally localized and would not adversely impact overall populations. Environmental education use is not expected to increase substantially over time.

The cumulative disturbance caused by environmental education and all other public uses occurring on the Refuge is not expected to adversely affect fish and wildlife populations or their habitats. A number of factors including: suitable site conditions, presence of facilities, access limitations, and seasonal restrictions or other regulations tend to concentrate uses. At any one time, much of the Refuge is unaffected by these uses and is free of disturbance.

Biological Integrity, Diversity, and Environmental Health

Environmental education activities, conducted in accordance with Refuge regulations, are not expected to adversely affect fish and wildlife populations or the biological integrity, diversity, and environmental health of the Refuge as it is defined in Service policy (FWS, 2001).

Other Uses and Public Safety

Environmental education is not expected to adversely affect other Refuge uses or public safety. The Refuge's Visitor Services programs will be adjusted as needed to eliminate or minimize any future problems and provide quality wildlife-dependent recreational opportunities, which include promoting public safety. Experience on many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of environmental education on other wildlife-dependent recreation or public safety at Big Stone NWR is expected to be minor.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge.

Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Environmental Education

____ Use is Not Compatible

____ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. The Refuge Manager will monitor use patterns and densities and make adjustments in timing, location, and duration as needed to limit disturbance.
2. Use will be directed to public use facilities (both existing and in the future), which are not in or near sensitive areas.
3. Use is limited to daylight hours only.

Justification: In view of the above and with the stipulations previously described, environmental education will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. Environmental education is a priority public use of the Refuge System and providing this program contributes to achieving one of the Refuge goals. Well-designed environmental education programs can be effective resource management tools that provide an opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service and to influence visitor behavior when visiting units of the Refuge System.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds—a literature review of impacts and mitigation measures — prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) in Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Compatibility Determination

Use: Farming

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

Is the use a priority public use?

Farming is not a priority public use in the Refuge System.

Where would the use be conducted?

Farming occurs on approximately 2–4 percent of Refuge lands annually.

When would the use be conducted?

Spring planting typically begins in early April, and harvest typically concludes by November of each year.

How would the use be conducted?

The Refuge will allow farming by private individuals for the purpose of habitat management. Cooperative farming is the term used for cropping activities (growing agricultural products) conducted by a third party on land that is owned by or managed as part of the Refuge. This activity is implemented to prepare a quality seed bed for the establishment of native prairie species.

Cooperative farming activities will only be performed on previously disturbed areas such as previously farmed land, which have unacceptable levels of chemical residue, noxious weeds, or non-native plant species or ecotypes or to honor the land use clauses of a purchase agreement. To ensure that all Service policies are met, all such land use clauses must be approved by the Refuge Manager prior to Service acceptance of the purchase agreement.

Cooperative farming is conducted through a sealed bid process. The highest bidder receives the contract for that area. Cooperative farming is conducted under the terms and conditions of a Cooperative Farming Agreement or Special Use Permit issued by the Refuge Manager. The terms of the agreement or permit ensure compliance with Service policy and area-specific stipulations to meet management objectives and safeguard resources.

Contracts are typically written for 3–4 years. The cooperator breaks up the ground the first year and then farms it for the remaining 2–3 years. The last year of the contract requires the cooperator to seed the field to soybeans. Soybean stubble is the preferred substrate into which the Refuge seeds native grasses and forbs.

Farming entails the use of mechanical equipment such as tractors, disks, and seeders. Each site is tilled prior to spring planting, once ground conditions permit the use of heavy equipment without damage to the soil. Tilling requires 1–2 days per site. Some sites may also be treated with herbicide prior to planting. Crops such as corn and soybeans are planted. Typically, planting is completed in one day or less on any individual site, and planting on all sites usually

begins as early as mid-April and is completed as late as early June depending on soil conditions and type of crop planted. Cooperators are limited to using only Service-approved herbicides.

Harvest techniques are the same for both no-till and traditional farming practices. Harvest begins in the fall, using a self-propelled harvesting implement such as a combine, and usually takes about one day per site and is complete on all sites by late October.

Why is this use being proposed?

Farming is used to prepare seed beds for the Refuge's grassland restoration program.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Most of the needed work to prepare for this use would be done as part of routine management duties. The decision to use cooperative farming as a management tool would occur as part of the strategies developed under specific program or unit habitat management planning. The additional time needed to coordinate issuance and oversight of the needed Special Use Permit or Agreements is relatively minor and within existing Refuge resources.

Are existing Refuge resources adequate to properly and safely administer the use?

The needed staff time for development and administration of a cooperative farming program is available. The additional time needed to coordinate issuance and oversight of the needed Special Use Permit or agreements is relatively minor and within existing Refuge resources.

Anticipated Impacts of the Use:

How does farming affect Refuge purposes and the Refuge System mission?

The use of farming provides Refuge staff with a management tool that allows the Refuge staff to meet the habitat goals and objectives. Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes (FWS, 2001).

How does farming affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Cooperative farming to prepare suitable seed beds for native prairie plantings will result in short-term disturbances and long-term benefits to both resident and migratory wildlife using Refuge lands. Short-term impacts will include disturbance and displacement typical of any noisy heavy equipment operation. Cropping activities in old fields or abandoned croplands will also result in short-term loss of habitat for any animal or insect species using those areas for nesting, feeding, or resting. Long-term benefits are extremely positive due to establishment of diverse nesting cover utilizing local eco-type Northern Tallgrass Prairie Ecosystem plant species. The resulting habitat will greatly improve conditions for most of the same species affected by the short-term negative impacts. Strict time constraints placed on this use will limit anticipated

impacts to these relatively minor areas. Farming and any associated impacts are expected to occur on approximately 2–4 percent of Refuge lands annually.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination:

Farming

____ Use is Not Compatible

____ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Farming activity will only take place on previously altered tracts of land within the Refuge and must meet specific habitat and related wildlife objectives and contribute to the purposes of the Refuge.
2. Cooperating farmers will be subject to Service policy and regulation regarding use of chemicals. Herbicide and pesticide use is restricted by type and to the minimum necessary amount applied.
3. Special conditions of Cooperative Farming Agreements will address unique local conditions as applicable.
4. Planting and harvest activities are restricted to minimize disturbance of wildlife species.

Justification: In view of the above and with the stipulations previously described, farming will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. As practiced at Big Stone NWR, farming contributes to the achievement of Refuge purposes and the Refuge System mission because it is used to restore native habitat.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Compatibility Determination

Use: Firewood Cutting and Timber Removal

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: The removal of standing or fallen trees by private individuals and contractors. This covers all wood removal activities regardless of the ultimate use of the wood (e.g., firewood, pulp, etc.).

Is the use a priority public use?

Wood cutting and timber removal are not priority public uses of the Refuge System.

Where would the use be conducted?

The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Harvest sites will vary in size from a portion of an acre up to several hundred acres depending on the site and management objectives.

When would the use be conducted?

Wood removal activities may be authorized throughout most of the year. Wood cutting will not be allowed during times when the activity will cause damage to roads and grasslands. The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Most often, wood removal activities for the purposes of firewood will occur September through December, while commercial harvest activities occur during the winter months when frozen ground will facilitate access and afford protection to underlying soils and vegetation.

How would the use be conducted?

Equipment used for harvest may range from chainsaws and axes to more traditional logging equipment such as feller-bunchers, log skidders, and intensive hydro-ax (grinding-pulverizing). Access may be by car and trailer, pick-up truck, farm tractor, or larger traditional logging equipment. Differences in scope and necessary equipment will occur depending on the amount and type of wood available for removal.

Why is this use being proposed?

This activity will only occur where the Service has determined that a management need exists to remove wood. Wood removal may be done where trees are encroaching on the open marshes, grassland areas, granite outcrops, or degrading earthen water impoundment structures.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Planning, issuing permits, and monitoring a wood product harvest program would require a minimal commitment of staff hours. In the past, the Refuge has issued approximately 10 Special Use Permits annually to private individuals for this activity and one Purchase Order/Task Order

for contracted timber removal. All harvest sites are marked on maps by Refuge staff. By permitting a wood products harvest, the manager has identified a management need and will have secured and prioritized the necessary station resources.

Are existing Refuge resources adequate to properly and safely administer the use?

No additional fiscal resources are needed to conduct this use. The needed staff time is already committed and available. Most of the needed work to prepare for this use would be done as part of routine management duties. The decision to allow firewood cutting or a timber removal contractor will be determined as part of strategies developed under habitat management discussions. The additional time needed to coordinate issuance and oversight of the needed Special Use Permit for purchase order is within existing Refuge resources. Monitoring timber removal effects will be a part of the existing grassland monitoring program.

