

U.S. Fish & Wildlife Service

DeSoto and Boyer Chute

National Wildlife Refuges

Comprehensive Conservation Plan



U.S. Department of the Interior
Fish and Wildlife Service
Region 3 (Midwest Region)
Division of Conservation Planning; Bloomington, MN

Cover Photograph: White-faced Ibis; Sharon Bailey



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.

DeSoto and Boyer Chute

National Wildlife Refuges

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DeSoto and Boyer Chute

National Wildlife Refuges

Comprehensive Conservation Plan

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Executive Summary

Introduction

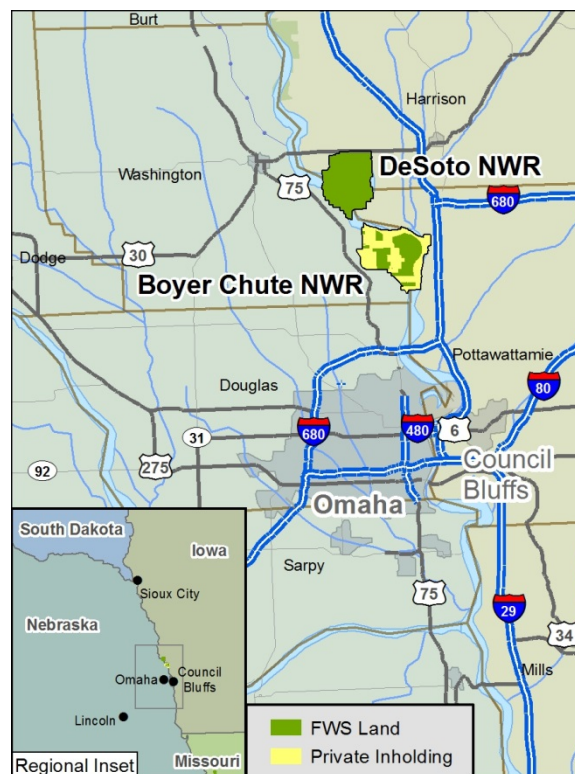
The U.S. Fish and Wildlife Service (Service) has developed this comprehensive conservation plan (CCP) to guide the long-term management of DeSoto and Boyer Chute National Wildlife Refuges (NWRs, refuges) located on the border of Nebraska and Iowa 15 miles north of the Omaha–Council Bluffs Metropolitan Area. For Boyer Chute NWR, this is the first comprehensive planning effort undertaken to guide future management. For DeSoto NWR, this effort revises the CCP finalized in January of 2001—allowing management to consider changing public values, incorporate new scientific information, and reevaluate the management direction. For both refuges this planning process serves to redirect management in the aftermath of catastrophic flooding that occurred in 2010 and 2011. This plan addresses management challenges and opportunities that have emerged because of these flood events.

An environmental assessment (EA) including four potential management alternatives accompanied the draft version of this plan, and was submitted for public review in the fall of 2013. This CCP is based on the preferred alternative of the EA, and is designed to ensure that the refuges fulfill their established purposes and play a role in fulfilling the mission of the Service and the National Wildlife Refuge System (Refuge System).

Background

The Missouri River ecosystem is a resource of national importance with a long history of human interaction and ecological change. The lands and waters of the basin host abundant and diverse resident wildlife and provide important stopover sites for migratory birds in the central flyway. Only three national wildlife refuges straddle the channelized third of the river that flows the 735 miles between Sioux City, Iowa and St. Louis, Missouri. Two of these refuges, DeSoto NWR and Boyer Chute NWRs are located side-by-side, 15 miles north of the Omaha–Council Bluffs Metropolitan Area (figure ES-1). The third is Big Muddy NWR with units between Kansas City and St. Louis, Missouri. DeSoto and Boyer Chute Refuges share management, headquartered out of DeSoto NWR, because of their close proximity and the commonality of their habitats, wildlife management, and ecological resources. When fully acquired, these refuges will conserve over 18,000 acres of unique riverine habitats, seasonal wetlands, bottomland forests, and native floodplain grasslands. The refuges are also popular destinations for people due to the important cultural resources and abundant opportunities for wildlife-dependent recreation they offer to nearby communities and the Greater Omaha–Council Bluffs Metropolitan Area.

Figure ES-1: Location of DeSoto and Boyer Chute Refuges



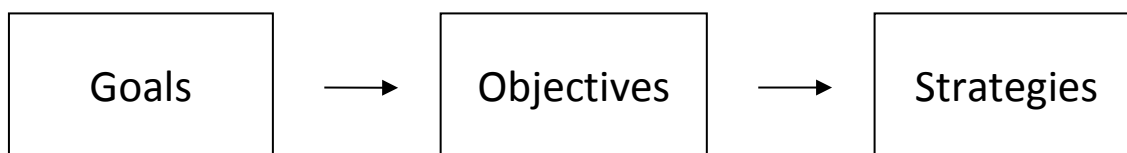
DeSoto National Wildlife Refuge was established in 1958 and encompasses 8,365 acres of floodplain habitat on a former oxbow of the Missouri River. In addition to a stretch of the Missouri River channel and a large oxbow lake, the refuge contains riparian forests, grasslands, wetlands, and riverine habitats that host over 250 bird species, 35 mammal species, 30 reptile and amphibian species, and 60 fish species. DeSoto NWR is also the home of the Steamboat Bertrand Museum Collection, one of the premier assemblages of Civil War era artifacts in the United States. In addition to this wildlife observation, hunting, fishing, and a variety of other wildlife-dependent recreation opportunities available to the public attract enough visitors to make DeSoto NWR one of the more heavily visited refuges in the National Wildlife Refuge System.

Boyer Chute NWR was authorized in 1992 in an ongoing effort to recover, restore, and safeguard fish and wildlife habitat along the Missouri River corridor. Approximately 4,040 acres of 10,010 acres authorized for acquisition are currently owned and managed by the Service; the rest remains in private ownership. Similar to DeSoto NWR, the refuge conserves landscape features found only along major rivers systems including backwaters, side channels, and islands as well as a diversity of associated floodplain habitats ranging from wetlands and prairies to riparian shrublands and woodlands.

Planning Process

A year's worth of CCP planning activities occurred for Boyer Chute NWR starting in 2010. However, two successive years of catastrophic flooding on the Missouri River (2010–2011) resulted in the decision to start planning over, and combine the management of DeSoto and Boyer Chute Refuges. This represents the first CCP effort for management of Boyer Chute NWR, and is the second CCP undertaken for DeSoto NWR.

During the refuge planning process, all factors of management—including habitats, wildlife, visitor services, facilities, operations, cultural resources, and other relevant issues—are discussed and evaluated by Service employees, partners, stakeholders, and the public. A range of alternative management options are then clearly defined and presented to partners, stakeholders, and the public to identify and refine the most suitable or “preferred” management plan for the refuge. This CCP describes the results of the planning process and the details of the preferred alternative. In this document, the broad goals of the preferred alternative are defined and measureable objectives are identified to support each goal. Potential implementation strategies are then offered as available methods to meet these goals and objectives within the 15-year timeframe.



Refuge Goals

Three shared goals were identified by DeSoto and Boyer Chute Refuges:

Goal 1: Habitat

Provide quality native grasslands, floodplain forests, wetlands, sandbar, and riverine habitats through land conservation, restoration, and management.

Goal 2: Wildlife

Protect, maintain, and enhance a diversity of resident, migratory, and endangered species native to the Missouri River floodplain.

Goal 3: People

Refuge visitors will understand and appreciate management of the refuges and the National Wildlife Refuge System through participation in diverse wildlife-dependent recreation, environmental education, and outreach opportunities, and will understand the progression of change in the Missouri River Valley as reflected through the Steamboat Bertrand Museum Collection and its history.

Planning Issues

Scoping identified eight broad issue categories that were addressed when developing management alternatives for the refuges:

- **Habitat Management:** What is the best way to manage habitats on the refuges to maximize benefits to wildlife and support conservation in the greater Missouri River ecosystem?
- **DeSoto Lake:** What is the best way to manage DeSoto Lake to maximize benefits to wildlife and people?
- **Land Conservation:** What Service footprint will best accomplish the refuges' land and water conservation goals and best supplement Missouri River ecosystem conservation?
- **Wildlife:** How can the refuges have the greatest beneficial impact on wildlife in the Missouri River ecosystem?
- **Refuge Administration:** In what ways can the administration of the refuges be improved?
- **Visitor Services & Public Use:** How can the refuges direct resources to provide the best visitor services possible while adhering to capability standards for such uses (given wildlife as the Service's first and highest priority)?
- **Infrastructure:** What is the best configuration of refuge infrastructure for both administration and visitor use?
- **Outreach, Support, & Partnerships:** How can the refuges bolster their relationships with partners, visitors, and other constituents?

Overview of Future Management

Over the next 15 years the refuges will take a very active approach to habitat and wildlife management and monitoring, focusing on expanding seasonal wetland habitat to emulate preregulation flood cycles of the Missouri River, and will increase visitor services available to the public. The inlet and outlet structures on DeSoto Lake will be improved to increase management capabilities—allowing the maintenance of the closed system lake or the creation of a limited open system with riverine characteristics and enhanced fish passage. Seasonal wetland acres will increase during the spring and fall migrations through a robust pumping program while offering mudflats, annual vegetation, and perennial vegetation throughout nonmigratory periods. This wetland regimen will be designed to emulate two-year and five-year Missouri River flood cycles.

The cooperative farming program at DeSoto NWR will be phased out and agriculture will only be used in a limited capacity by refuge staff as a management tool to address invasive species, set back succession, and prepare seed beds. The grassland component of the refuges will decrease as new areas transition to wetland and wooded habitats. Grassland and wetland acres will vary seasonally due to natural and managed cycles of wetland expansion and contraction. The past emphasis on mesic tallgrass prairie will shift to a mix of mesic and hydric grasslands. The proportions and distribution of bottomland forest, cottonwood parkland, and shrub/scrub habitat will remain similar to current conditions on DeSoto NWR and will increase moderately on Boyer Chute NWR as Boyer Island and additional riparian areas are transitioned to forested habitats. The table below shows the approximate percent of land cover types associated with the refuges.

Table ES-1: Land Cover Change on the Refuges

Land Cover Type	DeSoto NWR			Boyer Chute NWR		
	2001	Current (2013)	Future	Current (2013)	Future	Future Assuming Full Acquisition
Bottomland Forest	37%	35%	35%	4%	19%	27%
Shrub/Scrub	3%	3%	3%	1%	1%	1%
Grassland	20%	36%	28%	29%	15%	58%
Seasonal Wetland	1%	2%	17%	5%	5%	6%
Missouri River	3%	3%	3%	7%	7%	7%
Sandbar	1%	1%	1%	0%	0%	0%
Developed	1%	1%	1%	1%	1%	1%
Agriculture	24%	7%	0%	--	--	--
DeSoto Lake	10%	11%	11%	--	--	--
Private Inholding	--	--	--	53%	53%	0%

DeSoto NWR is fully acquired, and staff will only consider expansion of the authorized boundary under conditions that are opportunistic, collaborative, and do not exceed a 10 percent increase over the current acreage. Funds have not been allocated for acquisition of the privately-owned 53 percent (calculation excludes the Missouri River surface area) of Boyer Chute NWR since 2005, but management will continue to seek opportunities to acquire inholdings and promote land acquisition as a regional priority. Newly acquired lands on Boyer Chute NWR will be converted from agriculture to prairie habitat, and the development of bottomland forest habitat will be encouraged along riparian corridors.

Wildlife monitoring will increase for a number of aggregated conservation targets, including invasive species, migratory waterfowl, shorebirds, secretive marshbirds, grassland birds, forest birds, fish and aquatic species (in DeSoto Lake), and game species. Additional details of the monitoring program will be fleshed out immediately following the CCP in an inventory and monitoring step-down management plan.

The visitor services program will expand in a number of ways with careful consideration of wildlife disturbance during bird migrations. Overall, public access and visitor opportunities increase while visitor services infrastructure remains fairly constant compared to current conditions. Use of DeSoto Lake will also remain the same as current conditions—closed only during the migratory period. The heavy-duty bridge to the Boyer Island Unit of Boyer Chute NWR will eventually be removed for maintenance, safety, and chute habitat reasons, and replacement options will be considered. Additional changes include new hunting opportunities on both refuges, permitting fishing on all lakes and ponds on units open to the public, opening additional areas of both refuges to the public for wildlife observation and photography, creating new trails and wildlife observation areas, allowing leashed dogs on the refuges, increasing collaborative environmental education within Omaha schools; updating and improving interpretive information, infrastructure, and services; and working to increase volunteerism.

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Chapter 1: Introduction

The Process and the Plan

This document represents a comprehensive conservation plan (CCP) that guides the management of DeSoto and Boyer Chute National Wildlife Refuges (NWRs, refuges) in Nebraska and Iowa. The CCP is the result of a collaborative, multiple-year planning process that includes preplanning, scoping, alternatives development, environmental assessment (EA) and Draft CCP document preparation, public review and comment, and the adoption of this final plan to guide management of the refuges over the next 15 years. The planning process for DeSoto and Boyer Chute Refuges is described in further detail in chapter 2.

The Refuges

DeSoto and Boyer Chute Refuges straddle the Missouri River in Nebraska and Iowa 15 miles north of the Omaha–Council Bluffs Metropolitan Area. DeSoto NWR, established in 1958 as a migratory bird refuge, contains 8,365 acres of floodplain wetlands, grasslands, and forests surrounding DeSoto Lake, an oxbow lake cut off from the main channel of the Missouri River in 1960. DeSoto NWR is home to a diversity of resident and migratory species, hosting over 250 bird species, 35 mammal species, 30 reptile and amphibian species, and 60 fish species. DeSoto NWR Visitor Center also hosts the Steamboat Bertrand Museum Collection, one of the premier assemblages of Civil War era artifacts in the United States. The refuge attracts over 250,000 visitors annually—making DeSoto NWR one of the more heavily visited refuges in the National Wildlife Refuge System.

Boyer Chute NWR, authorized in 1992 and established in 1997, is located immediately south of DeSoto NWR. The Service has acquired 4,040 acres of the refuge, or 40 percent, of its 10,010-acre authorized boundary. When full acquisition from willing sellers is complete, the refuge will connect with DeSoto NWR through Wilson Island State Recreation Area to the north and with the Neale Woods Nature Center to the south. Boyer Chute NWR contains wildlife and habitats similar to those found at DeSoto NWR, and together the refuges provide a broad range of wildlife-dependent recreation opportunities and experiences to the public.

Document Chapters

This first chapter provides a brief introduction to the comprehensive conservation plan. The remaining chapters provide more detailed information on the refuge planning and policy context (chapter 2), the refuge environment and current management (chapter 3), and the objectives, rationales, and potential implementation strategies that will guide management of the refuges over the next 15 years (chapter 4). Appendices include the Finding of No Significant Impact (FONSI), species lists, abbreviations and glossary, legal and policy guidance, literature cited, appropriate use designations, compatibility determinations, the list of preparers and contributors, the communications list, and the response to comments on the EA and Draft CCP.

Chapter 2: Refuge Planning Context

In this chapter:

[Introduction](#)
[Refuge System Planning Guidance](#)
[Refuge Management Guidance](#)
[Relationship to Other Conservation Initiatives](#)
[The Refuge Planning Process](#)

Introduction

This chapter provides a background for the comprehensive conservation planning process undertaken for each unit of the National Wildlife Refuge System (NWRS, Refuge System). The first tier of planning guidance comes from the overarching policy and legislation that governs all federal agencies as well as guidance that applies to the Refuge System as a whole. The second tier of planning guidance derives from refuge-specific factors and the local social and ecological context. A third tier of guidance is informed by the refuges' role as articulated by broader conservation initiatives and planning efforts—both internal and external to the Service. The fourth and final section of this chapter describes the details of the planning process as it has unfolded for these two refuges.

Refuge System Planning Guidance

This first section outlines the broad, overarching guidance that applies to all Refuge System units. It is created at the highest levels of the federal government and provides guidance for the refuge planning process. Included are the mission of the U.S. Fish and Wildlife Service (FWS, Service); the mission, goals, and guiding principles of the Refuge System; and a compendium of other relevant federal legislation.

The U.S. Fish and Wildlife Service

DeSoto and Boyer Chute Refuges are administered by the Service, the primary federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations and their habitats. The Service oversees the enforcement of federal wildlife laws, management and protection of migratory bird populations, restoration of fisheries, administration of the Endangered Species Act of 1973, restoration of wildlife habitat such as wetlands, collaboration with international conservation efforts, and the distribution of conservation funding to states, territories, and tribes. Through its conservation work, the Service also provides a healthy environment in which Americans can engage in outdoor activities. Additionally, as one of three land managing agencies in the Department of the Interior, the Service is responsible for the Nation's Refuge System.

FWS Mission

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

The National Wildlife Refuge System

The Refuge System was founded in 1903 when President Theodore Roosevelt designated a three-acre island off the Florida coast, Pelican Island, as a sanctuary for colonial nesting birds. Today, the Refuge System has grown to a network of over 560 national wildlife refuges (NWR, refuge), 38 wetland management districts, and 49 coordination areas covering over 150 million acres of public lands and waters. Over 50 percent of these lands (over 76 million acres) are contained within Alaska's 16 refuges, with the remainder distributed throughout the other 49 states and U.S. territories. Since 2006, Marine National Monuments have been added to the Refuge System, bringing over 50 million additional acres in the Pacific Ocean under federal protection and conservation management.

The Refuge System is the world's largest collection of lands and waters specifically designated and managed for fish and wildlife. Overall, it provides habitat for more than 700 birds species, 220 mammal species, 250 reptile and amphibian species, 200 fish species, and more than 280 threatened or endangered plants and animals. As a result of international treaties for migratory bird conservation and related legislation such as the Migratory Bird Conservation Act of 1929, many refuges have been established to protect migratory waterfowl and their migration flyways that extend from nesting grounds in the north to wintering areas in the south. Refuges also play a vital role in preserving threatened and endangered species.

Refuges provide important recreation and education opportunities for visitors as well. When public uses are deemed appropriate and compatible with wildlife and habitat conservation, refuges are places where people can enjoy hunting, fishing, wildlife observation and photography, environmental education and interpretation, and other recreational activities. Many refuges offer visitor services such as visitor centers, wildlife trails, automobile tours, and environmental education programs. Nationwide, over 41 million people visit national wildlife refuges annually.

NWRS Mission

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 fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Improvement Act of 1997 – Public Law 105-57).

NWRS Goals

Revised goals for the Refuge System were adopted on July 26, 2006 and were incorporated into Part 601 of Chapter 1 of the “U.S. Fish and Wildlife Service Manual.” The goals 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); and
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

NWRS Guiding Principles

The National Wildlife Refuge System Administration Act of 1966, as amended, states that each refuge shall be managed to fulfill both the mission of the Refuge System and the purposes for which the individual refuge was established. It also requires that any use of a refuge be a compatible use—a use that will not materially interfere with nor detract from, in the sound professional judgment of the refuge manager, fulfillment of the mission of the Refuge System or the purposes of the refuge. The 1997 amendments to the National Wildlife Refuge System Administration Act of 1966 identified a number of principles to guide management of the Refuge System. *Conserving the Future: Wildlife Refuges and the Next Generation* (2011), which presents the Service's new vision, revised and renewed the Service's commitment to the guiding principles, drawing on Aldo Leopold's land ethic and introducing a new principle for our commitment to scientific excellence. The revised guiding principles include the following:

- We are land stewards, guided by Aldo Leopold's teachings that land is a community of life and that love and respect for the land is an extension of ethics. We seek to reflect that land ethic in our stewardship and to instill it in others.
- Wild lands and the perpetuation of diverse and abundant wildlife are essential to the quality of the American life.
- We are public servants. We owe our employers, the American people, hard work, integrity, fairness, and a voice in the protection of their trust resources.
- Management, ranging from preservation to active manipulation of habitats and populations, is necessary to achieve Refuge System and Service missions.
- Wildlife-dependent uses involving hunting, fishing, wildlife observation, photography, interpretation and education, when compatible, are legitimate and appropriate uses of the Refuge System.
- Partnerships with those who want to help us meet our mission are welcome and indeed essential.
- Employees are our most valuable resource. They are respected and deserve an empowering, mentoring, and caring work environment.
- We respect the rights, beliefs, and opinions of our neighbors.
- We are a science-based organization. We subscribe to the highest standards of scientific integrity and reflect this commitment in the design, delivery and evaluation of all of our work.

To maintain the health of individual refuges and the Refuge System as a whole, managers must anticipate future conditions. Managers must endeavor to avoid adverse impacts and take positive actions to conserve and protect refuge resources. Effective management also depends on acknowledging resource relationships and acknowledging that refuges are important parts of larger ecosystems. Refuge managers work together with partners—including other refuges, federal and state agencies, tribal and other governments, non-governmental organizations and groups, academic institutions, the public, and others—to protect, conserve, enhance, or restore all native fish, wildlife, plants, and their habitats.

Legal and Policy Compliance

Although the National Wildlife Refuge System came into existence over 100 years ago, it was not until the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) that several important mandates were established making the administration and management of refuges more cohesive and unified. The Improvement Act directs the Secretary of the Interior to ensure that the mission of the Refuge System and purposes of the individual refuges are carried out. Fundamental to this effort is the preparation of a 15-year comprehensive conservation plan (CCP) covering each unit in the Refuge System. In addition, the Improvement Act mandates that consideration be given to the maintenance of biological integrity, diversity, and environmental health; regulated determination of compatible public uses; facilitation of wildlife-dependent recreation; protection of archaeological and cultural values, coordination and cooperation with state fish and wildlife agencies; and the development of plans in a process that ensures active public involvement.

In addition to the Improvement Act and a refuge's establishing and authorizing legislation, several federal laws, executive orders, and regulations govern the administration of each refuge. Key legislative policies that direct refuge management include the Endangered Species Act (1973), Clean Water Act (1977), Land and Water Conservation Fund (1965), and Migratory Bird Treaty Act (1918). Appendix D contains a partial list of the legal mandates that guided the preparation of this plan and those that pertain to refuge management activities.