Anticipated Impacts of the Use:

How does firewood cutting and timber removal affect Refuge purposes and the Refuge System mission?

The use of firewood cutting/timber harvest provides a management tool that allows the Refuge staff to meet the habitat goals and objectives. Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes (FWS, 2001).

How does firewood cutting and timber removal affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

In permitting this type of activity, the potential exists to directly impact wildlife by displacement of animals from localized areas due to disturbance, or crushing of nests as a result of access for this activity. These impacts are easily avoided by timing of the activity in accordance with site specific characteristics.

Indirect impacts to waterfowl production and Refuge goals will occur as a result of removing woody vegetation. In nearly every instance, these impacts will be positive. The removal of woody vegetation from historic grassland or wet meadow habitats impacts waterfowl production and the Refuge System mission by increasing the amount of nesting habitat and reducing predator habitat. In some cases, the removal of trees along roads, trails, and dikes is necessary because of the hazard to users from dead trees. For some people, there will be a temporary reduction in aesthetic quality on timber harvesting sites.

Access for the purpose of removing wood may impact habitat by rutting soils, destroying groundcover, creating weed seedbeds, introducing invasive species, and increasing sedimentation due to runoff in nearby wetlands. These impacts can again be avoided by timing of the activity and requiring equipment be cleaned prior to entering the Refuge.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public

notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination:

Firewood Cutting and Timber Removal

_____ Use is Not Compatible

_____ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Work generally will be restricted to areas where soil types indicate that habitat was historically comprised of native prairie vegetation, on granite outcrops and associated habitats, or in existing non-native woodlots associated with abandoned farm sites.
2. If work is in an area where waterfowl nesting is likely, no cutting operations will be permitted from April through July 15.
3. Vehicle access for wood removal will be limited to existing trails or restricted to periods when the ground is frozen or dry to limit rutting and damage to growing vegetation.
4. A Special Use Permit will be issued to private individuals so special conditions can be developed in order to reduce or eliminate site specific impacts and ensure Service management goals are met.
5. Purchase Orders/Task Orders will be issued to commercial operations to ensure site specific impacts and Service management goals are met.

Justification: In view of the above and with the stipulations previously described, firewood cutting and timber removal will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. As practiced at Big Stone NWR, tree cutting and removal contributes to the achievement of Refuges purposes and the Refuge System mission. It helps maintain prairie habitat, which is the historic condition within the Refuge and provides habitat for migratory birds.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Compatibility Determination

Use: Fishing

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

Is the use a priority public use?

Fishing is a priority public use of the Refuge System. The State of Minnesota manages and regulates the taking of game fish species throughout the State, maintaining healthy populations.

Where would the use be conducted?

Fishing is allowed on all waters within Big Stone NWR. Boat fishing is only allowed in the Minnesota River channel with non-motorized boats or boats using electric motors. Bank fishing and ice fishing are allowed throughout the rest of the Refuge; however, due to suitable habitat and access constraints, ice fishing is typically limited to the Minnesota River and the East Pool impoundment.

When would the use be conducted?

Minnesota fishing regulations allow fishing year round for many species, but most fishing activity on the Refuge occurs from May through October. Ice fishing activity increases when the water level in East Pool is high in the winter. Refuge regulations limit all public use activities, including fishing, to daylight hours.

How would the use be conducted?

Fishing on Refuge waters is in accordance with state seasons and regulations as well as Refuge regulations, which in some cases may be more restrictive than State regulations. One example is that state regulations allow night time fishing, where Refuge regulations limit fishing to daylight hours. Several fishing platforms, parking lots, a boat access, and walk in access points allow visitors access to Refuge fishing sites. Ice fishing is allowed; however, access using ATVs/UTVs, snowmobiles, and off road travel is prohibited.

Why is this use being proposed?

Fishing is a priority general public use of the Refuge System. The Service recognizes fishing as a traditional outdoor pastime, deeply rooted in the American heritage (FWS, 2006b). Fishing programs promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

The present Refuge fishing program is designed to be administered with minimal Refuge resources. Refuge regulations mirror state regulations in large part, which allows Minnesota Department of Natural Resources (MN DNR) Conservation Officers to assist in law enforcement.

Several fishing access areas were recently rehabilitated and are now accessible. There is a small amount of maintenance, mowing, and other upkeep at boat launching facilities that is funded as part of regular Refuge management activities. Approximately \$3,000 annually is required for labor and materials to update and print maps and maintain signs. The Refuge staff does not remove snow on any access points or parking lots.

Are existing Refuge resources adequate to properly and safely administer the use?

At the present level of fishing use there are adequate Refuge resources to implement the fishing program. Law enforcement is the primary tool necessary to ensure proper and safe administration of this use, and although there is no Law Enforcement Officer stationed at the Refuge, law enforcement services are available through the Regional Law Enforcement Program. Additionally, the local State Conservation Officer and Big Stone County Sheriff's Office provide additional assistance when requested.

Anticipated Impacts of the Use:

How does fishing affect Refuge purposes and the Refuge System mission?

The fishing program on the Refuge helps fulfill the Refuge System mission and does not detract from the ability to fulfill Refuge purposes. The Refuge was established under several purposes, but primarily to conserve, manage, maintain, and protect wildlife and habitat resources. Fishing will not detract from these purposes. Fishing is a priority public use of the Refuge System and allowing fishing on the Refuge helps fulfill the System mission.

How does fishing affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Fishing is not expected to adversely affect fish populations and fish habitat within the Refuge. Conserving a diversity of fish and their habitat is included in one the goals of the Refuge System (FWS, 2006a). But the focus is on maintaining populations not individuals (FWS, 1992). Fishing does cause mortality and wounding of individuals within a fish population, but fishing is regulated so it does not threaten the perpetuation of fish populations. The effects of fishing on fish populations are monitored by the MN DNR and are considered in setting annual limits.

Wildlife and Wildlife Habitat

Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations (DeLong, 2002) includes a summary of effects on wildlife from disturbance from fishing and other forms of recreation. The author documents that disturbance can alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife. It is probable that fishing would cause some or all of these effects to some degree on Refuge wildlife. A number of measures mitigate these effects. Although fishing is allowed throughout the Refuge, the majority of the fishing takes places along the Minnesota River, the East Pool impoundment, and where there are facilities to accommodate fishing. Fishing activity is estimated at 1,000 visits annually on the Refuge and is not expected to increase substantially over time.

The cumulative disturbance caused by fishing activity and all other public uses occurring on the Refuge is not expected to adversely affect fish and wildlife populations or their habitats. A number of factors including: suitable site conditions, presence of facilities, access limitations, and seasonal restrictions or other regulations tend to concentrate uses. At any one time, much of the Refuge is unaffected by these uses and is free of disturbance.

Biological Integrity, Diversity, and Environmental Health

Fishing conducted in accordance with state and Refuge regulations is not expected to adversely affect fish and wildlife populations or the biological integrity, diversity, and environmental health of the Refuge as it is defined in Service policy (FWS, 2001).

Other Uses and Public Safety

Fishing is not expected to adversely affect other Refuge uses or public safety.

If public use levels on Big Stone NWR expand over time, unanticipated conflicts between user groups may occur. The Refuge's Visitor Services programs would be adjusted as needed to eliminate or minimize each problem and provide a quality wildlife-dependent recreational opportunity, which includes promoting public safety. Experience on many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of fishing on other wildlife-dependent recreation or public safety at Big Stone NWR is expected to be minor.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Fishing

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Fishing must be conducted according to state-, federal- and Refuge-specific regulations.
2. Boat fishing will be restricted to the Minnesota River channel. Only non-motorized boats and boats using electric motors are allowed.
3. Camping, overnight use, and fires are prohibited.
4. The use of snowmobiles and all terrain and utility terrain vehicles (ATV/UTV) are prohibited.
5. Ice fishing structures, devices, and personal property must be removed from the Refuge daily.

Justification: In view of the above and with the stipulations previously described, fishing will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. Fishing is a priority public use of the Refuge System and providing a fishing program contributes to achieving one of the Refuge goals. Fishing is not expected to adversely affect the biological integrity, diversity, and environmental health of the Refuge or the Refuge System.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds—a literature review of impacts and mitigation measures—prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) *in* Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR. Available URL: <http://www.fws.gov/stillwater/litreview.pdf>

U. S. Fish and Wildlife Service. 1992. Population Management at Field Stations: General. 701 FW 1. Department of Interior. Available URL: <http://www.fws.gov/policy/701fw1.html>

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

U. S. Fish and Wildlife Service. 2006a. National Wildlife Refuge System Mission and Goals and Refuge Purposes. 601 FW 1. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/601fw1.html>

U. S. Fish and Wildlife Service. 2006b. Wildlife-Dependent Recreation: Fishing. 605 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw3.html>

Compatibility Determination

Use: Grazing

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: The Refuge will allow limited grazing by privately owned domestic livestock for the purpose of habitat management. Livestock will be chiefly cattle but may include other domestic livestock.

Is the use a priority public use?

Grazing is not a priority public use of the Refuge System.

Where would the use be conducted?

Grazing will occur on specified areas to improve or maintain grassland and wet meadow habitat. The decision to use grazing as a management tool would occur as part of strategies developed under specific program or unit habitat management planning. For example, grazing may be used to stimulate growth of desirable grass species or reduce woody vegetation or other undesirable invasive plant species.

When would the use be conducted?

Grazing may take place anytime from April through November. Most commonly, we will use short duration grazing periods, lasting four to eight weeks. The time period and frequency of grazing will depend on desired outcome as established in unit grazing management plans.

How would the use be conducted?

Grazing will be conducted using privately owned domestic livestock. Grazing unit fencing and other measures required to manage livestock will be the responsibility of the cooperating private party. Grazing fees will be charged based on annual review of local market rates conducted by the Refuge Manager, in consultation with area U.S. Department of Agriculture (USDA) specialists or reports; or as determined by permittee selection using a best bid basis. Grazing fees will typically be assessed using the Animal Unit Month (AUM) method. Grazing fees may include market rate deductions for special circumstances, such as: atypical fencing or water requirements, required cattle movement, or other factors limiting economic return for permittees. Frequency of grazing on any unit will be based on site-specific evaluation of the grassland unit being managed.

Administration of grazing programs will be conducted in accordance with a Habitat Management Plan. Grazing activities will be subject to the terms and conditions of a Special Use Permit issued by the Refuge Manager. The terms of the permit ensure compliance with Service policy and achieving habitat objectives while safeguarding Refuge resources.

Why is this use being proposed?

Grazing is a needed management tool to maintain and restore Refuge grasslands.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Most of the needed work to prepare for this use would be done as part of routine management duties. The decision to use grazing as a management tool would occur as part of strategies developed under specific program or unit habitat management planning. The additional time needed to coordinate issuance and oversight of the needed Special Use Permits is relatively minor and within existing Refuge resources. The need to monitor grazing effects will take additional time; however, it will be incorporated into the already existing grassland monitoring program.

Are existing Refuge resources adequate to properly and safely administer the use?

The needed staff time for development and administration of a grazing program is available. The additional time needed to coordinate issuance and oversight of the needed Special Use Permits is relatively minor and within existing Refuge resources. Monitoring of grazing effects will be easily incorporated into the grassland monitoring program. Most grazing costs (fencing, monitoring herd health, etc.) are assumed by the permittee.

Anticipated Impacts of the Use:

How does grazing affect Refuge purposes and the Refuge System mission?

The use of grazing provides a management tool that allows the Refuge staff to meet the habitat goals and objectives. Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes (FWS, 2001).

How does grazing affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Grazing by domestic livestock has severe short-term effects on grassland communities. Many of these effects are desirable and are designed to maintain and improve healthy grassland/wet meadow communities. Some of these effects include removing standing vegetation, trampling of other vegetation, and reducing populations of pioneering woody plants. Other effects, such as areas where livestock may frequently concentrate, are more harmful but generally short-lived. Grazing in the spring can cause direct loss of grassland bird nests due to trampling and loss of standing vegetation. Grazing at any time of year creates an aesthetic issue of concern for some people who enjoy using the Refuge; seeing public land being grazed by domestic livestock reduces the appeal of the visit for many people.

Grazing livestock can create minor direct disturbance of wildlife, such as causing nearby birds to take flight. There is a slight potential for conflict between members of the public and livestock or the permittee.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge.

Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Grazing

___ Use is Not Compatible

___ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Grazing must meet specific habitat and related wildlife objectives and contribute to the purposes of the Refuge.
2. Grazing will not occur more frequently than three out of every five years on any tract without the preparation of a site-specific compatibility determination.
3. Control and maintenance of the livestock will be the responsibility of the permittee.
4. All livestock grazing will be conducted under strict control of a Special Use Permit.
5. All fencing, water supply, and other livestock management costs will be borne by the permittee.
6. No insecticides will be used.
7. No supplemental feeding will be allowed.

Justification: In view of the above and with the stipulations previously described, grazing will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. As practiced at Big Stone NWR, grazing contributes to the achievement of Refuges purposes and the Refuge System mission because it is used to maintain native habitat.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Compatibility Determination

Use: Haying

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: The Refuge will allow haying by private individuals for the purpose of habitat management.

Is the use a priority public use?

Haying is not a priority public use of the Refuge System.

Where would the use be conducted?

The decision to use haying as a management tool on the Refuge would occur as part of strategies developed under specific program or unit habitat management planning. The total area on which haying will be permitted during any one year will likely be less than 500 acres.

When would the use be conducted?

Haying operations typically occur between July 15–August 1 and bales being removed by August 15. In some cases where sweet clover or noxious weeds have invaded an area, earlier haying would be allowed.

How would the use be conducted?

The Refuge will allow haying by private individuals for the purpose of habitat management. Permittee selection will be determined using a best bid basis. Haying is the cutting and processing (typically baling) of grass and forbs, with subsequent removal to an off-Refuge location. Haying of any area is usually conducted as a single event during any one year but may be repeated periodically to: remove undesirable grasses and forbs, remove accumulated plant biomass, remove or reduce woody vegetation, provide a desired vegetative condition (such as short grass browse), reduce vegetation fuel levels where wildfires are a concern, or prepare sites for establishment of desired vegetation, including prairie or wetland communities.

Haying activities will be subject to the terms and conditions of a Special Use Permit issued by the Refuge Manager. The terms of the agreement or permit ensure compatibility through implementation of Service policy and Refuge specific stipulations.

The haying process typically requires 3–4 visits to each site with heavy equipment over a period of 7–10 days. Haying begins in July when standing grasses and forbs are cut and gathered into windrows using a tractor, mower, and rake; or a swather—a self-propelled mowing machine. The hay cures for 3–7 days to reduce moisture content and is usually turned once with a tractor-drawn rake to speed and even drying. Once cured a tractor-drawn baler is used to package the windrows into bales of hay. A tractor-drawn wagon is used to collect the bales and remove them from the site.

Why is this use being proposed?

Haying is a needed management tool to maintain and restore Refuge grasslands.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Most of the needed work to prepare for this use would be done as part of routine management duties. The decision to use haying as a management tool would occur as part of strategies developed under specific program or unit habitat management planning. The additional time needed to coordinate issuance and oversight of the needed Special Use Permits is relatively minor and within existing Refuge resources. The need to monitor haying effects will take additional time; however, it will be incorporated into the already existing grassland monitoring program.

Are existing Refuge resources adequate to properly and safely administer the use?

No additional fiscal resources are needed to conduct this use. The needed staff time is already committed and available. Most of the needed work to prepare for this use would be done as part of routine grassland management duties. The decision to use a private operator for haying would only follow as part of strategies developed under grassland management discussions. The additional time needed to coordinate issuance and oversight of the needed Special Use Permit for haying is relatively minor and within existing Refuge resources. Monitoring haying effects will be a part of the existing grassland monitoring program.

Anticipated Impacts of the Use:

How does haying affect Refuge purposes and the Refuge System mission?

The use of haying provides a management tool that allows the Refuge staff to meet the habitat goals and objectives. Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes (FWS, 2001).

How does haying affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Haying will result in short-term disturbances and long-term benefits to both resident and migratory wildlife. Short-term impacts will include disturbance and displacement typical of any noisy heavy equipment operation. Cutting and removal of standing grasses will also result in short-term loss of habitat for those species requiring tall grasses for feeding and perching such as obligatory grassland bird species like the bobolink or dickcissel.

Long-term benefits will accrue due to the increased vigor of newly established grasses or the establishment of highly desirable native tallgrass prairie species, which will improve conditions for those same species affected by the short-term negative impacts. Longer-term negative impacts may occur to resident wildlife species such as pheasant that would lose over-wintering habitat in the hayed areas.

This is offset by the close proximity of large unhayed blocks containing suitable winter habitat near any area that will be hayed. Some nest destruction or nesting hen mortality may occur.