Wilderness Review

Refuge planning policy mandates that wilderness reviews be conducted through the comprehensive conservation planning process (FWS 2000b). The wilderness review process consists of three phases: inventory, study, and recommendation. In the inventory phase Service-owned lands and waters within the refuge that are not currently designated wilderness are reviewed, and areas that meet the criteria for wilderness established by Congress are identified. The criteria are size, naturalness, opportunity for solitude or primitive recreation, and supplemental values. Areas that meet the criteria are called Wilderness Study Areas (WSAs). In the study phase a range of management alternatives for the WSAs are developed and evaluated to determine if they are suitable for recommendation for inclusion in the National Wilderness Preservation System. In the recommendation phase the suitable refuge lands are described in a Wilderness Study Report that moves from the director of the Service through the secretary of the Department of the Interior and the president to Congress.

No lands within DeSoto or Boyer Chute NWRs satisfy the criteria for wilderness established by Congress and described in Service policy (FWS 2008b). These refuges do not contain 5,000 contiguous acres of roadless, natural lands, nor do the refuges possess any units of sufficient

size to make their preservation practicable as wilderness. Refuge lands and waters have been substantially altered by humans, particularly through altered seasonal flow regimes and engineering of the Missouri River channel, highly modified floodplain hydrology and drainage, agricultural and residential development of the floodplain, and the construction of diffuse transportation infrastructure networks.

Refuge Management Guidance

In addition to the guidance that applies to all Refuge System units, refuge planning is also affected by policy and guidance specific to the individual management units under review. This section outlines the planning guidance pertaining to the refuges' establishment authorities, purposes, land acquisition history, and self-prescribed vision statement.

Brief History of Refuge Establishment and Land Acquisition

DeSoto National Wildlife Refuge

The refuge acquired its name from a historic bend on the Missouri River. The bend was originally named after the river town of DeSoto (incorporated in 1855), which provided a steamboat landing and ferry crossing, promoted a railroad west, and was once the county seat of Washington County, Nebraska. The town of DeSoto prospered in the late 1850s and early 1860s, then declined as residents moved on to the Colorado gold fields. The town was ultimately abandoned in the late 19th century when the Missouri River channel shifted leaving the townsite several miles west of the river, and a railroad crossing was established three miles north in Blair, Nebraska.

Plans were developed and proposed for a DeSoto-Bertrand Bend cutoff by the U.S. Army Corps of Engineers (USACE, Corps) early in the Missouri River channelization and dam-building era. The project was designed to improve navigation on the Missouri River but was stalled by local resistance until 1956 when the Service made a preliminary investigation and determined that the area had substantial potential benefits for wildlife. Coupled with a primary purpose of wildlife conservation the refuge proposal offered extensive recreational benefits, engendering additional local support, and appeared in the 1958 Congressional Record as the "DeSoto–Bertrand Bend National Wildlife Refuge and Recreation Area."

DeSoto NWR was established in March of 1958 with the approval of the Migratory Bird Conservation Commission with the dual intention of providing for the needs of migratory birds and providing public recreation to local communities. According to realty records, the authorized land base

owned in fee title by the Service is fully acquired at 7,823 acres in size, with 3,499 in Iowa and 4,324 in Nebraska. Over 7,000 of these acres were acquired through federal Duck Stamp funding. A portion of the refuge's land acquisition took place before the DeSoto–Bertrand Bend



Migrating birds on DeSoto NWR; Randy Mays

was cut off from the main channel, and today the physical footprint of the refuge actually spans 8,365 acres. The additional 542-acre area discrepancy from the realty records is accounted for by the changes that took place in 1960 when the DeSoto–Bertrand Bend of the Missouri River was cut off and a new, shorter channel was dug by the Corps. The additional acreage includes the area from the top bank on the west side of the new channel to the foot of the levee on the east side of the channel. Nearly half of this area (286 acres) is the Missouri River channel itself, and the remainder is the levee and lands riverward of the levee. The new channel construction ultimately had the effect of decreasing the Missouri River channel acreage and increasing the acreage of land and water under the purview of the refuge. Land acquisition for the refuge occurred quickly between 1959 and 1962, with only a few small land transactions occurring subsequent to that period. A timeline of refuge land acquisition is included in table 2-1.

Table 2-1: Land Acquisition Summary by Fiscal Year, DeSoto NWR

Fiscal Year*	No. of Transactions		Yearly Acres Acquired		Leased Acres	Total Acres
	Iowa	Nebraska	Iowa	Nebraska		
1959	2	2	1,815.43	2,588.92	-	4,404.35
1960	-	1	-	1,640.97	3.61	6,048.93
1961	8	1	948.49	-16.38	-	6,981.04
1962	4	1	696.07	110.69	-	7,787.80
1963	2	-	3.02	-	-	7,790.82
1970	1	-	13.15	-	-	7,803.97
1972	1	-	21.00	-	-	7,824.97
1980	1	-	2.00	-	-	7,826.97

*The fiscal year pre-1976 ran from July 1–June 30. Beginning in 1976 the fiscal year has run from October 1–September 30.

Boyer Chute National Wildlife Refuge

The Boyer Bend area, where the refuge is now located, originally formed through the deposition and accumulation of sand and sediment from Iowa’s Boyer River, named after an early settler who hunted and trapped in the area. Over time, the erosive forces of the Missouri River cut channels and chutes through these deposits.

Interest in the Boyer Chute, the feature that gives the refuge its name, began during the Flood Control Acts and the Missouri River channelization era—well before the refuge was established. In 1937 a revetment and shale dikes were constructed across the upstream end of Boyer Chute. This engineering forced water to remain within the main river channel. Subsequent sediment accumulated behind the upstream cutoff and the construction of an earth-fill road crossing the middle of the old chute channel prevented water from flowing into the chute in all but spring high water periods or during floods (USACE 1995).

The impetus for a national wildlife refuge at the Boyer Chute arose in the late 1980s during the Missouri River Corridor Study, a multiple-partner collaborative project that identified Boyer Bend and its chute as the highest priority conservation restoration site on the 137-mile stretch of river between Sioux City, Iowa, and Plattsmouth, Nebraska. The refuge was authorized in August of 1992, and in the same year the restoration of Boyer Chute was undertaken by the Corps. The restoration was completed in 1994—the same year the majority of the visitor services infrastructure was developed on the lands that would become the refuge. The initial refuge design was a part of the Papio–Missouri River Natural Resources District’s (NRD) Missouri

River Corridor Project, and the land base included only the island formed by the restored Boyer Chute and a narrow strip of land immediately west of the chute (approximately 2,000 total acres) (FWS 1992). In August of 1995, the Service began managing the refuge under a Memorandum of Understanding with the Papio–Missouri River NRD who owned the land at the time. The refuge officially opened to the public over Labor Day weekend the following year (1996). In September of 1997, the NRD handed over fee title ownership of the original refuge land base, a 1,954-acre property, to the Service. This land transaction officially established the refuge. That same year a refuge boundary expansion began due to congressional appropriations under the Back to the River initiative, which enlarged the authorized acquisition boundary to 10,010 acres (FWS 1997). This initiative sought to increase fish and wildlife habitat and public recreation on the 65-mile stretch of the Missouri River between Herman and Bellevue, Nebraska.



Welcome to Boyer Chute NWR; USFWS

Approximately 4,040 acres (40 percent, all in Nebraska) of the proposed refuge boundary are currently owned and managed by the Service. The remaining 5,309 acres (53 percent, which *excludes* the 661 acres of Missouri River surface area) are privately owned with two exceptions: Boyer Bend Wildlife Management Area (WMA) held by the Iowa State Conservation Commission (81 acres) and a 444-acre agricultural tract owned by the Nebraska Board of Educational Lands and Funds (figure 2-1). The vast majority of non-refuge land in the authorized boundary is in agricultural production. When full acquisition from willing sellers is complete, the refuge will connect with DeSoto NWR through Wilson Island State Recreation Area to the north and with the Neale Woods to the south.

The current acquisition priorities for Boyer Chute NWR are depicted in figure 2-2. Phase One is west of the Missouri River and includes Boyer Island and the lands immediately southwest (52 percent acquired). Phase Two is also west of the Missouri River and includes the northwest areas of the acquisition boundary (13 percent acquired). Phase Three is all authorized lands on the east side of the Missouri River (0 percent acquired).

Figure 2-1: The Refuges and Adjacent Conservation Lands

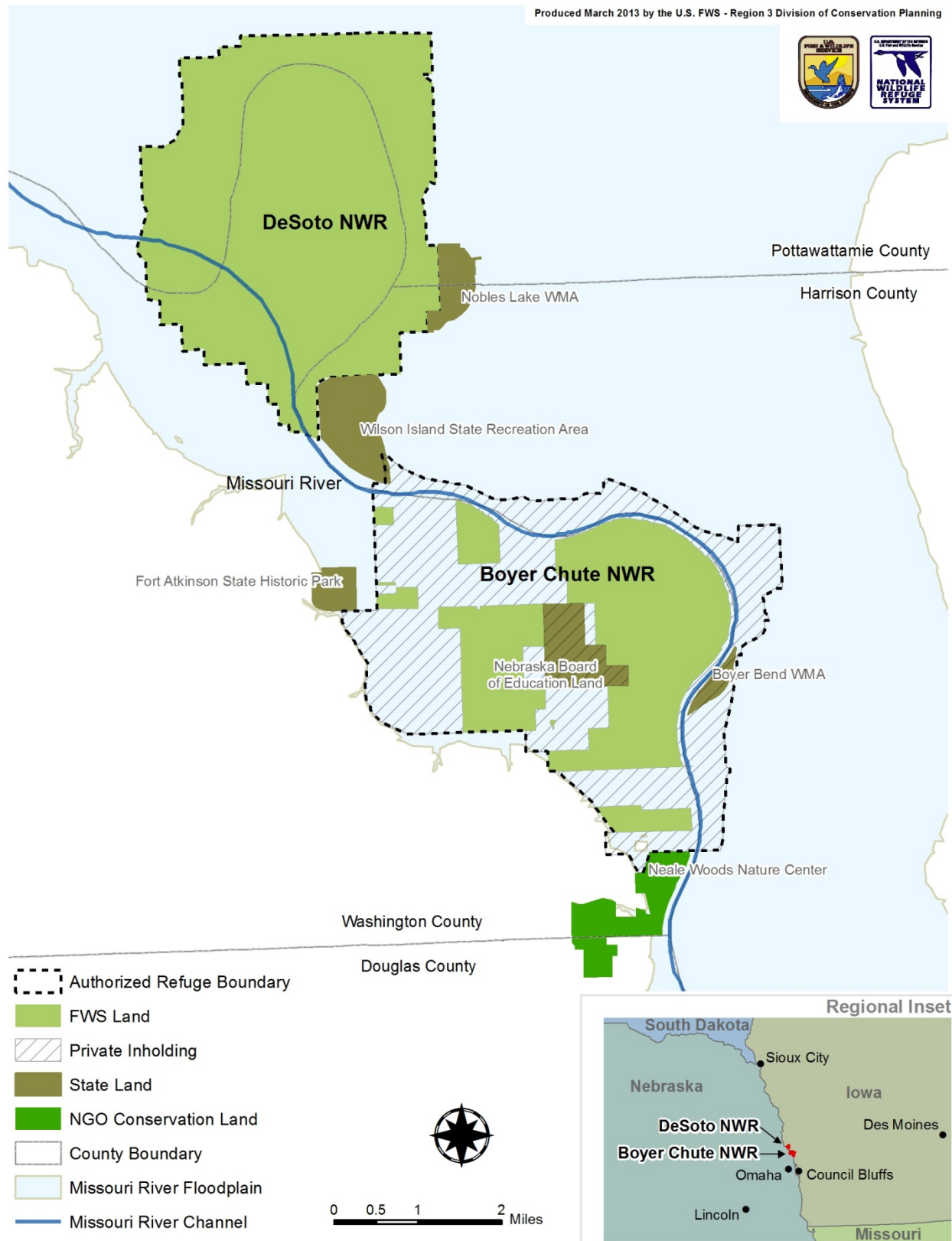
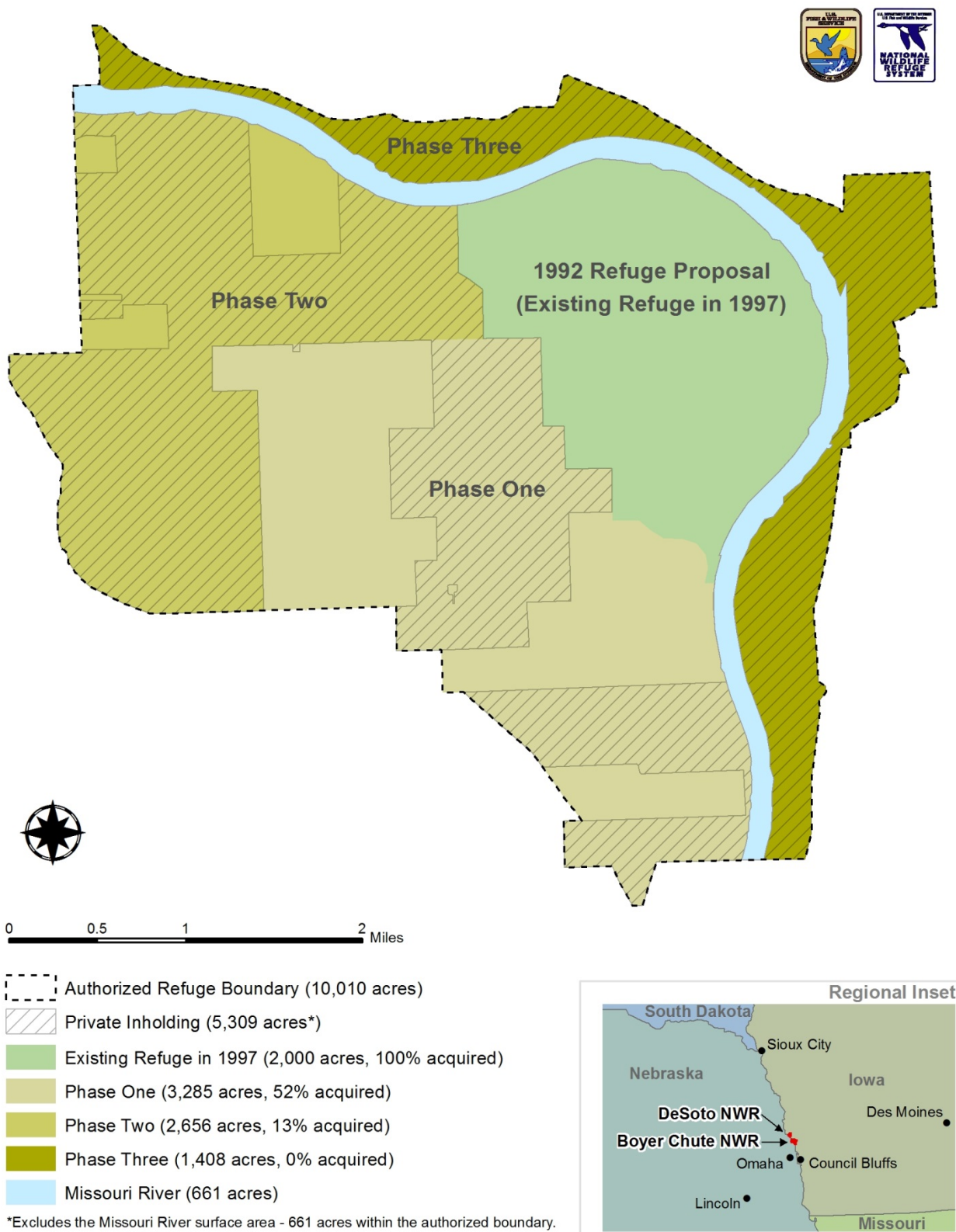


Figure 2-2: 1997 Land Acquisition Priorities, Boyer Chute NWR

Produced March 2013 by the U.S. FWS - Region 3 Division of Conservation Planning



Despite the 1992 refuge authorization and Service management which began in 1995, official Service land acquisition for (and formal establishment of) the refuge did not begin until 1997 when the NRD donated the 1,954-acre Boyer Island property. That same year Congress made an appropriation of two million dollars from the Land and Water Conservation Fund to expand the refuge, which funded a number of acquisitions in the years that followed. Priority was given to areas with potential for wetland restorations, including Nathan's Lake, Mud Lake, Horseshoe Lake, and the Mallard Wetlands. Much of the Nathan's Lake Complex (655 acres) was acquired and restored in collaboration with the NRD, and then transferred to the Service. The acquisition and restoration of Horseshoe Lake and Mallard Wetland properties (over 800 acres) were the result of the collaboration between the refuge, the Natural Resources Conservation Service's Wetland Reserve Program, and Ducks Unlimited. The total refuge acreage has remained stable since the end of 2005, with approximately 40 percent of the authorized refuge boundary acquired and managed by the Service. A timeline of refuge land acquisition is included in table 2-2.

Table 2-2: Land Acquisition Summary by Fiscal Year, Boyer Chute NWR

Fiscal Year*	No. of Transactions Made	Total Yearly Acres	Cumulative Refuge Acres
1997	1	1,953.85	1,953.85
1998	5	324.99	2,278.84
1999	3	505.31	2,784.15
2000	3	305.00	3,089.15
2001	6	170.12	3,259.27
2002	3	41.00	3,300.27
2003	2	28.94	3,329.21
2004	-	-	-
2005	5	710.56	4,039.77
2006	1	0.04	4,039.81
2007	-	-	-
2008	-	-	-
2009	1	(easement) 0.06	4,039.87
2010	-	-	-
2011	-	-	-

*The fiscal year has run from October 1–September 30 since 1976.

Boyer Chute NWR straddles two geographic regions of the Service, and management responsibilities have alternated over time from one region to the other. The refuge was first authorized in 1992 as a unit in the Rocky Mountain Region. When the Service finally began management of the refuge in 1995 under a Memorandum of Understanding with the land owner (Papio-Missouri River NRD), refuge operations and maintenance were delegated to DeSoto NWR in the Midwest Region of the Service. This arrangement lasted until July of 2001, during which time the refuge was “officially” established when, in 1997, the land was transferred to the Service. In July of 2001, Boyer Chute NWR switched hands and became an independent refuge fully supported and managed by the Rocky Mountain Region. Five years later in October 2006, full management and oversight of the refuge transferred back to DeSoto NWR because of the close proximity of the refuges, the added efficiencies of shared management, and because of their common ecology, habitats, wildlife management, and publics.

Refuge Purposes

National wildlife refuges are established under a variety of legislative acts and administrative orders and authorities. These orders and authorities include one or more specific purposes for which refuge lands are acquired. The purposes are of key importance in refuge planning and are the foundation for management decisions. The purposes of a refuge are specified in, or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.

By law refuges are to be managed to achieve their purposes, and unless otherwise indicated by the establishing document the following rules apply:

- Purposes dealing with the conservation, management, and restoration of fish, wildlife, and plants and their habitats take precedence over other management and administration purposes.
- When in conflict, the purpose of an individual refuge may supersede the Refuge System mission.
- Where a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict.
- When an additional unit is acquired under a different authority than that used to establish the original unit, the addition takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the addition.

DeSoto NWR's establishing authorities and related purposes include:

Migratory Bird Conservation Act of 1929

" . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d

Refuge Recreation Act of 1962*

" . . . 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 . . . " 16 U.S.C. 460k–460k-4

*This purpose was applied post facto to DeSoto NWR, which was established in 1958.

Boyer Chute NWR's establishing authorities and related purposes** include:

The Fish and Wildlife Act of 1956

" . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . " 16 U.S.C. 742f(a)(4)

" . . . 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 . . . " 16 U.S.C. 742f(b)(1)

******The Emergency Wetlands Resources Act of 1986 also appears in a number of important refuge documents. This act promotes, “. . . 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 . . .” (16 U.S.C. 3901(b), 100 Stat. 3583). Wetland habitats are a key component of the refuge’s floodplain ecosystem, and a primary collaborative focus for the refuge and its partners. This legislation, however, is neither included in the authorities cited in the environmental assessments, nor the official documents that transferred land from the NRD to the Service. In addition, all land purchases by the Service have occurred under the authority of the Fish and Wildlife Act of 1956 using monies from the Land and Water Conservation Fund.

Refuge Vision Statement

The vision provides a simple statement of the desired future condition for a refuge. It provides a sense of direction and an ideal for what the refuge will become through effective management. The purposes of the refuge and the mission of the Refuge System provide the foundation for the vision and are enhanced by the unique characteristics of the refuge and local environment. The shared vision statement for DeSoto and Boyer Chute Refuges is:

DeSoto and Boyer Chute National Wildlife Refuges are located in the migratory bird corridor of the Missouri River floodplain and provide essential habitat for resident, migratory, and endangered species. The Steamboat Bertrand Museum Collection, large concentrations of wetland-dependent birds, and inventive environmental education partnerships make these refuges special within the National Wildlife Refuge System. High quality floodplain forest, grassland, wetland, sandbar, and riverine habitats support diverse and productive populations of migratory waterfowl, shorebirds, and neotropical birds as well as rare threatened and endangered species including the pallid sturgeon, Piping Plover, and Least Tern. The refuges offer high quality interpretive and environmental education programs for the public that increase an appreciation for the impact of settlement along the Missouri River and the refuges’ role in conserving and managing Missouri River floodplain habitat and wildlife. The refuges also provide abundant opportunities to participate in environmental interpretation, wildlife observation, hunting, fishing, and other wildlife-dependent recreation while at the refuges. U.S. Fish and Wildlife Service staff and partners work collaboratively to understand, restore, and conserve biological communities on the refuges in a dynamic and changing environment, and work to promote an enduring appreciation for the refuges, the Refuge System, and Service trust resources.

Relationship to Other Conservation Initiatives

DeSoto and Boyer Chute Refuges constitute a total potential contribution of 18,375 acres (of a total 2.3 billion acres of U.S. land) to the conservation landscape. By themselves, the two refuges will have little impact on the retention of open space, the persistence of wildlife species, and the maintenance of ecosystem services. However, refuge efforts combined with activities and partnerships across the larger conservation network have great potential to provide a measure of sustainability to the Nation’s natural resources and provide the mechanism for the Service to meet its critical mission. The following sections identify a number of important conservation initiatives that overlap and complement the vision and goals outlined in this plan. Where possible, the refuges collaborate with these efforts and incorporate shared objectives.