Strict time constraints such as delaying most haying until after July 15th will limit the potential for these types of negative effects to occur within areas hayed. National wildlife refuges are managed first and foremost for wildlife (FWS, 2001). But the focus is on wildlife populations not individuals (FWS, 1992). Haying is likely to cause mortality of some individual animals, but is not expected to affect the perpetuation of wildlife populations.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Haying

_____ Use is Not Compatible

_____ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Haying must meet specific habitat and related wildlife objectives and contribute to the purposes of the Refuge.
2. Most haying will begin after July 15 to minimize disturbance to nesting migratory birds. In some years it may be necessary for haying to occur before July 15 to prevent seed dispersal of undesirable plant species.
3. Windrowed grass left lying to dry prior to baling must be raked and moved every two days if left on newly seeded native grass and in no cases should remain on the ground more than six days prior to baling.
4. Bales must be removed from the Refuge within seven days of baling.

Justification: In view of the above and with the stipulations previously described, haying will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. As practiced at Big Stone NWR, haying contributes to the achievement of Refuges purposes and the Refuge System mission because it is used to manage native habitat.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

U. S. Fish and Wildlife Service. 1992. Population Management at Field Stations: General. 701 FW 1. Department of Interior. Available URL: <http://www.fws.gov/policy/701fw1.html>

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Compatibility Determination

Use: Hunting

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956)

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

Is the use a priority public use?

Hunting is a priority public use of the Refuge System. Hunting was originally opened on Big Stone NWR in 1976 and is conducted in accordance with the Refuge Hunting Plan (1992).

Where would the use be conducted?

The hunting of certain species is an existing use that occurs on designated areas of the Refuge. Approximately 8,000 acres are currently open to hunting. Hunting is prohibited on approximately 3,500 acres that surround the Headquarters Complex and the Auto Tour Route.

When would the use be conducted?

Season dates for authorized species are consistent with Minnesota State regulations, except when more restrictive Refuge regulations apply. More restrictive Refuge regulations include, but are not limited to the Refuge being closed to all hunting from March 1 through August 30 and reduced season dates and hours when hunting fox, raccoon, and striped skunk. Specific dates for hunting seasons vary annually. The following table show the dates for the 2010 seasons.

Authorized Species	Refuge Season Dates
Wild turkey - spring	April 14–May 27, 2010
Wild turkey - fall	Oct. 14–24, 2010
Gray partridge	Sept. 19, 2010 – Jan. 2, 2011
Ring-necked pheasant	Oct. 16, 2010 – Jan. 2, 2011
Rabbit (cottontail and jack)	Sept. 18, 2010 – Feb. 28, 2011
Squirrel (fox and gray)	Sept. 18, 2010 – Feb. 28, 2011
Deer	Nov. 6–14, 2010
Deer	Nov. 27 – Dec. 12, 2010
Deer	Sept. 18 – Dec. 31, 2010
Raccoon	Oct. 23, 2010 – Feb. 28, 2011*
Fox (gray and red)	Oct. 23, 2010 – Feb. 28, 2011*
Striped skunk	Sept. 18, 2010 – Feb. 28, 2011*

* season dates differ from Minnesota State season

How would the use be conducted?

Bag limits and harvest methods for authorized species are consistent with Minnesota State regulations, except when more restrictive Refuge regulations apply. Hunting is allowed for the following species: wild turkey, ring-necked pheasant, gray partridge, cottontail rabbit, jack rabbit, gray squirrel, fox squirrel, white-tailed deer, red fox, gray fox, raccoon, and striped skunk. More restrictive Refuge regulations include, but are not limited to prohibiting the use of dogs to hunt furbearers and requiring the use of nontoxic shot for turkey hunting. Migratory bird hunting is not authorized on Refuge-owned lands.

Firearms, muzzleloader, and archery hunting all occur on the Refuge. Hunters make use of boat ramps and parking lots at various locations on the Refuge, and also park along existing roadways. There are no facilities provided specifically for hunters.

Why is this use being proposed?

Hunting is a priority general public use of the Refuge System that is also an important wildlife management tool. The Service recognizes hunting as a healthy, traditional outdoor pastime, deeply rooted in the American heritage (FWS, 2006). Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs. Hunting programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System. Public hunting opportunities are also available nearby on Waterfowl Production Areas administered by the Morris Wetland Management District and on the Lac qui Parle Wildlife Management Area administered by the Minnesota Department of Natural Resources (MN DNR).

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

The present Refuge hunting program is designed to be administered with minimal Refuge resources. Refuge regulations mirror state regulations in large part, which allows MN DNR Conservation Officers to assist in law enforcement. There is a small amount of road maintenance, mowing, and other upkeep performed that is funded as part of regular Refuge management activities. Approximately \$5,000 annually is required for labor and materials to update and print maps, and maintain signs.

Are existing Refuge resources adequate to properly and safely administer the use?

At the present level of hunting use there are adequate Refuge resources to implement the hunting program. Law enforcement is the primary tool necessary to ensure proper and safe administration of this use, and although there is no Law Enforcement Officer stationed at the Refuge, law enforcement services are available through the Regional Law Enforcement Program. Additionally, the local State Conservation Officer and Big Stone County Sheriff's Office provide additional assistance when requested.

Anticipated Impacts of the Use:

How does hunting affect Refuge purposes and the Refuge System mission?

The Refuge was established to conserve, manage, maintain, and protect wildlife resources and their habitat. Hunting does not adversely affect the ability of the Refuge to fulfill this purpose. National wildlife refuges are managed first and foremost for wildlife (FWS, 2001). But the focus is on wildlife populations not individuals (FWS, 1992). Hunting causes mortality and wounding of individual animals, but is regulated so it does not threaten the perpetuation of wildlife populations. The effects of hunting on wildlife populations are monitored within the State and

across the nation and are considered in setting annual hunting bag limits. Hunting is a priority public use of the Refuge System, and allowing hunting on the Refuge helps fulfill the Refuge System mission.

How does hunting affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Resident Game Species

The MN DNR annually reviews hunting seasons and bag limits and modifies them to avoid any long-term population declines. Hunting is not expected to adversely impact game populations.

Disturbance

Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations (DeLong, 2002) includes a summary of effects on wildlife from disturbance from hunting and other forms of recreation. The author documents that disturbance can alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife. It is probable that hunting would cause some or all of these effects to some degree on Refuge wildlife. A number of measures mitigate these effects. Hunting seasons occur outside the times when most wildlife species are raising offspring and are most sensitive to disturbance. Also, hunting is prohibited year round within the “Closed Area.” Motor vehicle use is limited to designated road and parking areas that were designed in a manner that effectively reduces disturbance to wildlife. Hunting activity has averaged approximately 2,500 visits annually since 2005. Although this number may increase slightly over time, it is expected that wildlife disturbance will remain at acceptable levels.

Habitat

Hunting is not expected to adversely affect Refuge habitat.

Biological Integrity, Diversity, and Environmental Health

Hunting conducted in accordance with state and federal regulations is not expected to adversely affect wildlife populations that occur on the Refuge and likely assists in maintaining the biological integrity, diversity, and environmental health of the Refuge. Some species, such as white-tailed deer, today occur at levels well above those thought to occur under historic conditions. Left unchecked high numbers of such species could adversely affect biological integrity, diversity, and environmental health. Hunting is a closely monitored tool that helps regulate wildlife populations.

Other Uses and Public Safety

Hunting is not expected to adversely affect other Refuge uses or public safety. Dogs are permitted for hunting for retrieving and trailing. At present, levels of use dogs used for these purposes are not expected to adversely impact non-target species or conflict with other uses. If public use levels on Big Stone NWR expand across time, unanticipated conflicts between user groups may occur. The Refuge’s Visitor Services programs would be adjusted as needed to eliminate or minimize each problem and provide a quality wildlife-dependent recreational opportunity, which includes promoting public safety. Experience on many national wildlife

refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impacts of hunting on other wildlife-dependent recreation or public safety at Big Stone NWR are expected to be minor.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Hunting

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Hunting must be conducted according to state-, federal-, and Refuge-specific regulations.
2. Hunting may be more restrictive than State seasons and regulations to ensure compliance with visitor safety and to reduce wildlife disturbance.
3. Hunting is prohibited within identified areas.
4. The retrieval of game is prohibited in areas closed to hunting.
5. All shotgun hunters (including turkey) may only possess approved nontoxic shot while in the field.
6. Dogs may be used only for ring-necked pheasant and gray partridge hunting.
7. Boats will be restricted to the Minnesota River channel. Only non-motorized boats and boats using electric motors are allowed.
8. Motor vehicles access is limited to designated roads and parking areas.
9. The use of snowmobiles and all terrain and utility terrain vehicles (ATV/UTV) are prohibited.
10. The construction or use of permanent binds, stands, or scaffolds is prohibited.
11. All personal property, including but not limited to stands, temporary blinds, platforms, and ladders must be removed at the end of each day's hunt.

Justification: In view of the above and with the stipulations previously described, hunting will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. Hunting is a priority public use of the Refuge System, and providing a hunting program contributes to achieving one of the Refuge goals. Disturbance of wildlife will occur, but limitations on hunting mean areas of the Refuge would be free of disturbance. Hunting is not expected to adversely affect the biological integrity, diversity, and environmental health of the Refuge or the Refuge System.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

Big Stone National Wildlife Refuge Hunting Plan. 1992.

DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds—a literature review of impacts and mitigation measures — prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) in Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR. Available URL: <http://www.fws.gov/stillwater/litreview.pdf>

U. S. Fish and Wildlife Service. 1992. Population Management at Field Stations: General. 701 FW 1. Department of Interior. Available URL: <http://www.fws.gov/policy/701fw1.html>

U. S. Fish and Wildlife Service. 1995. Migratory Game Bird Hunting: Regulations Development Process. 723 FW 3. Department of Interior. Available URL: <http://www.fws.gov/policy/723fw3.html>

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

U. S. Fish and Wildlife Service. 2006. Wildlife-Dependent Recreation: Hunting. 605 FW 2. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw2.html>

Compatibility Determination

Use: Interpretation

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: Providing interpretive materials and programs to Refuge visitors.

Is the use a priority public use?

Interpretation is a priority public use of the Refuge System.

Where would the use be conducted?

Interpretation is conducted at the Refuge office, the 5-mile Wildlife Drive and its associated facilities, the Riverview and Low Flow Public Access points, and at numerous visitor contact sites throughout the Refuge.

When would the use be conducted?

The Refuge office and most of the public use areas are open throughout the year. The Wildlife Drive is closed during the winter months.

How would the use be conducted?

In addition to interpretive facilities, Refuge staff provide guided tours and programs upon request.

Why is this use being proposed?

Interpretation is a priority general public use of the Refuge System. Interpretative programs promote understanding and appreciation of natural and cultural resources and their management on all lands and waters of the Refuge System.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Refuge staff is currently updating all interpretive signs for the existing Refuge facilities. When completed, the Refuge interpretation program is designed to be administered with minimal Refuge resources. There will be some maintenance and other upkeep of facilities that are funded as part of regular Refuge management activities.

Are existing Refuge resources adequate to properly and safely administer the use?

At the present level of use there are adequate Refuge resources to implement the interpretation program. Any future increase in programming would be designed to fit within the capacity of existing or projected future staffing as identified in the Draft Comprehensive Conservation Plan (CCP).

Anticipated Impacts of the Use:

How does interpretation affect Refuge purposes and the Refuge System mission?

Interpretation does not adversely affect Refuge purposes, and they help fulfill the mission of the Refuge System.

How does interpretation affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Wildlife and Wildlife Habitat

Interpretation is expected to have similar impacts to Refuge wildlife and wildlife habitat as those impacts from similar uses, such as wildlife observation and photography. Much of the Refuge is not affected because the majority of the interpreted sites are concentrated along the Wildlife Drive and its trails and observation facilities. These areas have been established areas of use. Damage to habitat by walking is minimal and temporary. Large groups typically use established foot trails or the local roads with little to no impact on vegetation. There is some temporary disturbance to wildlife due to human activities on trails; however, the disturbance is generally localized and would not adversely impact overall populations. Self-guided interpretation would be sporadic use by small groups of people at established trails and kiosks. This may cause short term disturbance as well, but again would have minimal impact.

The cumulative disturbance caused by interpretation and all other public uses occurring on the Refuge is not expected to adversely affect fish and wildlife populations or their habitats. A number of factors including: suitable site conditions, presence of facilities, access limitations, and seasonal restrictions or other regulations tend to concentrate uses. At any one time, much of the Refuge is unaffected by these uses and is free of disturbance. However, the addition of new facilities will have to be examined to determine need and disturbance factors before being approved.

Biological Integrity, Diversity, and Environmental Health

Interpretation conducted in accordance with Refuge regulations is not expected to adversely affect fish and wildlife populations or the biological integrity, diversity, and environmental health of the Refuge as it is defined in Service policy (FWS, 2001).

Other Uses and Public Safety

Interpretation is not expected to adversely affect other Refuge uses or public safety. The Refuge's Visitor Services programs will be adjusted as needed to eliminate or minimize any future problems and provide quality wildlife-dependent recreational opportunities, which include promoting public safety. Experience on many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of wildlife observation and photography on other wildlife-dependent recreation or public safety at Big Stone NWR is expected to be minor.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft CCP and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media

announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Interpretation

___ Use is Not Compatible

___ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Use of motorized vehicles is limited to maintained roads and parking areas.
2. Camping, overnight use, and fires are prohibited.
3. Environmental education and interpretation activities not led by Refuge staff would require verbal approval or a Special Use Permit by the Refuge Manager to minimize conflicts with other groups, safeguard students and resources, and to allow tracking of use levels.
4. Interpretive signs will include messages on minimizing disturbance to wildlife.
5. Harassment of wildlife or excessive damage to vegetation are prohibited.

Justification: In view of the above and with the stipulations previously described, interpretation will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. Interpretation is a priority public uses of the Refuge System, and providing these programs contributes to achieving one of the Refuge goals. Well-designed interpretation programs can be effective resource management tools that provide an opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service and to influence visitor behavior when visiting units of the Refuge System.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Compatibility Determination

Use: Non-Refuge Sponsored Special Events

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: This use is for special events sponsored by charitable and other non-profit clubs or groups. These events primarily include community-sponsored events including the CornFest 5/10K walk/run but may include other activities such as bicycle rides, runs, photography/art workshops, and scouting events. Other possible events would include river clean-up days and scouting activities. Events are held one to three times annually and would occur at different times throughout the year. Events may have up to 100 participants, although the number is generally less than 50. Participants use established roads, trails, and boat landings that are already open to the public. Clean-up events may include all portions of the Refuge generally accessible by boat.

Is the use a priority public use?

No, non-Refuge sponsored special events are not a priority public use of the Refuge System.

Where would the use be conducted?

Most events will take place along the 5-mile Auto Tour Route, but events could take place at other public use facilities or in the interior portion of the Refuge. Events will only be authorized when the Auto Tour Route or other public use facilities or portions of the Refuge are open to the public.

When would the use be conducted?

These events could possibly take place throughout the year, but most likely will occur during the spring, summer, and fall time periods. Care will be taken so these events do not conflict with priority public uses such as during hunting seasons.

How would the use be conducted?

The events will be conducted as per the sponsors.

Why is this use being proposed?

The Refuge is open to the public during the time periods that the use is allowed so no additional disturbance is created by allowing this use. These special events allow the public to build a connection to the Refuge through personal outdoor experiences that engage the senses and foster an appreciation of the outdoors.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

These events generally involve staff time for meeting with sponsors, explaining Refuge regulations, issuing a Special Use Permit, and providing some level of oversight during portions or the entire event.

Are existing Refuge resources adequate to properly and safely administer the use?

Existing staff are adequate to administer this use depending on number of requests received and the size and scope of the event. Since events are held or based on existing roads, trails, or landings, facilities are deemed adequate. Sponsors are required to furnish any additional facilities needed, such as portable toilets.

Anticipated Impacts of the Use:

How do non-Refuge sponsored special events affect Refuge purposes and the Refuge System mission?

These special events do not adversely affect Refuge purposes and help fulfill the mission of the Refuge System by allowing visitors to build a connection to the Refuge through personal outdoor experiences that engage the sense and foster an appreciation of the outdoors.

How do non-Refuge sponsored special events affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

The short term impact associated with these events is human disturbance to wildlife occupying habitat on the Refuge. Most events occur on established trails or areas that already support a moderate level of human activity. Wildlife that occupy habitat in these areas are accustomed to a higher degree of human disturbance. Any alteration of behavior or bird flight would be temporary and localized with wildlife quickly resuming normal activities.

There will be some short term impact to other visitors engaged in wildlife-dependent recreation during the event. Visitors, not engaged in the event, will be permitted to continue their activity. With an increase of public use during walks or runs, an increase of litter is expected. Event coordinators will be required to clean the area when the event is complete. Clean-up events actually reduce litter and debris and thus have a positive impact on the visual character of the Refuge.