Migratory Bird Conservation Initiatives

North American bird conservation efforts have evolved over the past few decades from predominantly localized efforts to landscape-scale initiatives with separate planning emphases on guilds of birds and a greater emphasis on collaborative management. There are over 700 species of birds in the United States, and DeSoto and Boyer Chute Refuges host over 250 of these species including a diversity of waterfowl, water birds, shorebirds, and landbirds. The refuges' position straddling the Central and Mississippi flyways (figure 2-3) makes them an important stopover as birds travel from their breeding grounds in the north to their wintering areas in the south.

North American Waterfowl Management Plan (1986)

Waterfowl (family *Anatidae*—including ducks, geese, and swans) are economically important for both hunting and wildlife observation activities, can be used as indicators of environmental health, and are an important part of wetland ecosystems. Habitat loss resulting from agriculture, urbanization, and industrial activities has caused their numbers to decline in recent decades.

The 15-year North American Waterfowl Management Plan was originally drafted in 1986 but has had a number of subsequent updates. The plan sets up a framework for cooperative planning and coordinated management between the United States and Canada to increase waterfowl populations to acceptable and desired levels. Mexico also became a signatory in 1994. The plan describes appropriate waterfowl population goals, and also provides recommended actions for reaching the population levels. One major result of the plan was the establishment of joint ventures (JVs) between private and government organizations within geographic regions to coordinate waterfowl research and management activities. These joint ventures assist in integrating continental migratory bird priorities into regional, state, and local level conservation programs.

Constituents include individuals, businesses, non-governmental organizations (NGOs), and local, state, and federal government representatives (FWS et al. 1986).

DeSoto and Boyer Chute Refuges lie within the Upper Mississippi River and Great Lakes Joint Venture (UMGL JV) region, yet they are also close to the Prairie Pothole Joint Venture (PP JV) to the north, and the Rainwater Basin Joint Venture (RWB JV) to the west (figure 2-



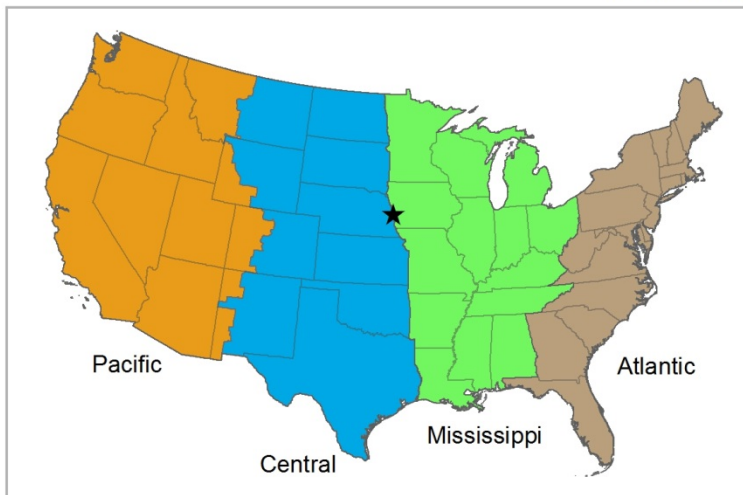
Wood Duck pair; USFWS (Dave Menke)

3). Because the Missouri River Corridor is a distinct and well-travelled migratory pathway, DeSoto and Boyer Chute Refuges have some unique characteristics and roles that distinguish them from other sections of these JVs. This midcontinental location is an important feeding and resting area for migratory waterfowl in the fall, and to a lesser degree in the spring. Because many of the region's wetlands have been drained for agriculture, remaining wetlands and riparian areas like those provided by the refuges are essential to the seasonal migration of many migratory bird species.

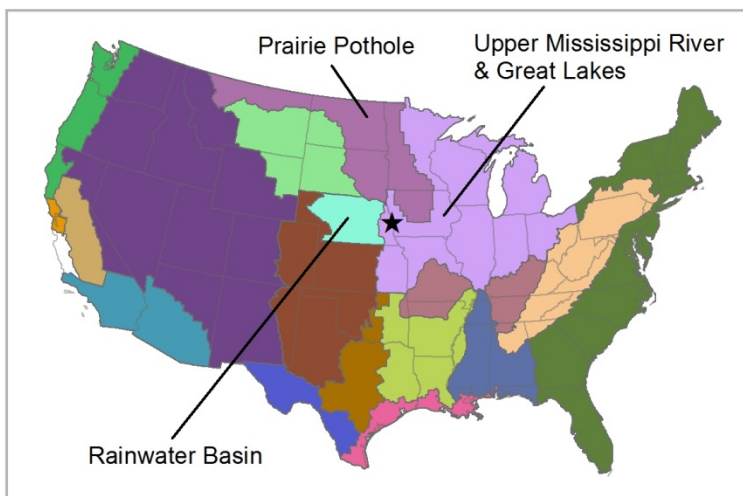
The UMGL JV was formed in 1993, and at 240 million acres it is one of the largest and most diverse JVs. It has protected, restored, and enhanced over 522,000 acres of habitat. Habitat conservation strategy handbooks for each bird group—shorebirds, landbirds, water birds, and waterfowl —along with a comprehensive implementation plan, were released in 2007 to provide guidelines for the habitat types and quantities required to sustain target bird populations. These new plans use the latest geospatial analysis tools along with the most current scientific knowledge in their biological planning, regional landscape design, and strategies for projects, monitoring, research, communication, and outreach.

Figure 2-3: Bird Conservation Regions (1)

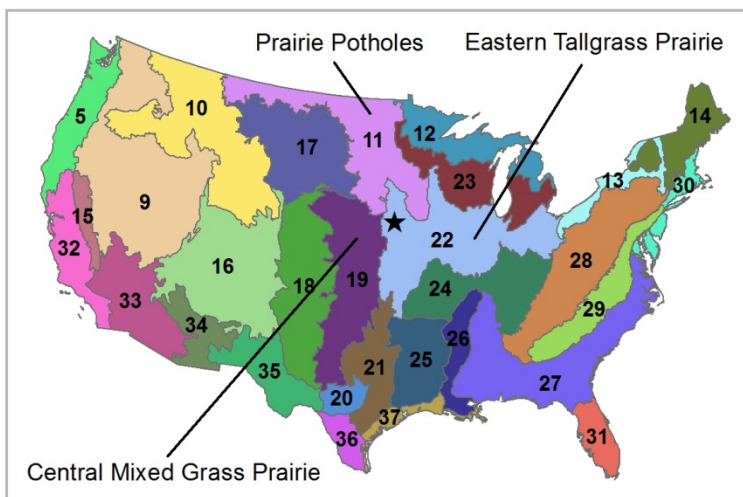
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U.S. Flyway Zones

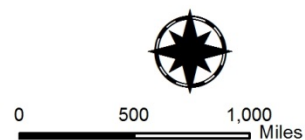


Joint Ventures



★ = DeSoto and Boyer Chute NWRs

Bird Conservation Regions



Established in 1987, the PP JV includes one-third of North America's Prairie Pothole Region. The portion contained within the United States is approximately 100,000 square miles. This landscape of depressional wetlands and grasslands combined with the Prairie Pothole Region in Canada constitute one of the largest and most productive concentrations of wetland habitat in the world. Birds native to the prairie pothole region include 18 species of waterfowl, 96 species of songbirds, 36 species of water birds, 17 species of raptors, and 5 species of upland game birds. Due to productive soils and abundant water, much of the Prairie Pothole region has been drained and used for agriculture or grazing. The JV works to counter this trend by saving or restoring high priority wetland areas and adjacent native prairie and grassland habitat throughout the region. Their 2005 Implementation Plan calls for the protection of 1.4 million additional wetland acres and 10.4 million acres of grassland (Ringelman 2005).

The RWB JV was formed in 1992 and spans 17 counties in south-central Nebraska. The basin is the narrowest point (approximately 150 miles wide) in the central flyway migration route between the Gulf Coast of Texas and Mexico and breeding grounds in the north. Each February and March millions of waterfowl rest, feed, and form pairs in this area. In addition, the wetlands are used in the spring by hundreds of thousands of migratory shorebirds. As an area with rich and productive land, many of the wetlands in this region have been converted to agricultural uses over the past century leaving less than 10 percent of the original wetland habitat—much of which is modified, degraded, and fragmented. Current wetland estimates in the basin tally 21,000 acres. The goal of the JV is to permanently protect 37,000 acres of wetlands with 25,000 acres of associated upland habitat to meet the needs of waterfowl and other migratory birds (RWB JV 2011).

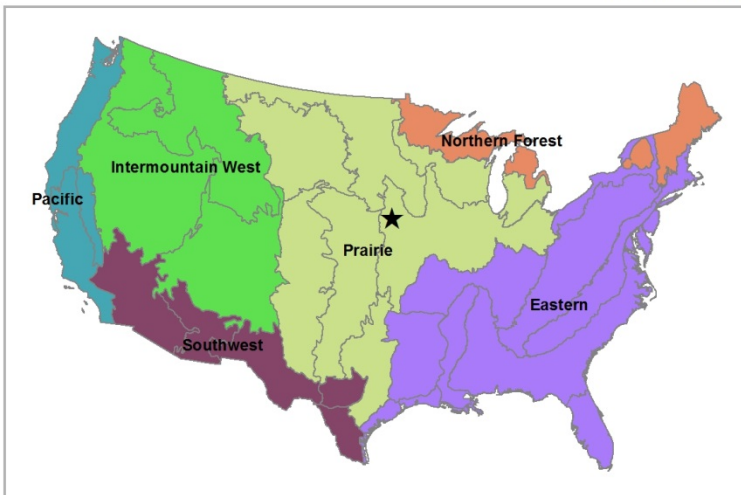
North American Landbird Conservation Plan (Partners in Flight 2004)

In contrast to the other three bird plans discussed here, the target species of the North American Landbird Plan focuses on birds that inhabit predominantly terrestrial habitats. Approximately 448 landbirds breed in the United States and Canada.

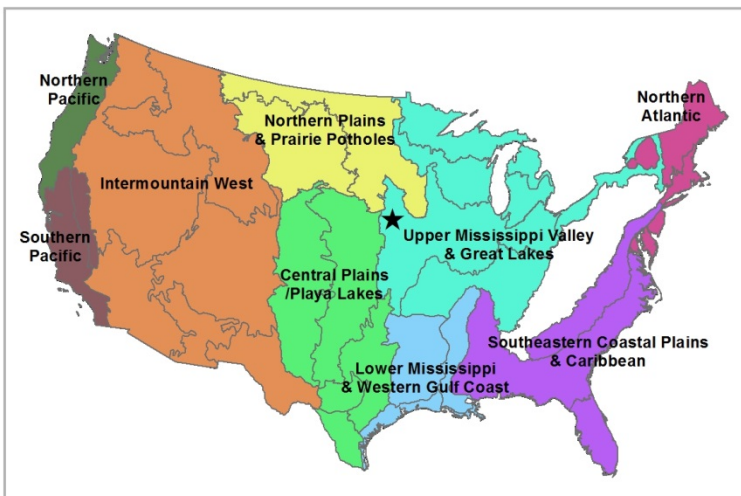
Landbirds contribute to the economy in a number of ways. First and foremost they provide ecosystem services such as pollination, seed dispersal, and the consumption of insect pests. They also provide recreation opportunities such as wildlife observation and photography. The loss, modification, degradation, and fragmentation of habitat constitutes the primary threat for landbirds, including neotropical migrants, short-distance migrants, and largely resident species. The North American Landbird Conservation Plan identifies 192 species of continental importance. Approximately half (100) of these species are on a "watch list" because of a threatened/endangered population status. The remaining 92, as well as 66 species from the watch list, are considered "stewardship species" because they characterize and typify biogeographic regions or avifaunal biomes of North America (figure 2-4). These regions are based on Bird Conservation Regions (BCRs) devised by the North American Bird Conservation Initiative, but have been merged into larger units (figure 2-3) (Rich et al. 2004).

Figure 2-4: Bird Conservation Regions (2)

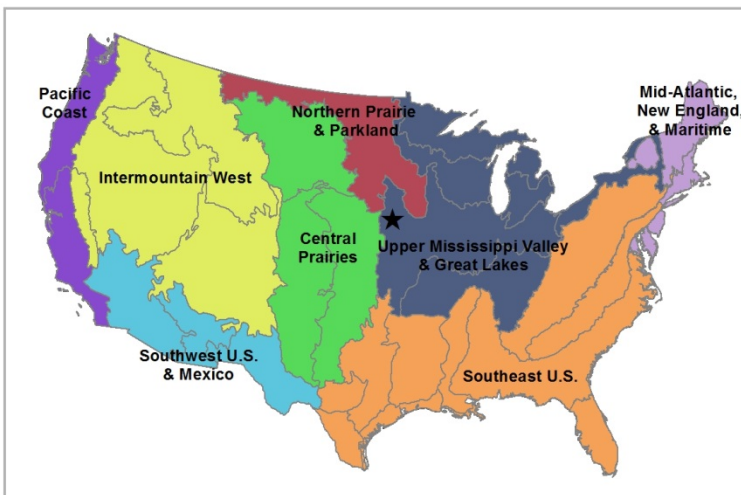
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Avifaunal Biomes



Shorebird Planning Regions



★ = DeSoto and Boyer Chute NWRs

Waterbird Planning Regions



0 500 1,000 Miles

DeSoto and Boyer Chute Refuges lie at the center of the Prairie Avifaunal Biome, in the heart of North America's native grasslands. Unfortunately, over 99 percent of the original tallgrass prairie has been lost to agriculture and urban development, many of the wetlands have been drained, and fire—the primary disturbance mechanism for successional grassland habitat—has largely been eliminated from this ecosystem. Restored prairies and wetlands like those found on the refuges are important steps toward the recovery of declining species that once flourished throughout the central plains. This avifaunal biome still provides the wintering habitat for many Arctic species of landbirds, and breeding areas for nearly 40 percent of the species on the watch list. The watch list was created to identify landbird species with multiple reasons for conservation concern across their entire range.

U.S. Shorebird Conservation Plan (2001)

The U.S. Shorebird Conservation Plan was drafted by a partnership of national, state, private, and academic organizations committed to shorebird conservation across the United States. The designation “shorebird” is applied to those birds commonly known as sandpipers, plovers, oystercatchers, avocets, and stilts. Of the 214 shorebird species worldwide, 50 regularly breed or occur in the United States. The challenges of shorebird conservation stem from their great migration distances (crossing multiple jurisdictions), low reproduction rates, concentrated use of dispersed migration stopovers, a general loss of habitat across the landscape, and a lack of shorebird population data. This plan groups the BCRs to create 11 shorebird planning regions. Within each, a regional working group sets conservation goals, identifies critical habitats, assesses research needs, and recommends strategies for outreach and education. Founded on collaboration and cooperation between partners, the goal of the plan is to stabilize populations of shorebird species by protecting adequate quantities of wetland, shoreline, and grassland habitat to meet their breeding, wintering, and migrating needs (Brown et al. 2001).

DeSoto and Boyer Chute Refuges lie within the Upper Mississippi Valley and Great Lakes (UMVGL) shorebird planning region but are very close to the boundary with the Central Plains and Playa Lakes (CPPL) region to the west and the Northern Plains and Prairie Potholes region (NPPPR) to the north (figure 2-4). The latter two shorebird planning regions together encompass the entire central flyway migratory corridor. Shorebird habitat is an important component of floodplain habitat management on the refuges, with special consideration for federally listed Piping Plovers and Least Terns as potential visitors to the refuges.

The UMVGL region contains five BCRs and 32 shorebird species, nine of which are of high conservation priority: Greater Yellowlegs, Whimbrel, Buff-breasted Sandpiper, Short-billed Dowitcher, Marbled Godwit, Wilson's Phalarope, Upland Sandpiper, American Woodcock, and the Piping Plover. This region is noted for its climatic variability, and its primary habitat threats result from agriculture, river manipulation, and urban development. Objectives for meeting shorebird needs in this region include the protection of 9.6 million acres of ephemeral and permanent wetlands with associated upland habitats.

The CPPL region contains 5 BCRs, and hosts 40 species of migrating shorebirds—13 of which breed in the region, including the federally endangered Piping Plover. Shorebirds of primary conservation concern in the region include the Piping Plover, Mountain Plover, Snowy Plover, American Golden-Plover, Long-billed Curlew, Upland Sandpiper, and Buff-breasted Sandpiper. The overwhelming majority (>85 percent) of land in the region is in private ownership. Conservation challenges include a lack of adequate shorebird monitoring, the availability of water and water rights issues, and habitat loss as a result of expanding agriculture and urbanization.

The NPPPR region encompasses two BCRs, contains 13 breeding species of shorebird, and is characterized by widespread prairie grasslands and millions of depressional wetlands.

North American Waterbird Conservation Plan (2002)

The North American Waterbird Conservation Plan was created through the voluntary, collaborative efforts of many individuals and organizations interested in the future of seabirds and other colonial nesting birds (i.e., herons, loons, pelicans, gulls, albatrosses, petrels, auks, and rails). In response to threats like habitat loss, invasive and exotic species introductions, pollution, industrial activity, and site disturbance, the activities proposed by the plan range from continent-wide monitoring to local conservation actions that promote the distribution, diversity, and abundance of water birds. The plan covers 210 species, including seabirds, coastal water birds, wading birds, and marshbirds. Of the freshwater habitat requirements noted in the plan, DeSoto and Boyer Chute Refuges provide those associated with stream corridors and wetlands. These habitats provide for the nesting, feeding, roosting, and resting needs of water bird species. Through inventory and monitoring this plan is able to help identify the most threatened birds and the most critical habitats (Kushlan et al. 2002).

The refuges are positioned at the intersection of three water bird planning regions. They fall within the UMVGL water bird planning region but are close to the Central Prairies (CP) region to the west and the Northern Prairie and Parkland (NPP) region to the north (figure 2-4).

The UMVGL water bird region contains approximately 40 species of water birds, among them are priority species of terns, herons, bitterns, rails, and loons. Also, superabundant species are present such as Double-crested Cormorants and Ring-billed Gulls. The large river systems of this region, which include the Mississippi and Missouri Rivers, provide much of the important water bird habitat. Freshwater habitats at DeSoto and Boyer Chute Refuges that are used by water birds include wetlands, shorelines, rivers, and small islands. Development, river dredging and diking, and agricultural drainage are listed among the top threats to water bird habitat in this region.

The CP water bird region also prioritizes habitats found at DeSoto and Boyer Chute Refuges, namely native grasslands punctuated by depressional or river-associated wetlands. These areas host large breeding populations of Interior Least Terns, Black Terns, Eared Grebes, Black-crowned Night-Herons, American Bitterns, and Virginia Rails. They also provide important stopover areas for midcontinental Sandhill and Whooping Cranes.

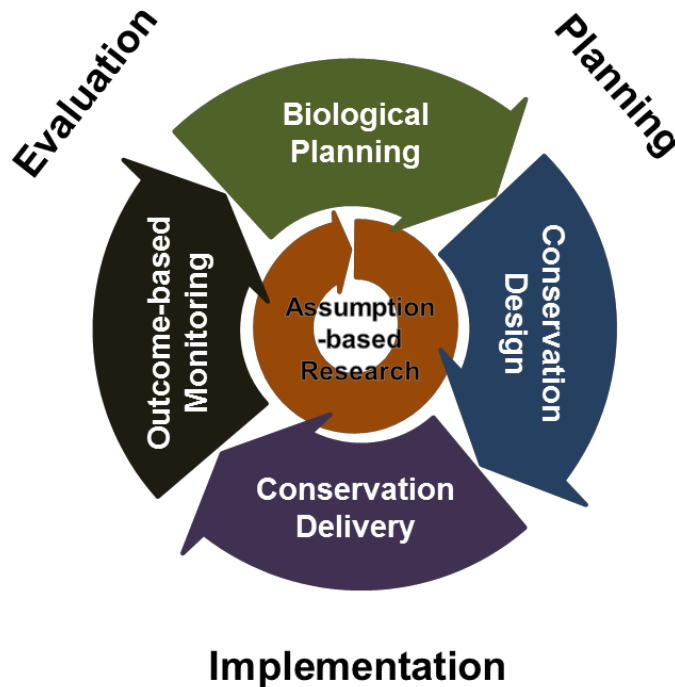
The NPP region's mixed grass prairies and numerous small wetlands provide some of the most important waterfowl production areas in North America. Twenty-four colonial, and fifteen non-colonial water bird species breed here. Efforts are being made to prevent the loss or deterioration of the pothole wetlands, and the impacts of climate change on these sensitive habitats are being closely monitored.

Strategic Habitat Conservation

Recognizing numerous advancements made in the fields of conservation, ecology, adaptive management, and technology, a panel of policy and technology experts from the Service, U. S. Geologic Survey, and the National Conservation Training Center formed the National Ecological Assessment Team (NEAT) in June of 2004. The goals of this team were to discuss and make

recommendations to the Service on its approach to conservation of 'trust resources' with efficiency, prioritization, and transparency as key drivers. The outcome of these meetings was the Strategic Habitat Conservation (SHC) framework, which is an iterative cycle of: (1) biological planning, (2) conservation design, (3) conservation delivery, and (4) monitoring (figure 2-5).

Figure 2-5: The Strategic Habitat Conservation Framework



The principles of SHC are not new to Service programs and projects, but the NEAT report formally establishes SHC as the new business model and operating platform for the Service in light of the 21st century's changing conservation landscape. Trends in the new millennium addressed by SHC include a focus on conservation science that is increasingly collaborative and interdisciplinary, spans multiple jurisdictions, uses a range of scales, and intertwines ecology with socioeconomic considerations. In addition, the face of the conservation workforce is changing, expectations from the public are increasing, and the complexity of environmental issues is intensifying. Whereas the previous era sought balance in the conservation and utilization of natural resources, the upcoming era has forced a recognition of limits to our environmental systems and the challenge of sustaining resources despite increasing pressures from threats such as urban development, energy production, water use, and climate change (FWS 2008c).

SHC emphasizes a landscape-scale consideration of resources and the importance of understanding and integrating the goals of collaborative partners as key ways to effectively achieve conservation objectives. This will require management support for work that not only spans program areas within the Service but support that extends beyond the Service to the interests and programs of the Service's conservation partners. The Service has taken steps to implement the SHC framework, including setting measurable, outcome-based objectives to guide visible progress towards conservation goals, using spatially-explicit models to provide the

means for systematic identification of conservation targets, and increasing the integration of science into planning and management decisions (FWS 2006 and 2008d).