Other than the potential for some increase in future visitation to the Refuge, no long-term impacts associated with these events are anticipated.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Non-Refuge Sponsored Special Events

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Events must include an educational message that helps further the understanding of the purposes of the Refuge and the mission of the Refuge System.
2. Event sponsors will furnish complete information on event description, date, time, preferred location, number of participants, and logistics for health and safety, so that the Refuge Manager can make a determination of best area and timing of events when issuing a Special Use Permit. Management reserves the right to deny any proposal that will cause an undue demand on staff or resources, is not related to a charitable or non-profit organization, or does not promote the goals of the "Healthier US" initiative designed to get Americans outdoors and active on their public lands.
3. Except for clean-ups, events will be scheduled only in areas open to public use and at appropriate times of the year to avoid significant wildlife and visitor disturbance. Events will be scheduled on a first-come, first-served basis, with no more than one event in the same area and time. All activities will be limited to the designated routes on established trails. Collection of money for the fund raising aspect of the event will be conducted offsite.
4. Water or rest stations will be approved by Refuge staff in advance of the event and will be located to avoid any sensitive sites (e.g., areas with high densities of foraging shorebirds, areas where waterbirds, waterfowl, raptors, or passerines are nesting, etc.) and to minimize disturbance to wildlife foraging/perching/loafing in adjacent wetlands and woodlands.
5. Event sponsors will be required to provide all personnel, materials, and supplies necessary to run the event. This requirement applies to any tables, chairs, displays, signs, traffic aids, law enforcement, litter receptacles, portable toilets, etc. that are needed.

Justification: In view of the above and with the stipulations previously described, non-Refuge sponsored special events will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

Compatibility Determination

Use: Scientific Studies and Research Projects by Third Parties

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the U.S. Fish and Wildlife Service (FWS, Service). Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: The Refuge allows research investigations on a variety of biological, physical, archeological, and social components to address Refuge management information needs or other issues not related to Refuge management. Studies are or may be conducted by federal, state, and private entities, including the U.S. Geological Survey, state department of natural resources, state and private universities, and independent researchers and contractors. This is not a wildlife-dependent use.

Is the use a priority public use?

No, this is not a priority public use of the Refuge System.

Where would the use be conducted?

Sites for this use would depend on the particular study being conducted and could occur in a variety of habitat types. Access would be restricted by Special Use Permit to only the study sites needed to meet the objectives of the research.

When would the use be conducted?

The timing of research activities would depend on the individual project, but currently most research occurs during the growing season. The entire Refuge is open for allowed research activities throughout the year in conjunction with the issuance of a Special Use Permit. The timing and number of visits by researchers may be restricted by Special Use Permit.

How would the use be conducted?

Research projects and scientific studies will be conducted via a specific protocol. Any research study sites, sampling locations, and transects can be temporarily marked by highly visible wooden or metal posts and must be removed when research ceases. Access to study sites is by foot, truck, all-terrain vehicle, boat, airboat, canoe, and other watercraft. Vehicle use is allowed on Refuge roads, trails, and parking lots normally open to the public.

Why is this use being proposed?

Most research by third parties is done to address Refuge management information needs or to contribute to a larger knowledge base about resources of concern to the Refuge.

Availability of Resources:

Facilities and staff are currently available to provide access, maintain roads, parking lots, and secondary access roads, as well as to issue Special Use Permits for research projects. Staff resources are deemed adequate to manage this use at anticipated use levels.

Access points and limited logistical support are available on the Refuge. Housing is not available.

Anticipated Impacts of the Use:

How do scientific studies and research projects affect Refuge purposes and the Refuge System mission?

Most research by third parties is done to address Refuge management information needs or to contribute to a larger knowledge base about resources of concern to the Refuge.

How do scientific studies and research projects affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Short-term impacts:

Research activities may disturb fish and wildlife and their habitats. For example, the presence of researchers can cause waterfowl to flush from resting and feeding areas, cause disruption of birds and turtles on nests or breeding territories, or increase predation on nests and individual animals as predators follow human scent or trails. Efforts to capture animals can cause disturbance, injury, or death to groups of wildlife or to individuals. To wildlife, the energy cost of disturbance may be appreciable in terms of disruption of feeding, displacement from preferred habitat, and the added energy expended to avoid disturbance.

Sampling activities can cause compaction of soils and the trampling of vegetation, the establishment of temporary foot trails and boat trails through vegetation beds, disruption of bottom sediments, and minor tree damage when temporary observation platforms are built or when tree climbers access bird nests.

The removal of vegetation or sediments by core sampling methods can cause increased localized turbidity and disrupt non-target plants and animals. Installation of posts, equipment platforms, collection devices and other research equipment in open water may present a hazard if said items are not adequately marked and/or removed at appropriate times or upon completion of the project.

Long-term impacts:

Long-term effects should generally be beneficial by gaining information valuable to Refuge management. No long-term negative impacts are expected, and the Refuge Manager can control the potential for long-term impacts through Special Use Permits.

Cumulative impacts:

Cumulative impacts would occur if multiple research projects were occurring on the same resources at the same time or the duration of the research is excessive. No cumulative impacts are expected, and the Refuge Manager can control the potential for cumulative impacts through Special Use Permits. Refuge Managers retain the option to prohibit research on the Refuge, which does not contribute to the purposes of the Refuge or the mission of the Refuge System, or causes undo resource disturbance or harm.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public

notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Scientific Studies and Research Projects by Third Parties

____ Use is Not Compatible

____ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Prior to conducting investigations, researchers will obtain Special Use Permits from the Refuge that make specific stipulations related to when, where, and how the research will be conducted. Refuge Managers retain the option to prohibit research on the Refuge, which does not contribute to the purposes of the Refuge or the mission of the Refuge System, or causes undo resource disturbance or harm.
2. Researchers must possess all applicable state and federal permits for the capture and possession of protected species, for conducting regulated activities in wetlands, and for other regulated activities. Researchers must demonstrate they have approval from the Animal Care and Use Committee, if such approval is required by their research institution.
3. Archeological researchers must obtain an Archeological Resources Protection Act permit from the Regional Director prior to obtaining a special use permit from the Refuge Manager.
4. Researchers will submit annual status reports and a final report concerning Refuge research to the Refuge Manager.
5. Researchers will submit an electronic copy of all raw data collected on national wildlife refuge lands to the Refuge Manager with the understanding that the researcher will have the opportunity to produce publications based on the data.

Justification: In view of the above and with the stipulations previously described, research by third parties will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. Research by third parties may play an integral role in Refuge management by providing information needed to manage the Refuge on a sound scientific basis. Investigations into the biological, physical, archeological, and social components of the Refuge provide a means to analyze management actions, impacts from internal and outside forces, and ongoing natural processes on the Refuge environment.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

Compatibility Determination

Use: Trapping of Furbearers

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975, when the U.S. Corps of Engineers transferred 10,540.43 acres to the USFWS. Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. 1:1 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. 1:1 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. 1:1 460k-2 (Refuge Recreation Act (16 U.S.C. 1:1 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. 1:1 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. 1:1 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. 1:1 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. 1:1 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: The Big Stone NWR will maintain a trapping program to:

- a.) Allow trapping of selected furbearing mammals following Minnesota State and Refuge regulations;
- b.) Minimize furbearer damage to physical facilities including dikes, Refuge water control structures, roads, and other facilities;
- c.) Minimize the occurrence of high animal population densities, which have the potential to transmit disease to humans, the larger furbearer population, other wildlife species, or domestic animals.

The species of furbearers that are permitted to be taken by way of trapping on Big Stone NWR are muskrat, mink, badger, raccoon, opossum, and striped skunk. The trapping of beaver, coyote, and river otter is prohibited on Big Stone NWR. Trapping of beaver is conducted only in nuisance situations by contracted trappers.

This compatibility determination does not apply to commercial trapping activities where the Service awards a contract for the removal of a species to facilitate management.

Is the use a priority public use?

Trapping is not a priority wildlife-dependent public use, as defined by the National Wildlife Refuge System Improvement Act of 1997. Trapping has been an authorized use of Big Stone NWR since 1975.

Where would the use be conducted?

Trapping would primarily occur in aquatic habitats and associated grasslands on Big Stone NWR.

When would the use be conducted?

Trapping will occur during the State furbearer trapping season, generally from mid-October through mid-March, each year. However, there may be situations requiring trapping outside of these state seasons when necessary to protect public health and safety or significant Refuge structures. The Refuge will coordinate with the Minnesota Department of Natural Resources (MN DNR) prior to allowing trapping outside of the normal state trapping seasons.

How would the use be conducted?

Big Stone NWR has been divided into six furbearer management units. The Refuge publicly announces (i.e., newspapers, bulletins, and personal contacts) the availability of these units for trapping and accepts applications from interested trappers on an annual basis. Trapping units are awarded through a lottery system. Each trapper that is awarded a unit is allowed one helper to assist them with their trapping activities. Therefore, a maximum of twelve individuals (up to two individuals per trapping unit) will be implementing trapping activities on Big Stone

NWR during any given year. All awarded trappers are issued a Special Use Permit, which covers trapping activities for that specific year or trapping season only. Permits will not be issued for multiple trapping seasons or years.

Approved trapping methods, specific certificates, and license requirements are issued under Minnesota State regulation as well as information concerning trap size and types of allowable sets in order to protect non-target species and provide for the safe use of the area by others.

All trappers must submit a Harvest Report at the end of the trapping season. Failure to do so renders the trapper ineligible for a trapping permit on Big Stone NWR the subsequent season. These reports provide data on the number and distribution of animals harvested, distribution of trappers, and rudimentary catch per unit effort (efficiency) estimates on the Refuge.

Factors affecting furbearer harvest on Big Stone NWR include length of the trapping season, fur prices, weather conditions, habitat changes, extent of aquatic vegetation coverage, and trapping effort.

Why is this use being proposed?

Trapping is a management tool to control furbearers on Big Stone NWR. Annually, furbearers cause damage to dikes and water control structures requiring staff and equipment resource commitment. Additionally, furbearers are the predominant predators of waterfowl and other ground and low nesting birds. While this activity is a non-priority public use, it is an activity that is a valued form of recreation for local visitors to Big Stone NWR.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Administrative costs to implement the trapping program are insignificant. Sufficient staff exists to issue the required permits, collect data (Harvest Reports), and oversee the program. Facilities and staff are currently available to provide access, maintain roads, parking lots, and secondary access roads. The absence of a Refuge law enforcement officer is not vital to the program.

Are existing Refuge resources adequate to properly and safely administer the use?

At the present level of trapping use there are adequate Refuge resources to implement the trapping program. There is no special equipment, facilities, or improvements needed to maintain the trapping program. Some staff time may be devoted to contacting trappers, writing permits, inspecting permits, and monitoring trapping results. It has been the norm, and is expected to continue, that these activities will require significantly less than one-tenth of a work-week for one staff member. Law enforcement is the primary tool necessary to ensure proper and safe administration of this use, and although there is no law enforcement officer stationed at Big Stone NWR, law enforcement services is available through the Regional Law

Enforcement Program. Additionally, the local State Conservation Officer can provide additional assistance when requested.

Anticipated Impacts of the Use:

How does trapping affect Refuge purposes and the NWRS mission?

The Refuge was established to conserve, manage, maintain and protect wildlife resources and their habitat. Trapping does not adversely affect the ability of Big Stone NWR to fulfill this purpose. National wildlife refuges are managed first and foremost for wildlife (FWS, 2001). But the focus is on wildlife populations not individuals (FWS, 1992). Trapping causes mortality and wounding of individual animals but is regulated so it does not threaten the perpetuation of wildlife populations.

How does trapping affect Fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/NWRS?

Resident Game Species

The MN DNR annually reviews trapping seasons and bag limits and modifies them to avoid any long-term population declines. Trapping is not expected to impact game populations.

Disturbance

Short-term impacts:

Because of the temporal separation of trapping activities and breeding wildlife using the Refuge, direct impacts to these resources by trappers is negligible. Trappers using the Refuge in March, may potentially disturb individual early nesting waterfowl on occasion, and cause temporary displacement from specific and limited areas. Impacts may include displacing migratory birds during the pair bonding/nesting season or destruction of nests by trampling. These impacts are occasional, temporary, and isolated to small geographic areas. Indirect impacts may include catch of target and non-target species that are predators on migratory birds and/or nests, or removal of species that induce habitat change (i.e., beaver). Bald eagles initiate nesting activity on the Refuge as early as February, but there is no evidence that trapping has impacted bald eagle nest success.

Long-term impacts:

Trapping may provide the long-term impact of controlling animals that cause damage to Big Stone NWR infrastructure and impact nesting waterfowl and other birds. There are expected to be no long-term population impacts from trapping on Big Stone NWR. While Minnesota has a regulated beaver trapping season, MN DNR indicates that there are not enough trappers to keep some beaver populations small enough to prevent problems. In Minnesota, mink have been one of the most valued furbearers for two centuries, and while thousands are trapped throughout the State each autumn, mink populations remain at healthy sustained levels.

Habitat

Trapping is not expected to adversely affect Big Stone NWR habitat. There are potential impacts on habitat by trappers walking through vegetation or using willow cuttings to mark their trap locations. It is, however, undetectable and insignificant. The creation of openings in heavy stands of aquatic vegetation can potentially enhance habitat use by fish and wildlife.

The removal of plant-eating species such as beaver and muskrat can have both positive and negative impacts on Refuge resources. Muskrats will dig dens into dikes of water management facilities causing considerable damage and add costs to operations for Big Stone NWR. Beaver will sometimes plug water control structures causing damage, limiting access, and compromising Big Stone NWR habitat and water level management capabilities. Managing beaver and muskrat populations at reasonable levels through a public trapping program can reduce costs to the Big Stone NWR in wildlife management activities.

Biological Integrity, Diversity, and Environmental Health

Trapping conducted in accordance with state and federal regulations is not expected to adversely affect wildlife populations that occur on the Refuge and likely assists in maintaining the biological integrity, diversity, and environmental health of Big Stone NWR.

Indirect impacts to wildlife nesting and breeding success can result from the removal of animals under a trapping program. In many instances, these impacts are positive. Reductions in populations of nest predators such as raccoon, skunk, and mink have a limited positive impact on nesting birds. The degree to which predator management, through a public trapping program, benefits migratory bird production can vary widely depending on the timing of the removal of predators, size of the habitat block, habitat isolation (for example islands), and adjacent land use.

Other Uses and Public Safety

Trapping is not expected to adversely affect other Refuge uses or public safety. If public use levels on Big Stone NWR increase through time, unanticipated conflicts between user groups may occur. If trapping results in conflicts, then the program will be reevaluated and either include more limitations or be eliminated as it is not a priority public use. Similar experiences from many national wildlife refuges have proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impacts of trapping on other wildlife-dependent recreation or public safety at Big Stone NWR are expected to be minor.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near Big Stone NWR. Comments received and agency responses will be included in the final version of the Big Stone NWR Comprehensive Conservation Plan.

Determination: Trapping

___ Use is Not Compatible

___ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Trapping must be conducted according to state-, federal-, and Refuge-specific regulations.
2. Trapping may be more restrictive than State seasons and regulations to ensure compliance with visitor safety and to reduce wildlife disturbance.
3. Boats will be restricted to the Minnesota River channel. Only non-motorized boats and boats using electric motors are allowed.
4. Motor vehicles access is limited to designated roads and parking areas.
5. The use of snowmobiles and all terrain and utility terrain vehicles (ATV/UTV) are prohibited.
6. Permittee trappers must submit a Harvest Report at the end of each season.

Justification:

Furbearer trapping on Big Stone NWR is a useful tool in maintaining balance between furbearers and habitat and safeguarding Refuge infrastructure. Trapping raccoon, badger, striped skunk, and mink benefits migratory birds including waterfowl. Trapping benefits Big Stone NWR management programs by providing additional data on furbearer populations. Trapping also benefits management programs by reducing beaver and muskrat populations, which sometimes cause problems with water management activities and damage roads and water management facilities by burrowing associated with flooding.

Trapping supports the purpose of providing incidental fish and wildlife-oriented recreation. Allowing this use furthers the mission of the National Wildlife Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the Refuge.

Overall, managed furbearer trapping contributes to the purposes of Big Stone NWR by maintaining vigor and health of furbearer populations and by safeguarding Refuge infrastructure critical to habitat for scores of fish and wildlife species.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

U. S. Fish and Wildlife Service. 1992. Population Management at Field Stations: General. 701 FW 1. Department of Interior. Available URL: <http://www.fws.gov/policy/701fw1.html>

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Compatibility Determination

Use: Wildlife Observation and Photography (including the means of access such as automobile driving, hiking, biking, canoeing, kayaking, boating, snowshoeing, and cross country skiing)

Refuge Name: Big Stone National Wildlife Refuge (NWR, Refuge)

Establishing and Acquisition Authorities: Big Stone NWR was established on May 21, 1975 when the U.S. Corps of Engineers transferred 10,540.43 acres to the USFWS. Legal authorities used for establishment of the Refuge include Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Refuge Recreation Act (16 U.S.C. 460k-460k-4), Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901), Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), and Migratory Bird Conservation Act (16 U.S.C. 715-715d, 715e, 715f-715r).