The work outlined in this CCP for DeSoto and Boyer Chute Refuges adheres to the SHC framework by conducting a thorough review of science relevant to management of the refuges, feeding the information and issues identified during scoping directly into near- and long-term goals and objectives, and defining strategies to guide conservation delivery through the 15-year life of the CCP and beyond.

Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative

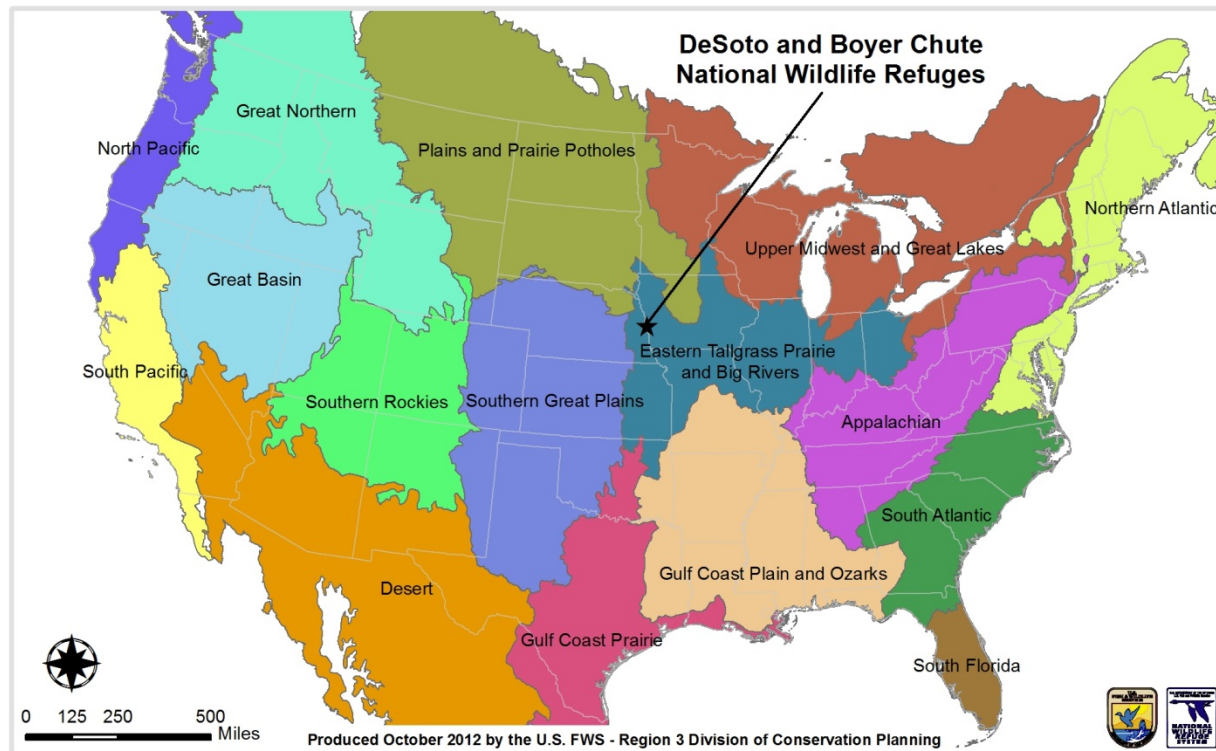
In 2009, with SHC as the guiding philosophy, the Service established a national geographic framework, or a continental platform on which to establish landscape-level conservation partnerships and implement conservation actions in the 21st century (FWS 2009b). The framework establishes boundaries for 22 geographic areas, each to serve as a base for the establishment of a Landscape Conservation Cooperative (LCC). LCCs will provide a spatial context and an organizational structure for facilitating conservation planning, shared science, information exchange, and decision support in response to broad-scale, complex, and dynamic issues such as climate change.



Eastern Tallgrass Prairie LCC; USFWS

DeSoto and Boyer Chute Refuges are located within the Eastern Tallgrass Prairie and Big Rivers (ETPBR) LCC (figure 2-6). The ETPBR LCC stretches across the agricultural belt of America from Ohio to Kansas, and the vast majority of the land is held in private ownership. Agriculture drives the regional economy, habitat conditions are driven by agricultural practices, and both will be impacted by climate change. In particular, changes in the frequency and magnitude of flood events and drought cycles have the great potential to affect the wildlife and habitat at the refuges. Along with

human uses such as navigation and irrigation, the big rivers (Mississippi, Missouri, Illinois, Wisconsin, Ohio, and Wabash) of this LCC provide commercial and recreational fisheries and important migratory bird habitat.

Figure 2-6: Landscape Conservation Cooperatives

Climate Change Planning

Climate change is an important part of the conservation dialogue and has been formally recognized by the Service as one of the leading conservation challenges of the 21st century.

U.S. Fish and Wildlife Service

In its strategic plan, “Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change,” the Service calls for bold and strategic action to address climate change through three broad, overarching strategies: adaptation, mitigation, and engagement (FWS 2010b). Despite considerable uncertainty regarding the magnitude, extent, and timing of changes, the Service vision includes measures to “. . . sustain diverse, distributed, and abundant populations of fish and wildlife through conservation of healthy habitats in a network of interconnected, ecologically functioning landscapes” (pg. 5). The plan also describes six principles deemed essential to achieving this vision: priority setting, partnership, best science, landscape conservation, technical capacity, and global approach. Climate change is a key consideration in the discussions and decision making for the future management proposed at DeSoto and Boyer Chute Refuges. Climate change is likely to have major impacts on larger river systems like the Missouri River through altered flow cycles, groundwater recharge within the watershed, water availability, land cover change, habitat availability, effects to infrastructure, and so forth.

“Conserving the Future: Wildlife Refuges and the Next Generation” (FWS 2011c) is the encapsulation of the Refuge System’s bold, new vision. This vision acknowledges the broad social, political, and economic changes that have taken place since the agency last set

comprehensive goals in 1999. The document articulates 24 recommendations to guide the future of the Refuge System; recommendation number two directly addresses climate change:

“Develop a climate change implementation plan for the National Wildlife Refuge System that dovetails with other conservation partners’ climate change action plans and specifically provides guidance for conducting vulnerability assessments of climate change impacts to refuge habitats and species as well as direction for innovation in the reduction of emissions and improved energy efficiency on federal lands (FWS 2011c).”

Iowa

The report, *Climate Change Impacts on Iowa*, was released in January of 2011 by the Iowa Climate Change Impacts Committee (ICCIC). The report highlights the effects of climate change on Iowa’s economy, health, and natural and agricultural systems. Iowans are already experiencing higher temperatures, higher humidity levels, and increased precipitation frequency and intensity—particularly in eastern Iowa. The committee summarized their findings with six key recommendations to policymakers, of which number three addresses wildlife conservation:

“Increase investments in state programs that enhance wildlife habitat and management and restore public and private lands. Changes in climate will have a direct impact on both game and non-game species.”

In addition, recommendation two encourages the protection of Iowa’s soil and water resources, on which the state’s economy depends.

The changes to wildlife and habitats in Iowa are described by the 2011 ICCIC report as including changes in interactions among species, timing of life cycles, northward shifts in species ranges, major shifts in the steady state of some natural systems, and unknown impacts to game species of fish, bird, and mammal. With specific regard to floodplain areas such as those found at DeSoto and Boyer Chute Refuges, the report states, “. . . the higher rainfall portions of the pothole region in Iowa and eastern Minnesota may take on greater importance for protecting duck populations (Johnson et al. 2010)”; and

“Given the potential for greater streamflows due to increased rainfall, it also makes sense to give rivers more room to flood. Game fish and other animals can survive these floods if we give them room. Greater wetland capacity and wider stream corridors will also reduce downstream flooding and sedimentation, while improving fish and wildlife habitat in normal years.”

Groups of species in Iowa most vulnerable to climate change include (ICCIC 2011):

- Species restricted to cold microclimates such as fens, cold air slopes, and cold-water streams.
- Rare, threatened, or endangered species.
- Specialists that rely on one species of pollinator or host for their survival.
- Declining species, including grassland nesting birds and neotropical migrant birds in general.
- Species that need large blocks of undisturbed forest or prairie.

- Turtles that rely on incubation temperature to determine the sex of the offspring; the sex ratio of their offspring (and thus future reproductive potential) are disturbed by rising temperatures.
- Turtles and amphibians vulnerable to mid-summer flooding (e.g., wood turtle).

Greenhouse gas emissions are also a great concern for Iowans, as indicated in the Iowa Climate Change Advisory Council's 2008 "Final Report." The report describes scenarios and sets goals for the reduction of greenhouse gases through the year 2050. A number of policy options are provided to legislators to meet these goals (ICCAC 2008).

Nebraska

The State of Nebraska does not currently have a climate change action plan. A section of the Nebraska State Wildlife Action Plan (Schneider et al. 2005) calls for "species and ecosystem adaptation to climate change" and for at-risk species to be evaluated for vulnerability to climate change. Strategies for adapting to climate change include reducing non-climate stressors (i.e., invasive species, pests, pathogens, pollution, and habitat loss, degradation, and fragmentation); maintaining ecological processes and functions (i.e., disturbance, hydrology); conserving a network of conservation areas; restoring habitat connectivity; increasing climate change knowledge (i.e., vulnerability assessments, monitoring, experiments, and modeling); and managing adaptively.

State Wildlife Action Plans

Congress charged each state in the Nation with producing a comprehensive wildlife conservation strategy to help conserve wildlife and natural areas and ensure their persistence for future generations. The resulting State Wildlife Action Plans (SWAP) assess the current condition of the state's wildlife and habitats, identify and prioritize issues and challenges, and lay out actions for long-term conservation of wildlife resources. They include recommendations for the conservation of lands and waters, invasive species management, data gathering and monitoring, collaboration, environmental education, and other relevant natural resource considerations. States must have a SWAP to receive federal funding from the Wildlife Conservation and Restoration Program and the State Wildlife Grants Program.

Iowa

The Iowa Department of Natural Resources (DNR) developed the Iowa Wildlife Action Plan (IWAP) with a 25-year vision for addressing concerns regarding 999 of Iowa's birds, mammals, fish, amphibians, reptiles, mussels, land snails, dragonflies, and damselflies. Of the species considered, 147 are game species, and 297 are considered species of greatest conservation need (SGCN). Nearly one-third of all Iowa species are in need of conservation effort to prevent eventual candidacy for threatened or endangered status. Fish and birds have the greatest total number of species listed as SGCN, but aquatic and semi-aquatic wildlife have the highest percentages of their total number of species listed. Riverine habitats have the greatest number of SGCN among aquatic habitats, and woodlands have the most among the terrestrial habitats (table 2-3) (Zohrer 2006).

Table 2-3: Iowa's Species of Greatest Conservation Concern (Zohrer 2006)

Wildlife Group	Total Species Considered	SGCN	Percent of Total
Breeding Birds	206	67	33
Migratory Birds	199	18	9
Mammals	82	18	22
Fish	153	67	44
Amphibians and Reptiles	71	31	44
Mussels	55	29	53
Land Snails	8	8	100
Butterflies	119	30	25
Dragonflies and Damselflies	106	28	26
TOTALS	999	296	30

Iowa covers approximately 56,239 square miles (35,992,960 acres). Ninety-four percent of Iowa was converted to farmland by 1990, leaving less than 30,000 acres of native prairies (0.1 percent), 422,000 acres of wetlands (5 percent), and 2,800,000 acres of forests (43 percent). Surface water is only 1 percent of the Iowa land surface. Iowa also has one of the highest proportions of privately-owned land in the Nation. Only about 600,000 acres of wildlife habitat (1.7 percent of the land area of the state) is permanently protected by public ownership, and an additional 57,000 acres permanently protected by conservation easements. One goal of the IWAP is to double Iowa's permanently protected wildlife habitat to 4 percent of the state land area (Zohrer 2006).

Iowa portions of DeSoto and Boyer Chute Refuges are located in the Missouri Alluvial Plain region of the state, an area buffering the lower two-thirds of the western boundary of the state and comprising 2 percent of the state's total land. This area is among the landforms of the state with the smallest proportion of wildlife habitat. Currently, 84 percent of the Missouri Alluvial Plain region is either cropped or developed (Zohrer 2006). The priority habitat classes for this region are wet forest and river oxbow channels—both relevant to management on the refuges.

Nebraska

In 2005 Nebraska developed its comprehensive wildlife conservation strategy: "The Nebraska Natural Legacy Project." This document describes the state's wildlife and habitat and lays out a strategic plan for species protection.

Due to rich and productive soils, Nebraska lands have been developed predominantly for agricultural uses. Today less than 2 percent of the original tallgrass prairie habitat in the state remains and just over 1 million acres (35 percent) of the state's wetlands persist. Nebraska once had nearly 24,000 miles of rivers and streams, most of which have now been modified through flow reductions and channelization. In addition, 97 percent of the state's land is privately owned, with only 3 percent owned and managed by federal or state agencies. Land use changes have had widespread consequences on state wildlife and associated habitats. In the strategy document six key stressors to ecological systems are identified: (1) altered fire regime, (2) altered grazing regime, (3) altered hydrologic regime, (4) introduction of invasive species and pathogens, (5) fragmentation, and (6) pollution (Schneider et al. 2005).

It is estimated that 30,000 animal species are found in Nebraska. Species of conservation concern were identified and divided into two tiers. The 80 species in Tier I are globally or nationally at-risk, whereas the 532 species in Tier II are at-risk in Nebraska but are secure in other parts of their range. The plan sets a conservation goal of at least 10 populations of each Nebraska endemic, restricted-range, or state listed species (Tier I). Tier II species identified as having a limited range in a larger geographic region, being widespread, existing commonly elsewhere but only peripherally in Nebraska, or as having Nebraska population as disjunct from the primary geographic range had goals of seven, four, one, and one populations in Nebraska respectively (Schneider et al. 2005).

Next, state habitats were classified. Terrestrial communities are categorized into 69 types and aquatic systems into seven types. The report acknowledges that a more refined classification scheme for aquatic habitats is needed and that nearly half of the Tier I at-risk species are dependent on wetland or riverine habitats (Schneider et al. 2005).

Habitats for at-risk species were then reviewed by designating 40 “biologically unique landscapes” across the state. These landscapes were selected for their potential to protect the greatest biodiversity and occur across a mixture of public and private ownership. If protected, these 40 landscapes have the potential to meet or exceed the SWAP’s population goals for 44 Tier I species (55 percent), partially meet the population goals for 24 additional Tier I species (35 percent), and will not meet the population goals for the remaining 17 species (24 percent). A second review was conducted to see if the existing network of federal and state conservation lands sufficiently protects the Tier I at-risk species. The study found that these lands meet or exceed the plan’s population goals for 18 Tier I species (23 percent), partially meets the population goals for 22 of the Tier I species (27 percent), and does not meet the population goals for 40 species (50 percent) (Schneider et al. 2005).

Nebraska portions of DeSoto and Boyer Chute Refuges reside in the SWAP’s Tallgrass Prairie Ecoregion, which constitutes the eastern quarter of the state. The refuges are also located in one of the priority biologically unique landscapes identified in the report simply as the Missouri River Landscape. There are 11 state listed species in the Missouri River Corridor, six of which are federally listed. Nineteen Tier I at-risk species are documented in this landscape (see Threatened and Endangered Species section and Species Lists in appendix B) including five birds, five fish, one reptile, one mammal, six mollusks, and one plant (Schneider et al. 2005).

Region 3 Fish and Wildlife Conservation Priorities

Although every species and habitat are important, there is a subset that requires immediate attention for their conservation, protection, and/or recovery. At the federal level, conservation priorities are directed first toward migratory birds, interjurisdictional fish, and those species that are nationally threatened or endangered with extinction.

In accordance with the Government Performance and Results Act the Service must direct ample resources towards its most important functions and responsibilities. In 1997 a group of employees and wildlife specialists in the Midwest Region (Region 3) of the Service met to create a Fish and Wildlife Resource Conservation Priorities list. The report, published in January of 2002, identifies 243 species in the region as resource conservation priorities, along with habitat indicators, obstacles, strategies, and desired outcomes (FWS 2002). The report emphasizes the use of species as conservation targets over habitats for three primary reasons:

- Species are the primary element of biological diversity; they are irreplaceable if extirpated.
- Identifying species implies maintaining specific habitats in a way that meets the life cycle needs of the target species.
- By assessing multiple species within a single landscape, locations can be identified where elements overlap and the most essential habitats occur.

The list of Region 3 species of conservation concern with ranges that overlap with DeSoto and Boyer Chute Refuges includes the massasauga rattlesnake, pallid sturgeon, shovelnose sturgeon, paddlefish, plains minnow, western silvery minnow, blue sucker, logperch, flathead chub, ottoe skipper, and western prairie fringed orchid. Regional conservation priorities for birds from the 2002 publication were updated in 2008 (FWS 2008a). Based on the updated list, the bird species of conservation concern whose ranges overlap with the refuges now includes the following 22 species: Swainson's Hawk, Bald Eagle, Least Bittern, Dickcissel, Black-billed Cuckoo, Henslow's Sparrow, Nelson's Sparrow, Chestnut-collared Longspur, Smith's Longspur, Peregrine Falcon, Rusty Blackbird, Loggerhead Shrike, Black Tern, Cerulean Warbler, Red-headed Woodpecker, Pied-billed Grebe, Upland Sandpiper, Hudsonian Godwit, Solitary Sandpiper, Short-eared Owl, Wood Thrush, and Bell's Vireo.

Double-crested Cormorants, bighead carp, and grass carp are also listed but are considered nuisance species.

Conservation Lands in the Vicinity of the Refuges

Much of the land conservation in the United States occurs on lands owned and managed by federal and state agencies in trust for the American public. Nationally, the states of the central plains have the lowest percentages of publicly-owned land. Nebraska ranks 41st of 50 states for federal ownership at 1.10 percent, and 44th for state ownership at 0.50 percent (National Wilderness Institute [NWI] 1995). Similarly in Iowa, 0.29 percent is federally owned (47th lowest of the 50 states), and 0.74 percent is state owned (41st of 50) (NWI 1995). A number of conservation land-holdings in the region surrounding the refuges are owned and managed by county and city governments as well as private organizations (figure 2-7).

All of the authorized land within DeSoto NWR's boundary has been acquired by the Service, and of the authorized 10,010-acre boundary for Boyer Chute NWR, 4,040 acres are owned and managed by the Service. As noted in figure 2-1, also within the authorized boundary for Boyer Chute NWR is a 440-acre tract owned by the Nebraska Board of Educational Lands and leased for agricultural use, as well as a 77-acre tract on the east side of the Missouri River held by the Iowa DNR as Boyer Bend Wildlife Management Area (WMA). Boyer Bend WMA is open to deer hunting and can only be publicly accessed by boat.

Two WMAs managed by the Iowa DNR share a common boundary with DeSoto NWR. To the east is Nobles Lake WMA, a 236-acre property that is half wetland and half upland with an access road and boat launch. To the west is Rand Bar WMA, 65 acres of bottomland forest only accessible by its frontage on the Missouri River.

Directly between DeSoto and Boyer Chute Refuges is the 423-acre Iowa DNR property, Wilson Island State Recreation Area. It is dominated by dense cottonwood forest, and camping, hunting, fishing, and mushroom gathering are all popular activities.



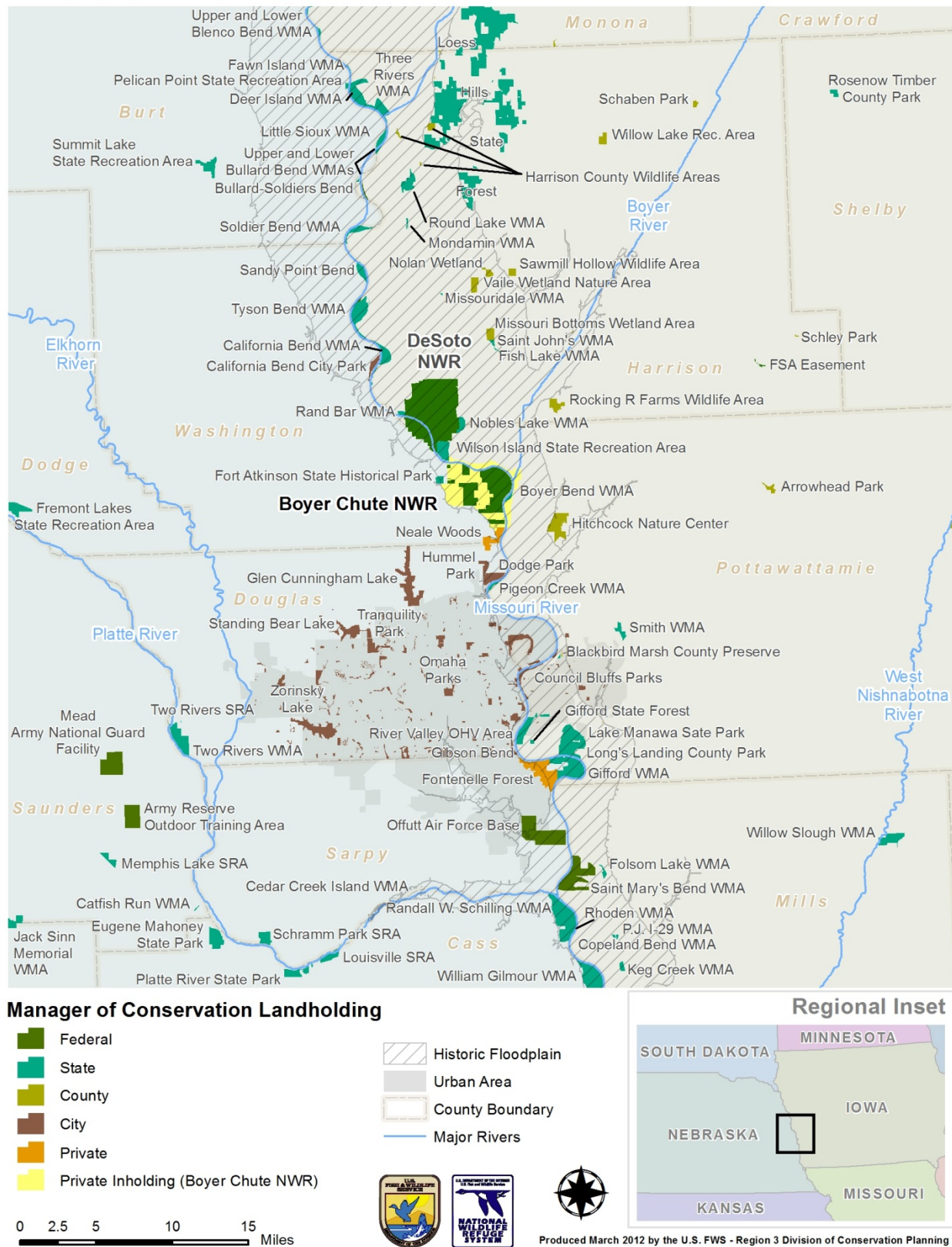
Fort Atkinson adjacent to the refuge; USFWS

As for conservation areas adjacent to Boyer Chute NWR, on the western edge of the refuge is the Fort Atkinson State Historical Park. This 157-acre park is the site of one of the first American forts built west of the Missouri River. Even before construction and use of the fort (1820–1827), this location was a common meeting place for Native American tribes, fur traders, and soldiers. Managed by the Nebraska Game and Parks Commission, the park showcases a historic military fort and the site known as “Council Bluff” where the Lewis and Clark Expedition first met with local Native Americans. On the southern border of Boyer Chute NWR's authorized

boundary is the Neal Woods Nature Preserve. This 554-acre property is privately owned and managed by the Fontenelle Nature Association and offers 9 miles of hiking trails through forests and prairies, environmental education programming, and a nature center.

An examination of the broader region surrounding the refuges reveals a number of additional conservation lands owned and managed by a diversity of conservation entities (figure 2-7). As figure 2-7 indicates, several conservation areas are located directly along the banks of the Missouri River. The vast majority are state WMAs, but there are a few private conservation lands, as well as a number of city parks in Omaha, Nebraska; Council Bluffs, Iowa; and Blair, Nebraska. Farther from the Missouri River there are a handful of small county conservation lands in Iowa. The largest of these is the 1,003-acre Hitchcock Nature Preserve—considered one of the best places to observe fall raptor migrations in the region. Twenty-five miles north of the refuge in Iowa are the four units of the 11,266-acre Loess Hills State Forest. The state forest is administered by the Iowa DNR's Bureau of Forestry. Activities include hiking, backpacking, picnicking, camping, and hunting. It features an observation platform with panoramic views of the Loess Hills landscape. Three larger military installations are located to the south and southwest of the refuge. Although natural resource conservation is not the primary purpose for these lands, they often have divisions and programs that address wildlife and habitat conservation.

Figure 2-7: Conservation Lands in the Area of the Refuges



The Refuge Planning Process

This section provides an overview of the refuge planning process as it relates to DeSoto and Boyer Chute Refuges by defining the purpose of a CCP, describing the planning process undertaken for these refuges, identifying and clarifying the major management issues considered during the planning process, explaining how this CCP relates to subsequent site-specific planning efforts, and presenting the options for revising plans.

Purpose of a Comprehensive Conservation Plan

This CCP describes the management direction and desired future conditions for DeSoto and Boyer Chute Refuges over the next 15 years. The plan provides guidance and rationale for management actions and will be used by the refuge manager and staff as a reference document when developing work plans and making management decisions. Through the development of goals, objectives, and strategies, this CCP describes how the refuges contribute to the overall mission of the Refuge System, fulfill the purposes designated for each refuge, and use the best available science for adaptive management.

This plan enhances the management of DeSoto and Boyer Chute Refuges by:

- Providing a clear statement of desired conditions and management direction for the refuges.
- Maintaining continuity in management of the refuges over time.
- Integrating activities at the refuges with conservation activities that occur in the surrounding region.
- Ensuring that management of the refuges is consistent with all applicable laws, policies, and plans.
- Providing neighbors, visitors, and the general public with an understanding of the Service's management actions on and around the refuges.
- Facilitating public involvement in management decisions for the refuges by providing a process for effective coordination, interaction, and cooperation with affected parties, including federal agencies, state conservation organizations, adjacent landowners, and interested members of the public.
- Demonstrating support for management decisions and their rationales using the best available science, sound professional judgment, and public involvement.
- Ensuring that management and planning at the refuges considers the preservation of historic properties.
- Providing a sound basis for budget requests to meet operational, maintenance, and capital improvement needs on the refuges.

The 2001 DeSoto CCP

Current management of DeSoto National Wildlife Refuge is guided by a comprehensive conservation plan that was begun in July 1999 and received final approval in January 2001 (FWS 2001). A revision of the 2001 CCP was prompted by the catastrophic flooding in 2011

and by a desire to more efficiently integrate management of DeSoto and Boyer Chute Refuges. The 2001 DeSoto NWR CCP contained 25 goals, 43 objectives, and 212 strategies and called for an addition of 7.75 full-time equivalent positions. Habitat was to shift slowly away from agriculture to a diversity of natural cover types that would better support wildlife (table 2-4).

Table 2-4: Future Land Cover Projected by the DeSoto 2001 CCP

Habitat	Acres in 2001	Approximate acres projected for 2015
Woodlands	3,345	3,700
Grasslands	1,642	2,780
DeSoto Lake	788	788
Croplands	1,989	475
Wetlands	101	115
Sandbar/Beach	40	40
TOTAL	7,905	7,898

Highlights from the goals, objectives, and strategies of the 2001 CCP include the following:

- Increased and enhanced habitats friendly to migratory waterfowl to increase use days
- Reduction of the midcontinental Snow Goose population
- Increased cottonwood recruitment
- Studies of potential management options for DeSoto Lake
- Maintenance of the DeSoto Lake sport fishery
- Increased land conservation adjacent to the refuge
- Increased off-refuge wetland restoration
- Reduction of invasive species
- Control of the resident deer herd
- Upgraded facilities at the Steamboat Bertrand Discovery Site
- Encouragement of wildlife observation and photography
- A robust environmental education program in local schools
- Maintenance of the Steamboat Bertrand Museum Collection
- Additional law enforcement and higher safety standards
- More visitation, volunteerism, partnerships, and collaborative research
- High quality interpretation of the FWS mission, the Lower Missouri River ecosystem, the Steamboat Bertrand Museum Collection, and the Lewis and Clark history in the area

Overview of the Planning Process

Developing a CCP takes multiple years and involves a great deal of refuge staff effort and regional office support. For organizational simplicity, the planning process is divided into five

stages: (1) preplanning, (2) scoping, (3) alternative development, (4) draft preparation and review, and (5) final document preparation and approval.

The Comprehensive Conservation Plan (CCP) for DeSoto and Boyer Chute National Wildlife Refuges was also developed with contributions and assistance from many state and federal partners, NGOs, universities, and citizens (see appendices H and I). The active participation of stakeholders was vital to understanding the full range of perspectives and values associated the refuges, and the contributions of these entities was invaluable in determining the future direction of the refuges' management.

Preplanning

Preplanning occurs before the formal planning period begins. During preplanning, policy is reviewed, the core planning team is established, a planning record is created, interest groups are identified, and an initial planning timeline is drafted. Studies, reports, surveys, research and monitoring activities, previous planning efforts, historical documents, and other background information and data resources are also gathered and reviewed during this period.

The planning process began independently for Boyer Chute NWR during the summer of 2010, and planning progressed until the following summer at which time priorities shifted to the 2011 Missouri River flood response. In September of 2011, it was decided to start the planning process over from the beginning—this time combining the planning effort for DeSoto and Boyer Chute Refuges. By default the initial Boyer Chute NWR CCP planning period became an extended preplanning stage for the new combined EA and CCP.

This CCP planning effort for DeSoto NWR constitutes the first CCP revision effort undertaken by the Midwest Region of the Service. The 2001 DeSoto NWR CCP and any associated monitoring or implementation tracking of the original CCP can therefore also be considered a form of preplanning for this revised CCP.

Scoping of Planning Issues

The official planning period begins with the scoping process—a thorough assessment of thoughts, ideas, concerns, challenges, opportunities, and other issues associated with the refuges. The scoping process begins by soliciting input from the refuges' staff, then stakeholders and the public, and finally leadership within the Service.

The first step, a CCP kick-off meeting, was held at DeSoto NWR at the end of November 2011. Refuge and regional planning staff met to discuss the refuges' vision statement and goals, brainstorm issues, and review the planning process.

The next step is for the planning team to engage stakeholders including federal and state agencies, tribal governments, local communities, non-government organizations, academic institutions, neighbors, and others interested in the future of the refuges in identifying the issues and opportunities they see confronting the refuges. Although input, feedback, and comments are encouraged throughout the entire planning process, the official public scoping period is the best time for stakeholders to engage in the planning process.

For DeSoto and Boyer Chute Refuges, the formal comment period began on January 23, 2012 and ended on February 24, 2012. As a part of this comment period two open houses were held to provide the public a forum to discuss ideas with refuge staff and regional planners. The first

open house was held at DeSoto NWR's Visitor Center on February 15 and the second at the Fort Calhoun City Hall Library on February 16. Nearly forty people signed in during the open houses, and a total of eleven written comments were submitted to refuge staff during the public scoping period.

The final stage of scoping took place at the Service's Midwest regional office, where leaders from the Refuge System, Migratory Birds, Ecological Services, Fisheries, and other Midwest Region programs further discussed and refined the list of issues that would be addressed in the CCP. This internal scoping meeting was held on March 29, 2012.

The issues discussed during the scoping phase and described in the Planning Issues section below helped bring important topics to the attention of the plan's authors and were used to inform the writing of the management alternatives in the environmental assessment (EA) document—including the preferred alternative that forms the basis of this CCP.

Alternatives Development

Developing management alternatives as a part of the refuge planning process is derived from the National Environmental Policy Act of 1969 (NEPA). This act requires federal agencies to consider the impacts of proposed actions and to develop a reasonable range of alternatives to those actions.

An initial set of management alternatives was developed during the Refuge Review Workshop held May 1–2, 2012. The resulting set of draft alternatives was further refined through a series of meetings, calls, and follow-up activities. An Alternatives Workshop was held the last week of November 2012, which served to define and clarify the details of management under each of the alternatives, review and revise draft objectives, and discuss the environmental effects associated with each alternative. At this point the proposed action (Alternative D) was selected by refuge staff and was further developed as the basis for the Draft CCP.

Preparation and Review of Environmental Assessment and Draft Plan

The CCP is published in two phases: draft and final, in accordance with NEPA. The EA and Draft CCP document presents the full range of alternatives considered for future management of the refuges, and the environmental effects associated with each alternative. The EA and Draft CCP document also identifies the preferred alternative selected by refuge staff as the desired basis for the Final CCP and further describes the goals, objectives, and strategies associated with the proposed management direction.

A complete preliminary version of the EA/Draft CCP was completed on May 28, 2013. It was then reviewed and revised by refuge and regional office staff in June and July, a time period that culminated with an internal review meeting at the Midwest Regional Office on August 1, 2013. The EA/Draft CCP was then released for review by the public for a period of 30 days. Public review and comment began on September 20, 2013 with the publication of a Notice of Availability in the *Federal Register*, a news release made through local media outlets, a postcard announcement sent to the CCP mailing list, the distribution of an e-mail announcement, the delivery of paper copies of the full document to local libraries, and by making an electronic copy available on the Service's website. Due to a federal government shutdown from October 1–16, 2013, the public review period was extended an additional three weeks until November 8, 2013, and the open houses were rescheduled to November 5 (Fort Calhoun) and November 7 (DeSoto NWR). Thirteen people attended the open houses, and a

total of eleven comments were submitted to the refuges during public review. The comments included topics ranging across refuge habitats and wildlife, management tools (such as prescribed fire and chemical use), public access and uses, land conservation and floodplain protection, and the planning process. Additional information from the public review and comment period is provided in the Response to Comments (appendix K).

Preparation and Review of the Final Plan

A thorough review of the Draft CCP document and proposed management direction was undertaken, and where appropriate comments received by the Service on the EA/Draft CCP were incorporated into the final version of the CCP. As with the Draft CCP, the availability of the Final CCP was announced with a notice in the *Federal Register* and through local media outlets, a final postcard and/or e-mail announcement was sent to the project mailing list, full copies of the document were sent to local libraries, and an electronic copy was made available on the Service's website.

The Final CCP document is the basis for management of the refuges for 15 years. It guides the development of more detailed, resource-specific step-down management plans, and underpins the annual budgeting process through Service-wide allocation databases. Most importantly, it lays out the general approach to managing habitat, wildlife, and visitor services at DeSoto and Boyer Chute Refuges, directing day-to-day actions and decision making.

Implementation

Implementation begins immediately following approval of the CCP and public notification of the decision. Funding and staff time will be allocated to implement of the CCP as appropriations, budgets, and other resources allow.

Step-Down Management Plans

The CCP provides general direction for refuge management over short- and long-term timeframes. It also begins to describe specific objectives and strategies for the refuges. Step-down management plans build on the framework provided by the CCP and develop management concepts in greater detail. This process provides refuge managers and staff the opportunity to identify specific implementation actions that will be carried out to meet the requirements of the CCP. It is common for refuges to revise or develop step-down management plans following the completion of the CCP. A number of step-down management plans may be undertaken depending on the resources of a refuge and management needs. Current Service direction recommends the development of at least three step-down management plans during the 15 years covered by a CCP, including the Habitat Management Plan, Inventory and Monitoring Plan, and Visitor Services Plan.

Plan Review, Amendment, and Revision

While CCPs are designed to provide guidance for refuge management over a 15-year period, planning policy also indicates that plans should be reviewed regularly. Service policy calls for an annual review of CCPs and modification when notable events or new information determine that change is necessary in order to achieve the refuge purposes, vision, and goals. Specifically, the policy calls for revision, “. . . when significant new information becomes available, ecological conditions change, major refuge expansion occurs, or when we identify the

need to do so during plan review” (602 FW 3(8)b). This policy offers an opportunity for adaptive management and may result in CCP amendments or minor, major, or complete revisions.

CCP amendments consist of changes to the plan that do not alter the original intent of any part of the plan and do not typically require additional NEPA compliance. Examples of amendments include changes in the priority or timing of strategies, or the creation of step-down management plans that support the original CCP objectives. Minor plan revisions cover small content changes that meet the criteria for a categorical exclusion under NEPA in accordance with 550 FW3.3C. Examples of minor revisions include changes to strategies or an objective’s numerical target value. Major or complete plan revisions include changes to content in the goals and objectives of the original CCP and require the same procedures and processes used to develop the original CCP including an environmental assessment or environmental impact statement with alternatives, environmental effects, and public review.

In the case of DeSoto NWR, catastrophic flooding in 2011 caused dramatic changes in refuge habitats and visitor services, as well as combining management with Boyer Chute NWR, prompted a complete CCP revision after 10 years instead of the full 15-year planning cycle.

Planning Issues

A planning issue is any 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. The scoping by refuge and regional Service staff, scoping among partner agencies, and public scoping identified a number of planning issues, which have been organized under the following headings: Habitat Management, DeSoto Lake, Land Acquisition, Wildlife, Refuge Administration, Visitor Services and Public Use, Infrastructure, and Outreach, Support, and Partnerships.

Habitat Management

Issue Question

What is the best way to manage habitats on the refuges to maximize benefits to wildlife and support conservation in the greater Missouri River ecosystem?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

The Missouri River once flowed across an expansive floodplain landscape, experienced seasonal changes in flow punctuated by surge events and periods of drought, sustained large-scale erosion and deposition, and was a constantly evolving mosaic of habitats and successional cover types. These processes and the resulting landforms were and remain important to wildlife associated with the Missouri River system, such as migratory birds and riverine fishes. Managing refuge lands in the Missouri River floodplain for habitat conditions that reflect historic assemblages and maintain diverse native wildlife populations is challenging, because the system and its driving landscape processes are dramatically different today than they were in the past. Considerable changes have occurred to the system over the past century due to main stem dams, channelization, and development of the floodplain, including:

- Altered seasonal and annual flow regimes
- Decreased erosion, deposition, and sediment loads
- Highly altered surface and subsurface hydrology
- Reduced disturbance frequencies, such as floods and fire
- Diminished habitat succession cycles
- Decreased acres of terrestrial and aquatic habitat (loss of 354,000 acres of floodplain habitat and 72 miles of river channel)
- Greater habitat fragmentation
- Reduced habitat heterogeneity
- Reduced habitat quality
- Invasive species impacts on plant and animal communities
- Increased wildlife disturbance
- Changing climatic conditions

Today, the Missouri River floodplain ecosystem is highly engineered and controlled. The landscape is now fairly stable and predictable for multiple years with occasional, (typically minor) flood events. The refuges must work within these constraints to provide habitats that continue to benefit diverse and abundant endemic and migratory wildlife populations. The consequences of not conserving and managing the refuges and other conservation lands in the Missouri River Valley to promote healthy floodplain habitats analogous to historic conditions are the continued loss and degradation of these unique big river system habitats and a gradual reduction in the diversity of species that comprise them.

Associated Planning Priorities

- Maximize adaptive capacity of management and refuge compatibility with flood cycles
- Optimize the quantity and distribution of wetlands, grasslands, and forests for wildlife
- Support the conservation of rare and declining riverine, shallow water, and sandbar habitats
- Address the concerns associated with farming on refuges
- Identify and meet critical biotic and abiotic monitoring needs
- Reduce invasive plant species
- Contribute to biological goals within the broader Missouri River landscape
- Maximize anticipation of, and management response to, climate change stresses

DeSoto Lake

Issue Question

What is the best way to manage DeSoto Lake to maximize benefits to wildlife and people?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

DeSoto Lake is a prominent and important feature of DeSoto NWR, and its management carries implications for habitat, wildlife, recreation, and partnerships. The channelization and armoring of the lower third of the Missouri River during the middle of the twentieth century eliminated 72 miles of the river habitat, including the oxbow cut off in 1960 to create DeSoto Lake. Subsequent drainage of Missouri River floodplain for agriculture and other developed uses has further reduced the acres of open water, wetland, and a range of aquatic habitats—negatively impacting to a number of species.

The full range of possible management options for DeSoto Lake has not yet been thoroughly explored. For example, it may be possible to change management of the drainage ditches that enter the lake, or reestablish some form of connection between the lake and the Missouri River. Changes to lake management have the potential to increase and/or improve aquatic habitat for wildlife. The fishery is also an important consideration of lake management. The degree of connectivity between the Missouri River and DeSoto Lake, and the manipulation of lake-associated wetland habitats will have impacts on the recreational fishery. For example, management could maintain an isolated, stocked, open water sport fishery, or move toward a more connected, river-influenced fishery.

Future management of the lake must carefully weigh these factors, along with any resulting management responsibilities. The potential consequences of not exploring the ways to improve the management of DeSoto Lake include the continued degradation of lake conditions, water quality, and aquatic habitat—providing sub-optimal benefits to wildlife, offering less to visitors in the form of fishing and other recreation activities, and requiring excessive management resources.

Associated Planning Priorities

- Maximize the quality of habitat for fish and other aquatic species
- Investigate and clarify the options for connectivity between DeSoto Lake and the Missouri River channel
- Investigate and clarify management options regarding the drainage ditches that enter the lake
- Improve water quality in DeSoto Lake
- Maintain a healthy fishery for anglers
- Minimize resources required for lake management
- Strengthen partnerships associated with lake management
- Minimize impact to refuge neighbors

Land Conservation

Issue Question

What Service footprint will best accomplish the refuges' land and water conservation goals and best supplement Missouri River ecosystem conservation?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

As mentioned in the habitat management issue statement, the quantity and quality of habitat in the Missouri River ecosystem has been greatly reduced and degraded from that which existed in the past. National wildlife refuges on the Lower Missouri River (DeSoto, Boyer Chute, Squaw Creek, and Big Muddy NWRs) play an important role in providing the habitat required to sustain wildlife populations in the Missouri River ecosystem. The refuges' overarching goal is to leverage their resources to make the greatest possible contribution to wildlife, habitat, and people. Identifying and safeguarding lands and waters that provide essential natural resource and conservation values is a key component of this goal. Two aspects of this goal relevant to DeSoto and Boyer Chute Refuges include: (1) fully acquiring the Refuge System priority lands currently authorized by Congress at Boyer Chute NWR, and (2) identifying ways to increase conservation in the ecosystem through a diversity of public and private efforts.

First of all, the lands and waters encompassing the authorized boundary of Boyer Chute NWR have been considered a high conservation priority for over 20 years, but land acquisition has been stymied by a lack of funding and willing sellers. It remains a long-term priority to acquire and restore the 5,309 acres (53 percent) of Boyer Chute NWR's authorized boundary that are still privately-owned and used for agriculture (this total excludes the 661 acres of Missouri River surface area). The refuge's existing collection of scattered, isolated parcels make habitat management less efficient, diminish benefits to wildlife, and make law enforcement more difficult.

Secondly, the Service is currently engaged with a number of partner agencies and organizations vested in Missouri River conservation. Opportunities exist for additional collaborative conservation between the Service and its partners in the broader Missouri River basin.

National wildlife refuges have an important role in the regional green infrastructure. They not only protect wildlife and habitat but help sustain essential ecosystem services for people. Within the larger regional context, the planning process can help the refuges review the best configuration of protected lands for wildlife, the conservation priority associated with existing habitats, the best way to consolidate fragmented landholdings, the most appropriate land protection strategies, and the strategic implementation of land conservation activities.

The consequences of inaction are fragmented landholdings that make it difficult to meet refuge wildlife and habitat objectives as well as broader conservation goals in the Missouri River ecosystem.

Associated Planning Priorities

- Acquire priority inholdings at Boyer Chute NWR

- Evaluate ways to improve conservation capacity for units of the Refuge System associated with the Missouri River ecosystem
- Support partners and the public in local and regional land and water conservation efforts

Wildlife

Issue Question

How can the refuges have the greatest beneficial impact on wildlife in the Missouri River ecosystem?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

The quantity and quality of wildlife habitats in the Missouri River ecosystem have decreased greatly in the past century, and as a result, a number of species populations associated with the ecosystem have declined. The overarching mission of biological conservation in the Refuge System is to maintain the diversity of species and habitats; however, the resources available to accomplish this mission are limited. It is a challenging responsibility for the refuges to set priorities among species of conservation concern and respond with appropriate management applications. Invasive species also impact refuge wildlife management decisions. Local conservation efforts are enhanced by an understanding of fish and wildlife conservation priorities at a broader, ecosystem scale, which can then be stepped down to individual refuges.