Refuge Purposes:

... shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ... 6 16 U.S.C. I:l 664 (Fish and Wildlife Coordination Act).

... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... 6 16 U.S.C. I:l 460k-1 0 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 6 16 U.S.C. I:l 460k-2 (Refuge Recreation Act (16 U.S.C. I:l 460k-460k-4), as amended).

... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ... 6 16 U.S.C. I:l 3901 (b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986).

... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 6 16 U.S.C. I:l 742f(a)(4) 0 ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 6 16 U.S.C. I:l 742f(b)(1) (Fish and Wildlife Act of 1956).

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds ... 6 16 U.S.C. I:l 715d (Migratory Bird Conservation Act).

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS, Refuge System) is to administer a national network of lands and waters for the

conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: Allow Refuge visitors to observe and photograph Refuge wildlife, habitat, and scenery.

Is the use a priority public use?

Wildlife observation and photography are priority public uses of the Refuge System.

Where would the use be conducted?

Although the entire Refuge is open for these activities, wildlife observation and photography occur primarily along the Refuge's 5-mile Wildlife Drive in the northwestern portion of the Refuge. The Wildlife Drive has several observation decks/overlooks, a fishing dock, and three trails that are used for wildlife observation and photography. The 'Riverview Public Access' and 'Low Flow Public Access' areas and the Minnesota River are also used for both activities. Refuge visitors are also encouraged to walk along Refuge service roads and dikes for wildlife observation and photography opportunities.

When would the use be conducted?

Wildlife observation and photography occurs year round. The Refuge limits wildlife observation and photography use to daylight hours only.

How would the use be conducted?

Wildlife observation and photography account for the majority of the Refuge's annual visitation with an average of 15,500 visits annually. Visitors observe and photograph wildlife from vehicles along roads, by hiking, biking, boating, and snowshoeing and cross country skiing into areas throughout the Refuge.

Entry on all or portions of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

Why is this use being proposed?

Wildlife observation and photography are priority public uses of the Refuge System. Wildlife observation and photography programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System.

Availability of Resources:

What resources are needed to properly (considering quality and compatibility) and safely administer use?

Facilities and staff are currently available to provide access, maintain roads, parking lots, secondary access roads, and signage. Maintaining the public use facilities is part of routine

management duties and staff and funding is available. Kiosks and interpretive trail signs may be added to improve visitor information but are not necessary to support the use.

Are existing Refuge resources adequate to properly and safely administer the use?

At the present level of wildlife observation and photography use there are adequate Refuge resources to implement these activities. Several Refuge facilities have been upgraded recently and offer numerous accessible opportunities for visitors to enjoy both wildlife observation and photography.

Anticipated Impacts of the Use:

How does wildlife observation and photography affect Refuge purposes and the Refuge System mission?

Wildlife observation and photography do not adversely affect Refuge purposes, and they help fulfill the mission of the Refuge System.

How does wildlife observation and photography affect fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the Refuge/Refuge System?

Wildlife and Wildlife Habitat

Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations (DeLong, 2002) includes a summary of effects on wildlife from disturbance from various forms of recreation. The author documents that disturbance can alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife. It is probable that wildlife observation and photography would cause some or all of these effects to some degree on Refuge wildlife. Much of the Refuge is not affected, because wildlife observation and photography tend to be concentrated along the Wildlife Drive, roads and trails, and at observation facilities. These areas have been established areas of use. Damage to habitat by walking is minimal and temporary. Large groups typically use established foot trails or the local roads with little to no impact on vegetation. There is some temporary disturbance to wildlife due to boating and human activities on trails; however, the disturbance is generally localized and would not adversely impact overall populations. Wildlife observation and photography use is expected to stay stable over time.

The cumulative disturbance caused by wildlife observation and photography and all other public uses occurring on the Refuge is not expected to adversely affect fish and wildlife populations or their habitats. A number of factors including: suitable site conditions, presence of facilities, access limitations, and seasonal restrictions or other regulations tend to concentrate uses. At any one time, much of the Refuge is unaffected by these uses and is free of disturbance. However, the addition of new facilities will have to be examined to determine need and disturbance factors before being approved.

Biological Integrity, Diversity, and Environmental Health

Wildlife observation and photography conducted in accordance with Refuge regulations is not expected to adversely affect fish and wildlife populations or the biological integrity, diversity, and environmental health of the Refuge as it is defined in Service policy (FWS, 2001).

Other Uses and Public Safety

Wildlife observation and photography is not expected to adversely affect other Refuge uses or public safety. The Refuge's Visitor Services programs will be adjusted as needed to eliminate or minimize any future problems and provide quality wildlife-dependent recreational opportunities, which include promoting public safety. Experience on many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of wildlife observation and photography on other wildlife-dependent recreation or public safety at Big Stone NWR is expected to be minor.

Public Review and Comment: This compatibility determination is part of the Big Stone NWR Draft Comprehensive Conservation Plan (CCP) and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in the final version of the Big Stone NWR CCP.

Determination: Wildlife Observation and Photography

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. The Refuge Manager will monitor use patterns and densities and make adjustments in timing, location, and duration as needed to limit disturbance.
2. Use will be directed to public use facilities (both existing and in the future), which are not in or near sensitive areas.
3. Use is limited to daylight hours only.
4. Personal portable photo or viewing blinds must be removed by sunset each day.
5. Interpretive signs will include messages on minimizing disturbance to wildlife.
6. Certain modes of access such as motorized vehicles and bicycles will be limited to designated trails, public roads, and parking lots.
7. Boats will be restricted to the Minnesota River channel. Only non-motorized boats and boats using electric motors are allowed.

Justification: In view of the above and with the stipulations previously described, wildlife observation and photography will not materially interfere with or detract from the Refuge System mission or purposes of the Refuge. Wildlife observation and photography are priority

public uses of the Refuge System, and providing opportunities for these activities contributes to achieving one of the Refuge goals.

Signature: Refuge Manager _____
(Signature and Date)

Concurrence: Regional Chief _____
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: _____

DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds—a literature review of impacts and mitigation measures — prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) *in* Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR. Available URL: <http://www.fws.gov/stillwater/litreview.pdf>

U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Appendix J: Finding of Appropriateness of a Refuge Use

In this appendix

Collection of Edible Wild Food Plants for Personal Use

Farming

Firewood Cutting and Timber Removal

Grazing

Haying

Non-Refuge Sponsored Special Events

Scientific Studies and Research Projects

Finding of Appropriateness of a Refuge Use

Refuge Name: Big Stone National Wildlife Refuge

Use: Collection of Edible Wild Food Plants for Personal Use

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a Refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	x	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with State fish and wildlife agencies. Yes No

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate

Refuge Manager: _____

Date: _____

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use. If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence. If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Big Stone National Wildlife Refuge

Use: Farming

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a Refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	x	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with State fish and wildlife agencies. Yes No

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate

Refuge Manager: _____

Date: _____

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use. If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence. If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Big Stone National Wildlife Refuge

Use: Firewood Cutting and Timber Removal

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a Refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	x	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with State fish and wildlife agencies. Yes No

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate

Refuge Manager: _____

Date: _____

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use. If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence. If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Big Stone National Wildlife Refuge

Use: Grazing

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a Refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	x	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with State fish and wildlife agencies. Yes No

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate

Refuge Manager: _____

Date: _____

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use. If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence. If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Big Stone National Wildlife Refuge

Use: Haying

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a Refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	x	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with State fish and wildlife agencies. Yes No

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate

Refuge Manager: _____

Date: _____

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use. If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence. If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Big Stone National Wildlife Refuge

Use: Non-Refuge Sponsored Special Events

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a Refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	x	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with State fish and wildlife agencies. Yes No

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate

Refuge Manager: _____

Date: _____

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use. If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence. If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Big Stone National Wildlife Refuge

Use: Scientific Studies and Research Projects

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a Refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	x	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with State fish and wildlife agencies. Yes No

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate

Refuge Manager: _____

Date: _____

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use. If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence. If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Appendix K: List of Preparers and Contributors

Big Stone National Wildlife Refuge Staff

Alice Hanley, Wildlife Refuge Manager
Jihadda Govan, Wildlife Refuge Specialist
Kim Bousquet, Wildlife Biologist
Richard Papasso, Wildlife Refuge Specialist (retired)

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