Wildlife management; Randy Mays

Another important step in providing direction for refuge wildlife management is having appropriate biological inventories and monitoring activities, which help managers understand and adapt management. Unfortunately, the resources required for these activities are not always available. In addition, the science that informs wildlife management decisions evolves over time, with new and improved insights discovered for achieving conservation successes. Keeping up with the changing state of science can be challenging, especially with the added uncertainty associated with climate change.

If wildlife objectives are not set to effectively meet wildlife needs in the ecosystem, the result will be the continued decline and eventual loss of certain species as well as the loss of relevance and value for DeSoto NWR, Boyer Chute NWR, and other conservation lands in the Missouri River ecosystem.

Associated Planning Priorities

- Maximize support for species of conservation concern
- Maximize the refuges' contribution to population objectives for target species
- Maximize benefits to migratory bird species (a refuge purpose for DeSoto NWR)
- Reduce invasive plant and animal species
- Maximize anticipation of, and management response to, climate change stresses on wildlife in the Missouri River ecosystem

Refuge Administration

Issue Question

In what ways can the administration of the refuges be improved?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

DeSoto and Boyer Chute Refuges were created independently, and their biological and visitor services management programs developed separately. Over time independent management led to a natural degree of redundancy or overlap as both refuges sought to meet infrastructure, equipment, staff, and program needs. In 2006 when full management of Boyer Chute NWR was passed to DeSoto NWR few immediate changes were made, but in response to the damage caused by severe flooding in 2011 efforts have been taken to integrate and streamline resources shared by the two refuges.

In addition to management redundancies, the agency budget is also an important consideration for administration. Service budgets are in a constant state of flux due to an annual allocation system and regular political turnover. The current decreasing trend in Service-wide allocations has further reinforced the need to increase management efficiencies. Not reviewing and streamlining administration of the refuges would be wasteful of refuge and Service resources, reduce funds available to other refuge programs, place an unnecessarily burden on the workload of refuges staff, and make understanding of, and compliance with, refuge management more difficult for visitors and the public.

Associated Planning Priorities

- Increase management efficiencies
- Increase management consistency between the refuges
- Consider changes in visitor fees to balance management needs and visitor satisfaction
- Optimize hours of operation to balance management constraints with visitor satisfaction
- Address law enforcement needs

Visitor Services and Public Use

Issue Question

How can the refuges direct resources to provide the best visitor services possible while adhering to capability standards for such uses (given wildlife as the Service's first and highest priority)?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

Service staff, local and state governments, conservation partners, and the public have long recognized the need for additional recreation opportunities along the Missouri River. There is a great demand for outdoor recreation opportunities from local towns and cities along the Missouri River, including the nearly 850,000 people in the Greater Omaha–Council Bluffs Metropolitan Area. The degree to which the refuges can help meet this need is influenced by a number of constraints.

First and foremost, maintaining infrastructure in a floodplain setting is risky, challenging, and oftentimes expensive. Secondly, the refuges have limited funds, time, and staff to meet the public demand. And finally, the FWS mission clearly establishes a priority for the conservation, protection, and enhancement of fish, wildlife, plants, and their habitats on national wildlife refuges over all other uses.

Because the refuges are on the fringe of a major metropolitan area, open space in the surrounding landscape will likely decrease in the future. Public lands will likely experience increased use, encounter demands for new and different types of uses, greet more diverse publics, and experience changes in the age structure and other demographics of visitors. Understanding and adapting to these trends are important for the refuges as management seeks to balance natural resource conservation with future visitor use.

The NWRS Mission demands that recreation be carefully balanced with wildlife and habitat priorities. Flooding in 2011 forced a review and evaluation of the existing visitor services infrastructure at the refuges. A number of socioeconomic factors are being considered as refuge staff assess current and future public access, public use, visitor services, infrastructure, and environmental interpretation. The decision making will hinge on four key factors: (1) the management direction of the biological program, (2) the design for joint management of DeSoto and Boyer Chute Refuges, (3) personnel resources available for programming, law enforcement, and maintenance, and (4) Service policies regarding the appropriateness and compatibility of public uses.

To offer appropriate visitor services opportunities on the refuges, staff must continually review, evaluate, and make improvements to the visitor services program. Effective adaptive management will allow the refuges to make the greatest contribution to public health and wellness, avoid unacceptable impacts to refuge habitats and wildlife, reduce safety concerns, minimize the management burden on refuge staff, and ultimately retain relevancy, advocacy, and public support.

Associated Planning Priorities

- Continue curatorship of the Steamboat Bertrand Museum Collection and integrated interpretation of the Discovery Site
- Maximize public access to refuge lands and waters within the constraints established for wildlife conservation
- Optimize consumptive uses (hunting, fishing, and gathering) on the refuges to avoid overharvest
- Promote the highest quality environmental education and interpretation programs
- Maximize safety
- Support appropriate use of refuge management resources (time, money, personnel)

Infrastructure

Issue Question

What is the best configuration of refuge infrastructure for both administration and visitor use?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

Four main factors have contributed to the need to review and evaluate refuge infrastructure in the planning process: (1) shared management of the refuges, (2) a history of high infrastructure development on the refuges, (3) flood constraints, and (4) budgetary constraints.

As described in the issue “Refuge Administration,” the two refuges came into being independently, and a large amount of public infrastructure was initially developed on each refuge to meet the anticipated recreation demands of local communities and the Omaha–Council Bluffs Metro Area.

In addition to considerations born of the new shared management, flooding and budgets have also led refuge management to reevaluate infrastructure on the refuges. Broad-scale flooding in 2011 damaged (and in some cases completely destroyed) infrastructure, requiring immediate and long-term decisions about what to reconstruct, what to remove, and the general constraints of building on a floodplain—even one as highly regulated as the Missouri River.

In addition, management continually seeks better ways to utilize the financial and staff resources at a field station. Changes are made when infrastructure is deemed inadequate, excessive, expensive, and/or maintenance-prone. The general consequence of not evaluating refuge infrastructure during planning is an unnecessary drain on refuge time, money, and personnel resources.

Associated Planning Priorities

- Ensure quality maintenance of infrastructure
- Maximize flood compatibility

- Where appropriate, provide flood resistance instead of flood compatibility
- Where possible, reduce excess infrastructure to increase efficiencies and reduce overhead

Outreach, Support, and Partnerships

Issue Question

How can the refuges bolster their relationships with partners, visitors, and other constituents?

Background (Why is it an issue? What are the consequences of not addressing the issue?)

Refuges do not exist in a void. They are public lands that require: (1) public and private support to accomplish conservation goals, (2) interaction with constituents to remain relevant, and (3) advocacy to persist. First of all, healthy relationship networks create a multiplier effect by leveraging the resources and efforts of multiple sources toward achieving conservation successes. Because the Service cannot accomplish its conservation goals alone, conservation values must be shared by partners, local communities, refuge neighbors, visitors, and the public. Secondly, the general public understanding varies greatly regarding the mission and purposes of national wildlife refuges, how they differ from other public lands, and how refuges can benefit the natural, social, and economic health of local communities. The need for outreach and education about the Refuge System is ongoing and essential to the FWS mission. Similarly, refuges must remain engaged with the communities and public they serve to understand their expectations as demographics and cultural values change over time.

A similar lack of public understanding exists regarding the ecological functions of big river systems like the Missouri. Conservation values such as flood relief and water table replenishment are generally less understood than economic uses such as agricultural production and industrial use. There is a long-standing need to improve public understanding of the floodplain's value to both natural and human systems.

The consequences of not building and maintaining strong relationships and support include a reduced capacity to achieve our mission; a reduced public appreciation of the unique wildlife, habitats, and ecosystems conserved by refuges; limited public advocacy or support; and ultimately the deterioration in the value of land conservation.

Associated Planning Priorities

- Increase public understanding of, and appreciation for, the refuges and the Refuge System
- Increase public appreciation and understanding of the Missouri River ecosystem
- Increase support for the refuges
- Increase interaction with Omaha–Council Bluffs and local communities
- Increase engagement in partnerships on the Missouri River
- Strengthen relationships with refuge neighbors

Chapter 3: Refuge Environment and Current Management

In this chapter:

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Introduction

This chapter first describes the geographic setting for DeSoto and Boyer Chute National Wildlife Refuges (NWRs, refuges), and then introduces the diversity of resources associated with the refuges under four broad categories: physical environment, habitat, wildlife, and people. A general description of the resource and the current refuge management of that resource are provided for each topic. The description of current management provides a reference for the management direction and values leading up to the development of the comprehensive conservation plan (CCP).

Geographic Setting

Refuge Sketch and Local Context

A description of each refuge is provided separately below as well as a section on easements administered by the refuges.

DeSoto National Wildlife Refuge

DeSoto NWR was established in 1958 and is located approximately 15 miles north of Omaha, Nebraska in Washington County, Nebraska and Harrison and Pottawattamie Counties, Iowa (figure 3-1). It lies midway between the towns of Missouri Valley, Iowa and Blair, Nebraska and straddles just over three river miles (641.1 through 644.7) of the Missouri River. For ease of reference and discussion in this CCP, portions of the refuges have been divided into management units and a naming convention applied as depicted in figure 3-2.

Figure 3-1: Regional Location of the Refuges

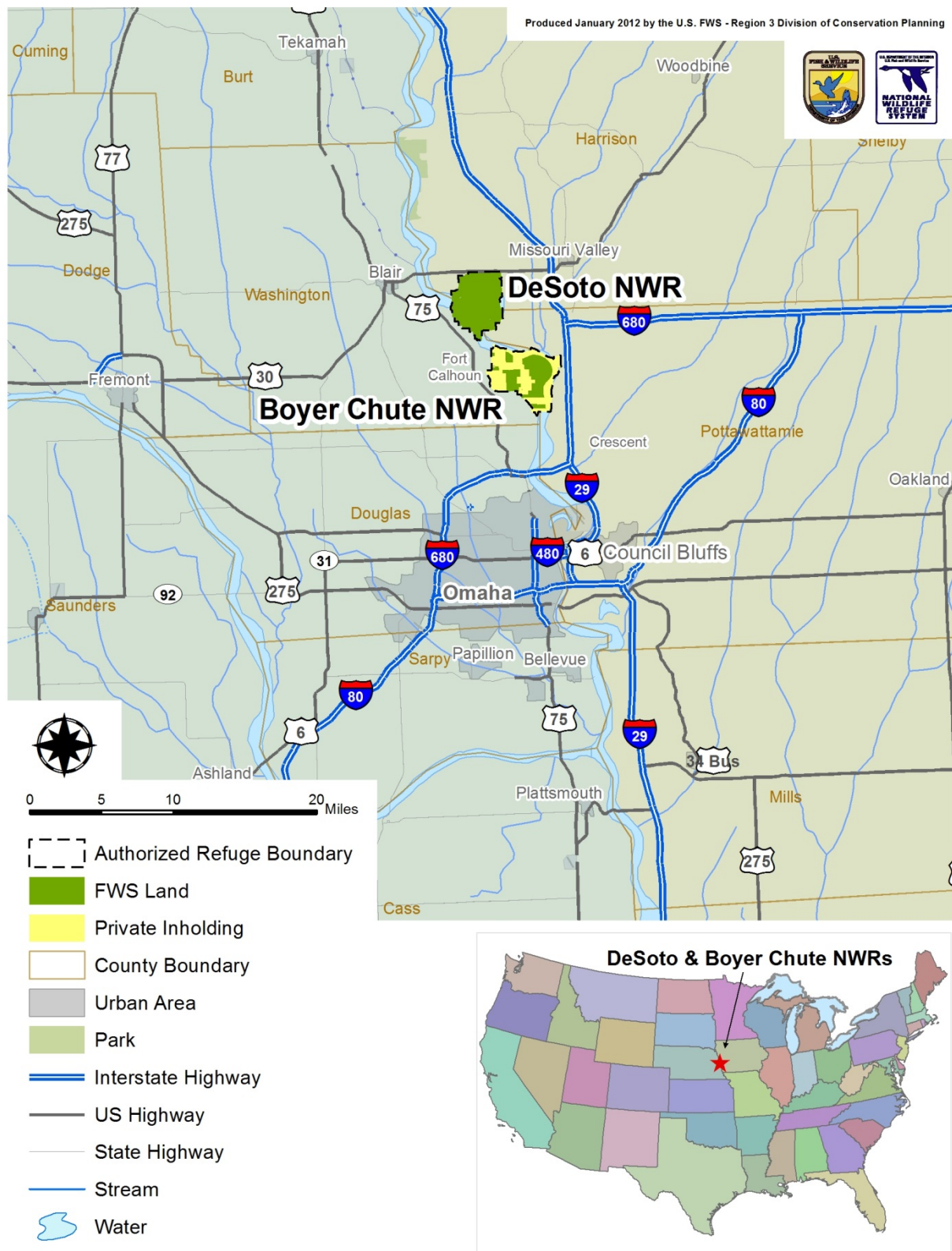
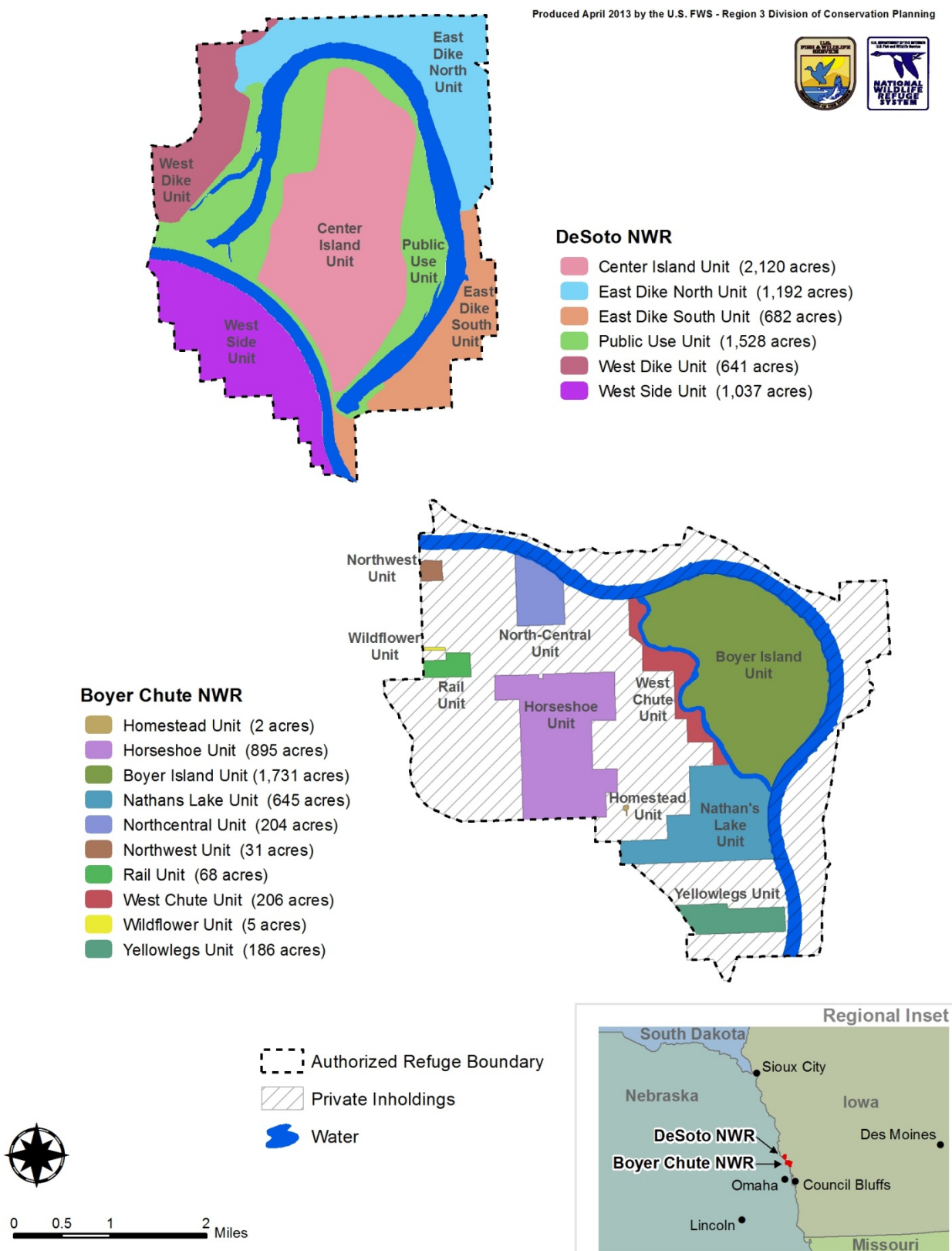


Figure 3-2: Refuge Management Units



Comprised of approximately 8,365 acres, DeSoto NWR is situated entirely within the historic floodplain of the Missouri River resulting in essentially flat topography and elevations ranging from 987 to 1,014 feet above mean sea level (MSL). Although the majority of the refuge is now protected from the river by a levee, DeSoto NWR's landforms, soils, and oxbow lake are all a direct result of the natural fluvial processes of meandering, deposition, and scouring carried out by the Missouri River for countless millennia. The oxbow bend that created DeSoto Lake began as a slight curve in the river and grew steadily larger over time as the outside of the river channel was eroded and undercut by the stronger outer current, and deposition occurred on the inside of the curve where the current is weaker. DeSoto–Bertrand Bend was well on its way to cutting itself off from the main channel and forming an oxbow lake, when in 1959–1960 the U.S. Army Corps of Engineers (USACE, Corps) excavated a cutoff channel and constructed levees from the dredge spoil to separate the new 7.5-mile DeSoto Lake from the primary channel of the Missouri River.

About half of the land comprising the refuge was cleared for agriculture in the 1940s and 1950s prior to refuge establishment. In 1958 when DeSoto NWR was established, its primary purpose was to provide for the needs of migratory birds (see Refuge Purposes in chapter 2). Early management emphasized providing sanctuary and food for migratory waterfowl by raising crops on refuge land through cooperative agreements with local farmers. In addition, 350 forested acres on the center island were cleared of trees, and shorelines were opened up to attract more geese. The refuge farming program has been slowly reduced since the 1970s in favor of native habitats such as wetlands, grasslands, and bottomland forests. DeSoto NWR remains an important stopover for migratory waterfowl during their spring and fall migration between the Arctic nesting grounds and the Gulf Coast wintering areas. A variety of ducks and geese migrate through the area; records show that in some years as many as 500,000 birds stop at the refuge to rest. Also, mature cottonwood gallery forest on the refuge is an important habitat for migratory raptors; records show that over 280 Bald Eagles have been seen on the refuge during the winter months. The natural regeneration of these bottomland forests has declined substantially since the 1950s with the reduction of natural flood cycles.

DeSoto offers a number of wildlife-dependent recreation opportunities including hunting, fishing, and wildlife observation. The refuge also has an outstanding environmental education program that emphasizes partnerships with local schools, is based on local curricula, and offers students successive opportunities to visit and learn. DeSoto NWR is nationally renowned for its archaeological museum collection and associated cultural history interpretation. The number of visitors has always been high at the refuge, averaging just under 200,000 in the 1960s, nearly 350,000 in the 1970s, almost 400,000 in the 1980s, and just shy of 300,000 in the 1990s. In the 2000s the number of visitors has averaged just under 250,000 annually. Changes in visitation over the decades have been attributed to changes in compatible public uses, the establishment of fees, occasional flood events, and fluctuations in wildlife populations.

Due to the historically dynamic nature of the Missouri floodplain, little early archeological evidence has been discovered on the refuges. The earliest known historical records are from the European colonization time period, including those of Native Americans, explorers, trappers, and frontier settlements in the area. Lewis and Clark are believed to have camped overnight on or near DeSoto NWR on August 3, 1804. Their stay in the area also includes the famous “Council Bluff” meeting with the Native Americans held only a few miles to the southwest of the refuge (just west of Boyer Chute NWR). A unique and popular facet of DeSoto NWR's history is the story of the Steamboat Bertrand. In April of 1865 the Bertrand cargo vessel was heading up the Missouri River from St. Louis to the goldfields of the Montana Territory when it hit a partially submerged snag on the DeSoto Bend and sank. The ship remained lost and buried for 103

years until two Omaha salvors rediscovered the steamboat's hull and cargo in 1968 under 28 feet of earth. The time-capsuled cargo of over 200,000 items was carefully excavated and preserved and has been housed since 1981 in the refuge's Visitor Center as one of the Nation's premier collections of Civil War-era artifacts.

Boyer Chute National Wildlife Refuge

Boyer Chute NWR was authorized in 1992 in an ongoing effort to recover, restore, and safeguard fish and wildlife habitat along the Missouri River corridor. The refuge is located just east of the farming community of Fort Calhoun, Nebraska and 15 miles north of Omaha, Nebraska. The authorized boundary resides along an eight-mile stretch of the Missouri River (river miles 631.8 to 640.2) in the wide, fertile floodplain of the Missouri River Valley on former river meanders in Pottawattamie County, Iowa and Washington County, Nebraska (figure 3-1).

By comparison to other national wildlife refuges, Boyer Chute NWR is a relatively new and a relatively small refuge, having existed for 20 years and incorporating just over 4,000 acres of managed land. Its combined acreage of separated units equates to approximately 40 percent of the total proposed acquisition boundary. The fragmented land status combined with a passive and gradual process of land acquisition poses challenges for management.

Boyer Chute NWR conserves a number of landscape features unique to large river systems including chutes, backwaters, side channels, islands, pools, sloughs, and sandbars as well as floodplain wetlands, prairies, shrublands, and forests. To every extent possible, management efforts on the refuge seek to restore or rehabilitate habitats and landforms that have been virtually erased by a century and a half of human-induced change in the Missouri River valley. Riverine, wetland, woodland, and grassland habitats are managed to provide habitat for a number of species, including three federally threatened or endangered species. Located on the edge of the central flyway, the refuge serves as a seasonal resting area for waterfowl and is a nesting area for a variety of migratory grassland, wet meadow, and wetland-dependent birds. It is also the year round home for many resident wildlife species. Refuge backwaters provide spawning, nursery, and food production areas; while the rivers, chutes, and side channels provide habitat for numerous aquatic species including the endangered pallid sturgeon. Boyer Chute NWR has documented over 200 bird species, 35 mammal species, 30 reptile species, 10 amphibian species, and over 60 fish species. Appendix B contains these and other species lists.

The refuge also provides unique opportunities for wildlife-dependent recreation along the Missouri River to approximately 25,000 visitors each year. The refuge offers activities such as wildlife observation and photography, environmental education and interpretation, and fishing and hunting to the small communities near the refuge as well as to the Greater Omaha–Council Bluffs Metropolitan Area.

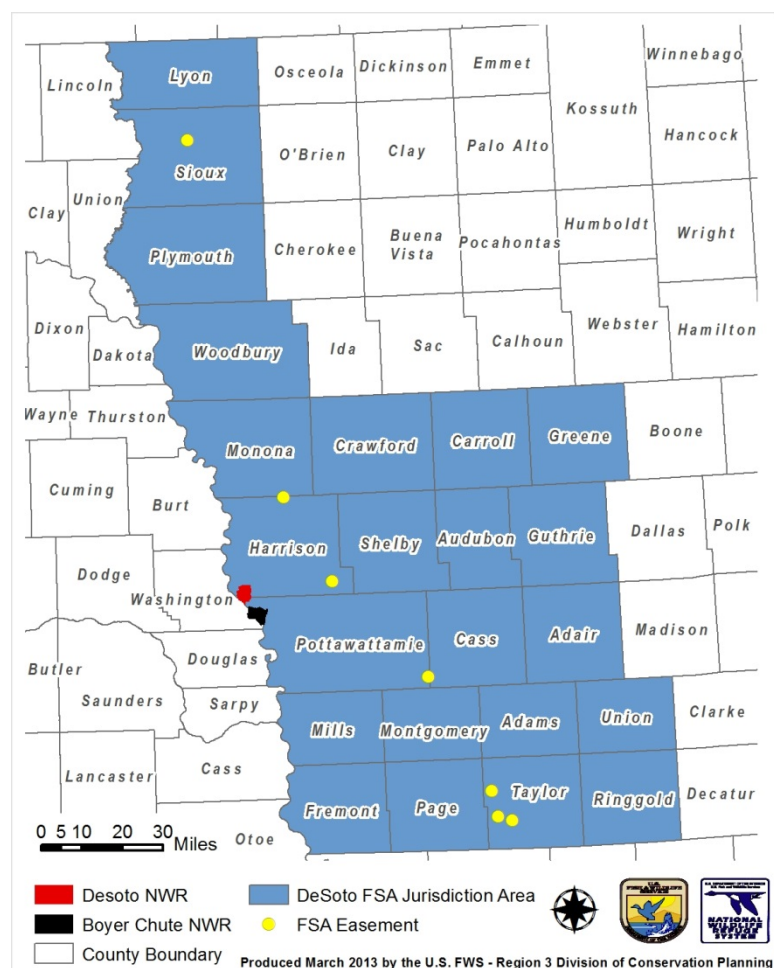
Other Units Administered: Conservation Easements

The 1985 Farm Bill's "Consolidated Farm and Rural Development Act" contained provisions for the protection of wetlands against conversion to agriculture. The Farmers Home Administration (FmHA) was given authority for the Farm Debt Restructure and Conservation Set-Aside Act's conservation easements—properties foreclosed on by the federal government, otherwise known as "inventory properties." Lands appropriate for the conservation easement program had important natural resource interests such as wetlands, floodplains, riparian corridors, endangered species habitat, and the uplands necessary to protect bottomland habitats. An

agreement between the FmHA and the U.S. Fish and Wildlife Service (FWS, Service) authorized the Service to be the easement manager and to protect these lands for conservation, recreational, and wildlife purposes. The “Service Easement Manual” (U.S. Department of the Interior 2005) states that, “The agreed upon purposes of this easement are the preservation and maintenance of the wetland and floodplain areas existing as of the date of this conveyance as well as protection and enhancement of plant and animal habitat and populations.” Farm Service Agency (FSA; previously known as FmHA) easements are administered by the Service as part of the National Wildlife Refuge System (NWRS, Refuge System) pursuant to the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd et. seq.), and thus they are subject to compatibility regulations and other relevant Refuge System policy.

DeSoto NWR has jurisdiction over the FSA easements in 23 western Iowa counties (figure 3-3). Within these counties, the refuge is responsible for the oversight and management of seven easement properties with a combined total of 177 acres.

Figure 3-3: Farm Service Agency Easements Administered by DeSoto NWR



The Service is authorized to protect and manage important natural resource interests on FSA easement properties. Ownership of the easement land is typically retained by private individuals but with deed restrictions related to conservation management. Because of the high degree of variability between individual FSA easements, review of the easement files is necessary in

evaluating Service-related management actions and enforcement activities. In general, service employees are responsible for habitat management and are granted access for maintenance, monitoring, enforcement, and other necessary management activities. The Service Easement Manual describes management rights as those that:

“ . . . include, but are not limited to, inspection for compliance with the terms of this easement; research regarding water, wetlands, fish and wildlife and associated ecology; and any other activity consistent with the preservation and enhancement of wetland functional values (DOI 2005).”

There is no public access to these easement properties unless explicitly stated in an individual easement document. According to policy, FSA conservation easements are checked annually using aerial or ground surveys for compliance, including boundary signs, trespass, and various other infractions.

Ecosystem Setting

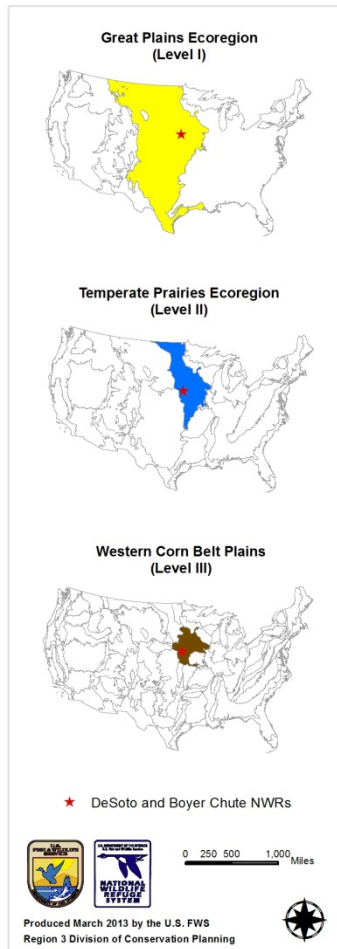
Ecoregional Context (Omernik/EPA)

North America has been classified into ecological units of varying scales using a number of different hierarchical systems. The different systems all use biotic and abiotic criteria to delineate areas of geographic similarity, with the intention of providing a framework for research and management of natural systems. Factors such as geology, vegetation, climate, soils, hydrology, land use, and wildlife are used in a system originally devised by James Omernik (Omernik 1987, 1995), and which was subsequently adopted, adapted, and further refined by the U.S. Environmental Protection Agency's (EPA's) Western Ecology Division (EPA 2000). Understanding a refuge's context within the broader physiographic region provides insights into opportunities, challenges, and other management implications.

At the highest of four levels in the Omernik/EPA hierarchy, the North American continent is divided into 15 Level I ecoregions that provide a broad continental perspective. Biophysical characteristics combined with human-related activities define the geographic dimensions for these ecoregions. The refuges are located within the **Great Plains (Level I) Ecoregion**, which paints a wide north-south swath down the center of the continent from north-central Canada to northeastern Mexico (figure 3-4). Covering over 1.3 million square miles, the region is characterized by minimal topographic relief, predominantly grassland vegetation, and sparse tree coverage. Well suited to agriculture, the soils of this region are threatened by reduced nutrient levels, increased salinity, and erosion. High winds and periodic severe droughts and frosts are also important climatic factors. Biologically, this region was once covered with specialized grassland plant and animal communities driven by fire, grazing, and climatic conditions. Rainfall increases from west to east across the region, defining the prairie types in the past, and defining predominantly agricultural zones today; what existed as short-, mid-, and tallgrass prairie zones now correspond with the rangeland, wheat belt, and corn/soy belts that now cover this landscape. Wetlands are concentrated in the post-glacial northern Great Plains, the Nebraska sandhills, and the seasonal playas of the southern United States. These wetlands provide important breeding, staging, and nesting habitat for migratory birds in the central flyway. This ecoregion was once able to support vast numbers of migrating mammals; now many of the species that once flourished in this ecoregion are vulnerable, rare, threatened, or endangered. Widespread conversion of prairies to agricultural production have made this region is one of the largest, and most productive farming and ranching areas on earth. In addition to farming,

mining and oil/gas extraction are important economic activities (Commission for Environmental Cooperation 1997, 2011).

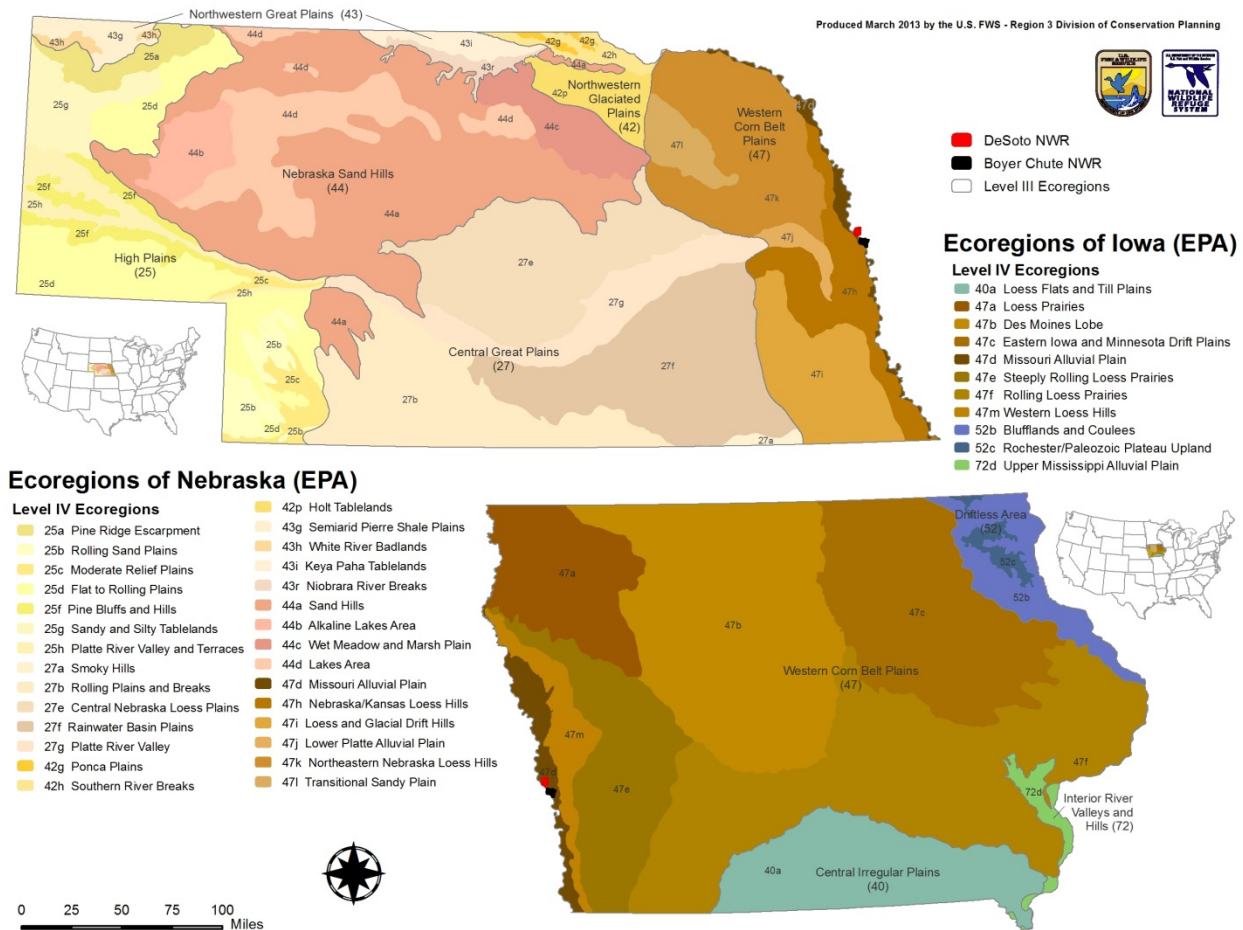
Figure 3-4: Ecological Context, EPA Levels I, II, and III



Level II of the Omernik/EPA hierarchy contains 52 regions based on physiography, wildlife, and land use. They are used to provide a national or sub-continental perspective nested within the Level I regions. The refuges lie in the **Temperate Prairies (Level II) Ecoregion**, (figure 3-4). This ecoregion is composed of irregular plains that were once tallgrass prairie and aspen parkland but are now used predominantly for agriculture. Past glaciations have left their mark on the terrain leaving moraines and numerous small lakes and wetlands. Most areas have calcareous soils; some southern areas have a loess substrate.

Level III of the Omernik/EPA hierarchy for North America has 194 regions, 104 of which are in the continental United States. DeSoto and Boyer Chute Refuges are located within the **Western Corn Belt Plains (Level III) Ecoregion**, which extends from southern Minnesota through central and western Iowa, eastern Nebraska, and the northern corners of Missouri and Kansas (figure 3-4). Hot summers and cold winters typify this severe, mid-latitude, humid continental climate. The land surface is characterized by level or gently rolling glacial till and loess plains covering shales, sandstones, and limestones. Mollisols and Alfisols are the predominant soils. The growing season typically ranges from 140–200 days, and precipitation ranges from 24–32 inches per year. Once dominated by tallgrass prairie and sparse oak-hickory woodlands, the overwhelming majority of the region has now been converted to highly productive soy and corn croplands, with some rangeland areas. Much of the original hydrology has been modified for agriculture, which has contributed to a number of environmental concerns, including surface and ground water contamination from soil erosion, fertilizer and pesticide applications, as well as livestock concentrations (Wiken et al. 2011).

The most site-specific scale in this hierarchy developed to-date is Level IV. The refuges are located in the **Missouri River Alluvial Plain (Level IV) Ecoregion**, which is comprised of the large, wide, alluvial valley of the Missouri River bordered by deep loess bluffs that straddles Nebraska and Iowa (figure 3-5). This region is distinguishable from adjacent Level IV regions because of the consistent, level river plain composed of deep, silty, clayey, and sandy alluvium. Extensive cropland has been developed in this region because of the rich soils but is constrained by flooding and high water tables. The Missouri River once meandered freely across this floodplain-centered region, but it has now been restricted by channelization efforts, levees, and dams (Chapman et al. 2001). The floodplain forest and tallgrass prairie native to this ecoregion have been extensively replaced by agricultural croplands.

Figure 3-5: Ecological Context, EPA Level IV

Missouri River Basin

Both refuges lie entirely within the floodplain of the Missouri River Valley on former river meanders. The lands that comprise Boyer Chute NWR's authorized boundary are predominantly on the west bank of the current Missouri River channel, whereas the majority of DeSoto NWR's lands are on what is now the east bank (figure 3-6). Both refuges hug the western edge of the floodplain, with the south and west boundaries of Boyer Chute NWR formed by the bluffs that delimit the edge of the floodplain. The floodplain valley is approximately 4 miles wide at the southernmost end of Boyer Chute NWR; it expands to about 7 miles in width between the refuges and grows to nearly 12 miles wide at the northern edge of DeSoto NWR. The Missouri River Valley continues to widen north of the refuges.

To understand why DeSoto NWR, Boyer Chute NWR, and other conservation lands in the Missouri River Valley merit protection, one must first understand the history of the larger Missouri River ecosystem. The Missouri River system is a national resource of substantial ecological importance with a long history of human interaction and change. As the longest river in the United States, the Missouri River drains approximately one-sixth of the U.S. land surface. The Missouri River flows 2,341 miles from its headwaters in Montana to the Mississippi River confluence in St. Louis, Missouri (figure 3-7). It drops from an elevation of approximately 14,000 feet above mean sea level (MSL) at its headwaters in Montana, to 405 feet MSL at its

mouth in St. Louis. DeSoto and Boyer Chute Refuges are at approximately 990 feet above MSL. The basin drains an area of 529,350 square miles, overlaps 10 states and one Canadian province, and is home to about 10 million people (MRNRC 1998). The lands and waters of the basin host abundant and diverse resident wildlife and serve as important stopover sites for great numbers of migratory birds in the central flyway.

Broadly speaking, the Missouri River is divided at Sioux City, Iowa—above which semi-natural stretches of the river are punctuated by large hydro-electric dams—and below which the channel has been engineered for navigation. Only three national wildlife refuges have been established on the banks of the channelized third of the river that flows 735 miles between Sioux City, Iowa and St. Louis, Missouri. Two of these, DeSoto NWR and Boyer Chute NWR, are located side-by-side 15 miles north of the Greater Omaha–Council Bluffs Metropolitan Area, or approximately 75 miles downriver from the last large dam. The third is Big Muddy National Fish and Wildlife Refuge, in the state of Missouri. The closest Service landholdings to DeSoto and Boyer Chute Refuges are a part of the Rainwater Wetland Management District (WMD) 75 miles to the west, the Iowa WMD 75 miles to the east, Squaw Creek NWR 100 miles downriver, and Lake Andes NWR Complex 200 miles upriver.

DeSoto and Boyer Chute Refuges provide sanctuary for wildlife in a vast agricultural landscape. The wildlife, habitats, and recreation opportunities associated with this big river system are unique and important. The refuges play a role in a much larger effort to rehabilitate the Missouri River ecosystem and provide opportunities for the public to increase their understanding and appreciation of this ecosystem.

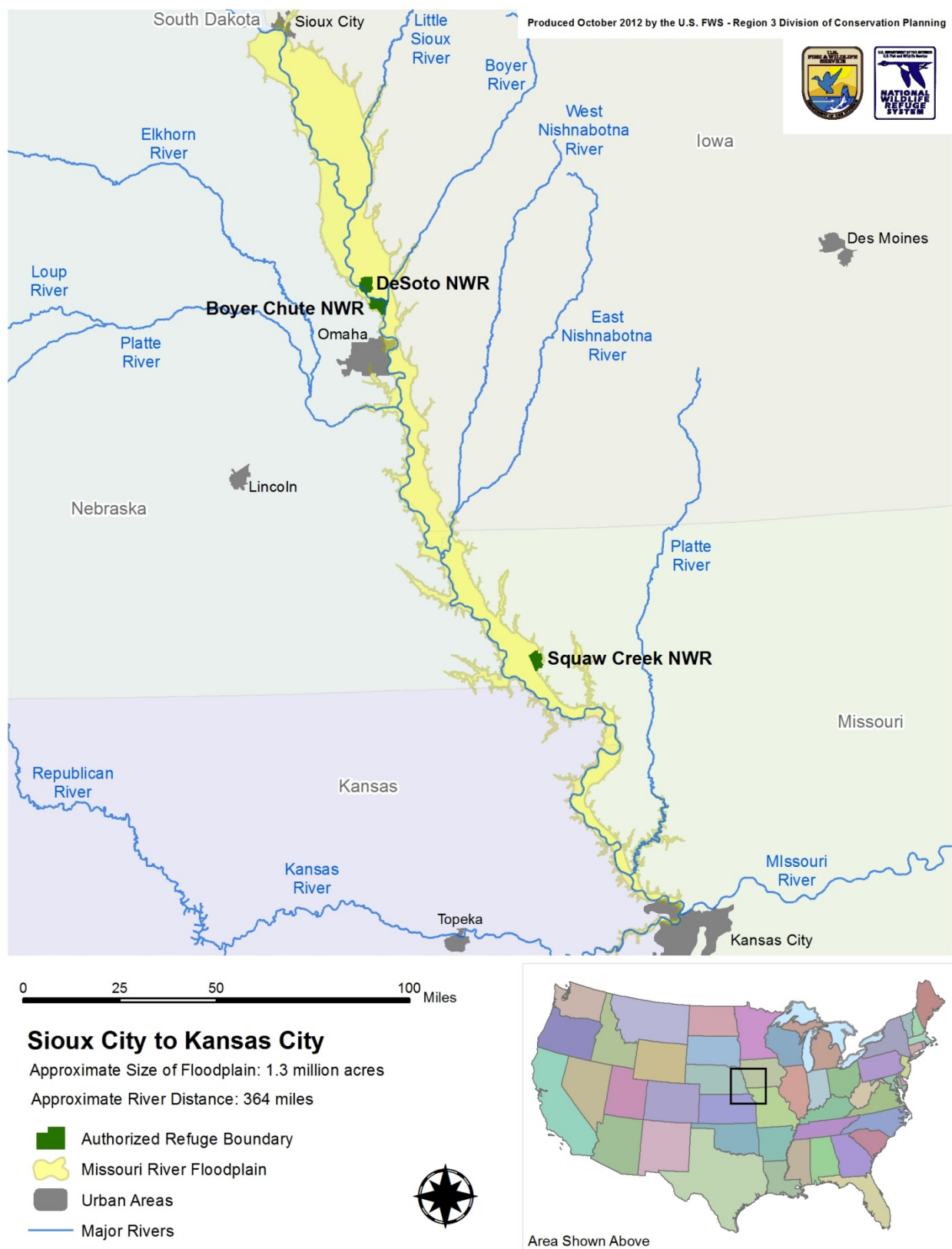
Figure 3-6: Lower Missouri River Floodplain

Figure 3-7: The Missouri River Basin



The history of the Missouri River as a part of the United States began when the Missouri River Basin was acquired from France on April 30, 1803 as a part of the Louisiana Purchase. The first federal exploration of the new territory occurred between 1804 and 1806, led by army officers Meriwether Lewis and William Clark. Subsequent exploration and navigation of the Missouri River included the adventures of John J. Audubon, Prince Maximilian, John C. Fremont, and Major Stephen Long. The first steamboat traveled the river in 1819, and the first federal improvement of the river began in 1824 with the removal of snags. Between 1820 and 1837, natural meandering and migration of the river in the area that now contains the present-day refuges moved the main channel three miles eastward from the Fort Calhoun bluffs near Fort Atkinson to its present location. Steamboat travel increased on the river and reached its peak in the 1880s but was quickly superseded by trains in the 1890s. A series of legislative acts followed, greatly changing the system dynamics and use of the Missouri River. The natural processes of this river system and the resulting landscape patterns changed dramatically over the 20th century as a result of two major anthropogenic factors: dam construction on the upper two-thirds of the Missouri River, and channelization on the lower 735 river miles below Sioux City, Iowa. The legislation with the greatest impacts on the hydrology and natural resources of the system include the following acts (USACE 2006):

The Rivers and Harbors Act of 1912: Authorized the Corps to create a six-foot navigation channel from St. Louis to Kansas City, Missouri.

The Flood Control Act of 1944: Authorized the development of the main stem of the Missouri River by the Corps according to the “Pick-Sloan Plan.” This plan called for a complete treatment of the river for flood control, navigation improvement, hydroelectric power generation, and the provision of water for irrigation, municipal use, and industry. Although not implemented in its entirety, it led to the creation of hundreds of miles of levees south of Sioux City, Iowa and six main stem dams above Sioux City. The dam construction era started in 1946 with Garrison Dam in North Dakota (excluding the Fort Peck Dam, which was completed in 1937, prior to the “Pick-Sloan Plan”) and was complete by the mid-1960s. The southernmost main stem dam, Gavins Point, located west of Yankton, South Dakota was completed in January of 1957.

The Rivers and Harbors Act of 1945: Authorized the Corps to secure a 9-foot deep by 300-foot wide navigation channel along the 735 river miles from St. Louis, Missouri, to Sioux City, Iowa, as a part of the “Missouri River Bank Stabilization and Navigation Project (BSNP).” This navigation channel was officially completed in 1981 and has been maintained to the present day.

Before the 20th century, the Missouri River flooded annually on a cycle that included a March/April rise caused by rain and melting snow on the Great Plains and then a higher June flood pulse when the Missouri River filled with runoff from Rocky Mountain snowmelt. In summer and fall the river discharge declined, reaching a low point in late December. Fall rains sometimes prompted a slight rise in the river during October or November. This annual cycle of rising and falling water levels, and the associated sediment flow and deposition within the floodplain, once created some of the Nation's most outstanding wetland and bottomland habitats.

In accordance with the “Pick-Sloan Plan,” six large dams were constructed on the Missouri River reaches in South Dakota, North Dakota, and Montana. This greatly changed both the flow regime of the river and the quantity of sediment transported to downstream reaches (National Research Council Panel 2002). Numerous Rivers and Harbors Acts have kept the Corps

working to create and maintain a channel that meets minimum navigation requirements for barge traffic below Sioux City, Iowa. The dams and channelization have brought with them socio-economic benefits such as recreation, power generation, irrigation, transportation, and water storage—but at a high cost to the natural resources of the ecosystem. In fact, “American Rivers” designated the Missouri River one of the most endangered river systems in the United States in 1997. On the landscape, the river’s channelization prompted the construction of levees and dikes, the armoring and stabilization of the river’s banks, the dredging of the navigation zones, and the confinement of the river to a single, stable channel. On the channelized stretches of the river the once broad river floodplain of 1.9 million acres with its mosaic of forests, shrublands, grasslands, and wetlands was reduced to a narrow, highly engineered, incised river course surrounded by agriculture, residential development, and industry. The channelization process eliminated 72 miles of river and nearly 354,000 acres of natural habitats, including the sandbar nesting areas required by bird species such as the federally endangered Piping Plover and Interior Least Tern. Channelization also virtually eliminated the backwater spawning habitat required for fish species such as the federally endangered pallid sturgeon. Additionally, these changes eliminated the cottonwood regeneration cycles that provide successional riparian forest stages important to raptors and passerine birds, and the backwater wetlands that provide food and resting areas for migratory birds in the central flyway (National Research Council Panel 2002). The Missouri River ecosystem currently hosts at least 60 mammals species, 301 bird species, 52 reptile and amphibian species, and 156 fish species (USACE 2006).

Today in terms of river miles, the Missouri River is 35 percent impounded, 32 percent channelized, and 33 percent unchannelized in inter-reservoir reaches (MRNRC 1998). Over the entire course of the Missouri River, forest and shrubland vegetation has declined by 47 percent since the late 1800s (Dixon et al. 2010). This same study analyzed the river reaches just south of Boyer Chute NWR (from Plattsmouth, Nebraska to Kansas City, Missouri) and found 70 percent of the land within a three-mile buffer of the river now in agricultural cropland, 9 percent forest, 7 percent grassland, 4 percent urban, and found that sandbar habitat had been nearly eliminated (Dixon et al. 2010).

Land Cover: Past and Present

Prior to European settlement the Missouri River meandered as a braided, dynamic series of channels, sandbars, backwaters, and sloughs across a wide floodplain. Even in the years between 1820 and 1890 the river channel migrated 5 miles eastward from the Fort Calhoun, Nebraska bluffs to its present location (USACE 1995). It is likely that the refuges were once covered by a shifting mosaic of bottomland forests, prairies, wetlands, and successional shrublands. The continual migration of the river channel would have removed the forest cover and periodically reset the succession cycle. Willows colonized bare islands and sandbars, to be succeeded by cottonwoods, which were later replaced by silver maple, box elder, red mulberry, and American elm.

Beginning in the late 1800s, lands in the river bottom were cleared for agriculture. This process increased in the 1940s and 1950s and is now characterized by agricultural land, altered hydrology, and scattered remnants of natural cover types.

Some of the earliest accounts of the vegetation and landscape in the area of the refuges comes from the journal entries of historical figures such as Captain Meriwether Lewis, William Clark, the Corps of Discovery, and surveyor William N. Byers.

The following edited excerpts describe the landscape and vegetation Lewis and Clark encountered from the Council Bluff and surrounding area (adapted from Lewis and Clark et al. 2002).

July 30, 1804

We proceeded on to a clear open prairie on the left shore, on a rise of about 70 feet higher than the bottom, which is also a prairie of high grass, plum bush, grape vine, and hazel. Both levels form bluffs to the river. The lower prairie is situated above the high water mark at the foot of the rising ground below the high bluff. We came to a small grove of timber at the foot of the rising ground between those two prairies.

Captain Lewis and I went up on the high bank and walked a short distance in the high prairie and observed the most beautiful prospects imaginable. This prairie is covered with grass 10 or 12 inches in height, soil of good quality, and the land rises another 80 or 90 feet about $\frac{1}{2}$ a mile back and is a one continual plain as far as can be seen. From the bluff on the second rise immediately above our camp is visible a beautiful bottom interspersed with groves of timber. The river may be seen for a great distance both above and below meandering through the plains between two ranges of high land (70 to 300 feet), which appear to be from 4 to 20 miles apart, each bend of the river forming a point which contains tall timber, principally willow, cottonwood, some mulberry, elm, sycamore, and ash. The groves contain walnut, Kentucky coffee tree, and oak and in addition, hickory and linden.

August 1, 1804

The prairie, which is situated below our camp is above the high water level and rich, covered with grass from 5 to 8 feet high interspersed with copse of hazel, plums, currents (like those of the U.S.) raspberries, and grapes of different kinds, also producing a variety of plants and flowers not common in the United States.

The prairies produce the black currant common in the U.S., the goose berry common in the U.S., and two kinds of honeysuckle, one which grows to a kind of shrub common about Harrodsburg in Kentucky (coralberry/Indian currant/buck brush), the other is not large or tall and bears a flower in clusters short and of a light pink color, the leaves differ from any of the other kind in as much as the leaves are distinct and do not surround the stalk as all the other does (wolfberry/western snowberry).

August 4, 1804

Proceeded on, passed through between snags, which was quit across the river the channel confined within 200 yards, one side a sand point, the other a bend, the banks washing away and trees falling in constantly for 1 mile.

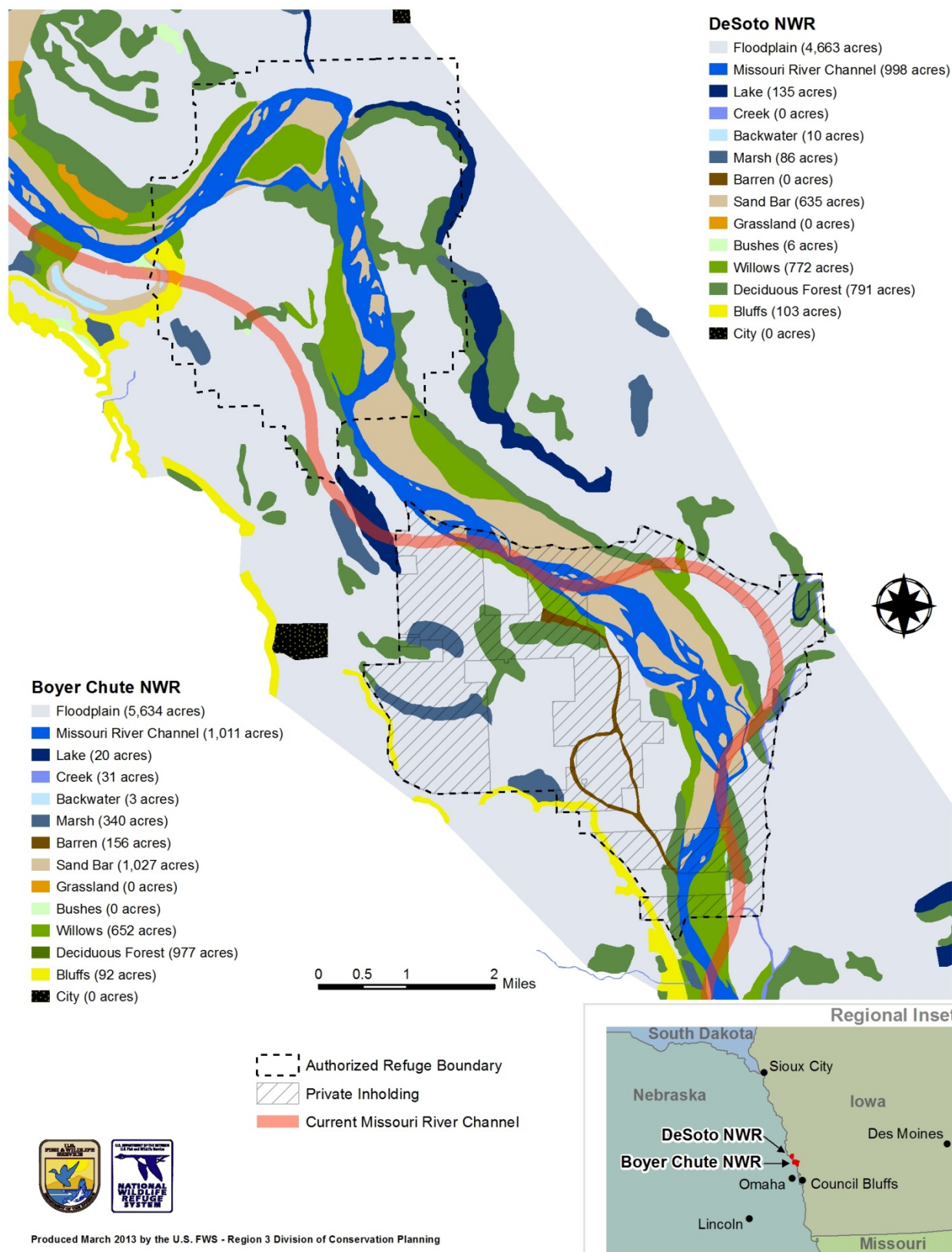
In 1856 William N. Byers, the first deputy surveyor of the Nebraska Territory, also gave a description of the Cabanne Post area six miles south of Fort Atkinson (just north of present-day Dodge Park) near Florence, Nebraska (Jensen 1998).

“Mostly level prairie-rolling . . . soil first and second rate clay and vegetable loam. The remainder of the township is mostly hilly & very broken, soil second rate – clayey. A good deal of this land is timbered with oak, walnut, elm, linn, ironwood, ash and hickory with a dense under growth of some wild plum, hazel, grape vines, & briars. Near the

river the land is level and wet, frequently swampy all subject to overflow. The growth is willows, cottonwood, grape vines, weeds and soil is first to third rate.”

Congress created the Missouri River Commission in 1884 and charged the five-member group with the development of the Missouri River Basin for river commerce, a task they undertook until the program ended in 1902. As a part of their charge, the Commission conducted an extensive surveying effort of the Missouri River in 1879 and 1894, including land cover and cultural features. Within this historical survey archive, the land that includes DeSoto and Boyer Chute Refuges is contained in the third of nine index maps, on plate XXIV. This plate shows a wider river channel, largely uninterrupted gallery forest of cottonwood and willow, small patches and strips of woodlands and forests scattered throughout the river terrace, regular sandbars and sand islands throughout the primary river channel, and a number of floodplain drainages and off-river wetland/open water areas. At the time of the survey, the main channel of the Missouri River coincided with the path of the existing Boyer Chute, and the DeSoto Bend oxbow just upstream and was not yet fully developed (figure 3-8).

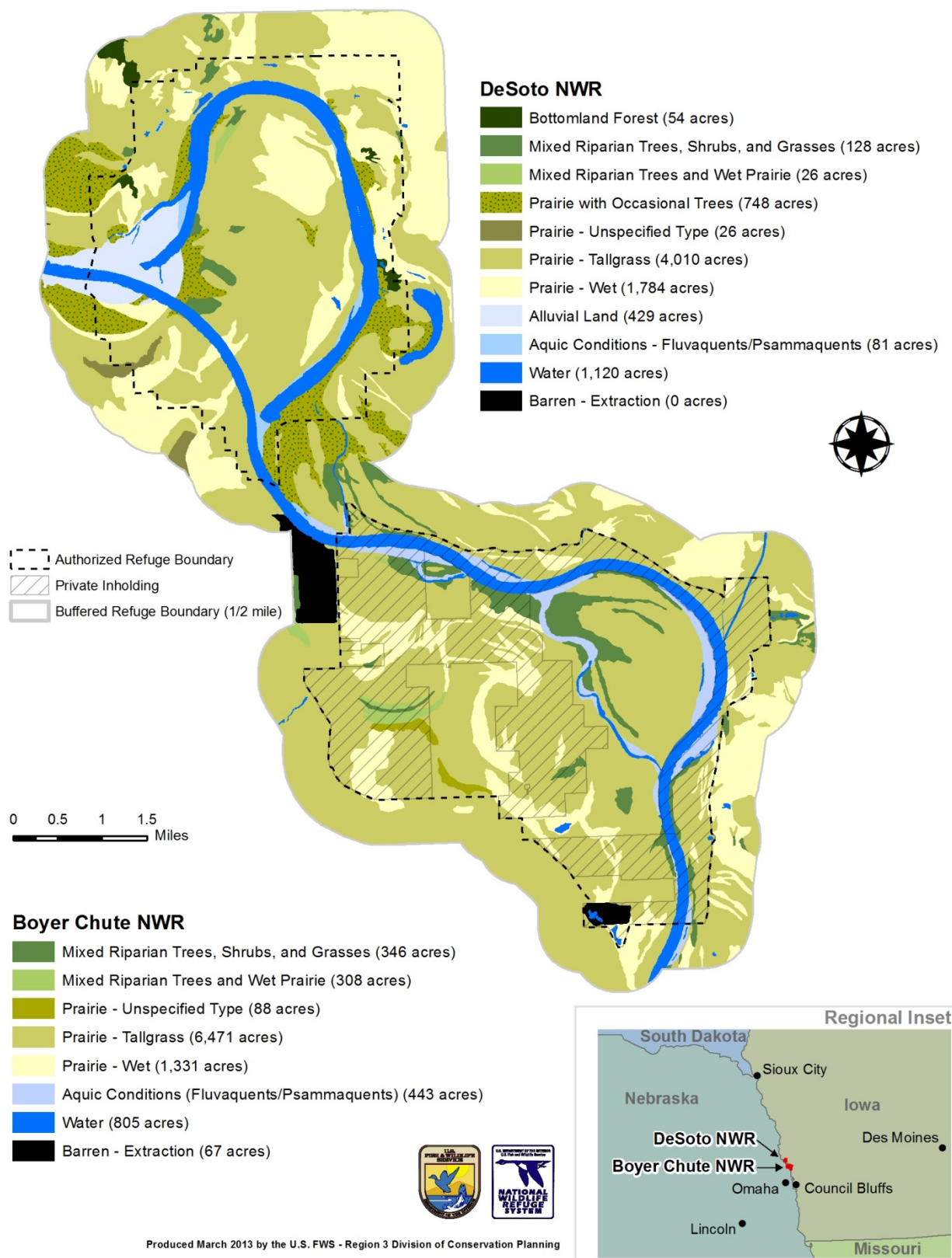
Figure 3-8: Historic Land Cover (1894)



In addition to historic descriptions of the Missouri River landscape, information contained in soil surveys can be used to understand vegetation capacity in an area. The soils in a given locality are the result of the parent rock material, organisms, climate, and relief as they interact over time. These factors and the resulting soils determine, in part, which vegetation communities take hold in a geographic locale. Soil survey data collected over the past century by the U.S. Department of Agriculture's (USDA's) Natural Resource Conservation Service (NRCS) includes written descriptions of native vegetation, which can be linked to the primary soil unit and mapped. Figure 3-9 uses data from the Soil Survey Geographic database to display the potential natural vegetation at DeSoto and Boyer Chute Refuges.

Potential vegetation on DeSoto NWR based on soil data indicate that nearly half (48 percent) of the total refuge acreage is suited to mesic tallgrass prairie with little or no woody component. Common species include big bluestem, little bluestem, Indiangrass, switchgrass, western wheatgrass, sideoats grama, and others. Another 21 percent is wet prairie containing additional species such as Kentucky bluegrass, blue grama, and sedges. Just over 10 percent is suited to sparse cottonwood, willows, and sandburs. Only 1 percent is considered good forest land that might include oak species. The remaining areas of the refuge are either in an open water status (13 percent) or considered a undifferentiated bottomland soil with aquatic conditions (6 percent).

For Boyer Chute NWR, the interpretation of vegetation based on soils indicates that the majority (77 percent) of the refuge's soils are typically associated with prairie grass species absent any woody vegetation. Most of these prairie areas (82 percent) include a typical mix of tallgrass prairie species, while the remainder are considered wet prairies. Approximately 8 percent of the soils within the authorized boundary are suitable for a mixture of native grasses, sandburs, willows, and cottonwoods. According to this dataset, the remainder of Boyer Chute NWR (approximately 15 percent) is comprised of open water, saturated wetland soils, or contains gravel extraction operations.

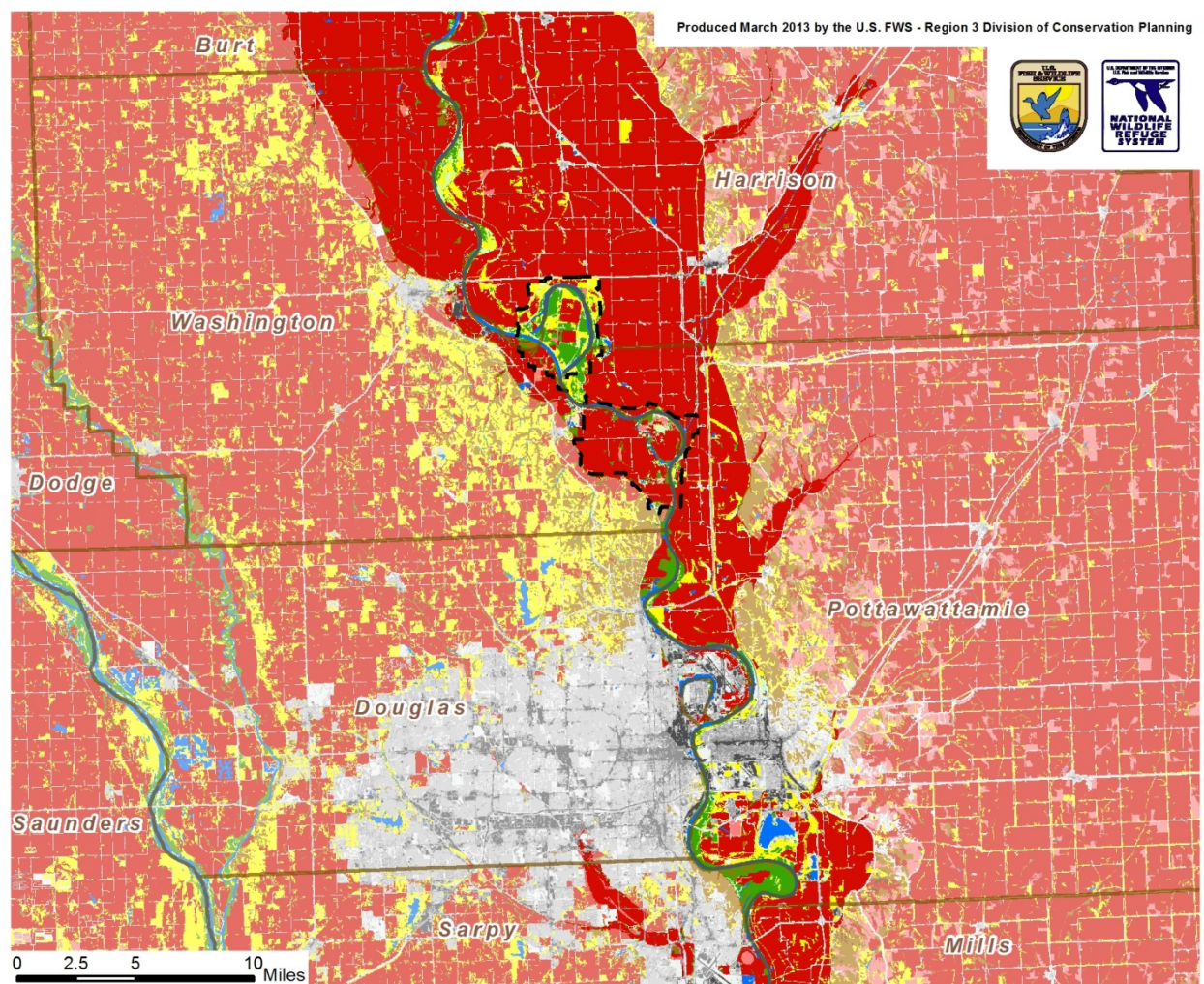
Figure 3-9: Potential Vegetation Based on Soils

In 2010 the Corps completed a study comparing the composition, extent, and distribution of vegetation in the basin in 1892, the mid-1950s, and 2006. The study sampled 13 segments of the river, and only one of these occurred in the unchannelized section of the river below Sioux City, Iowa. Although segment 13 from Plattsmouth, Nebraska to Kansas City, Missouri (river miles 365.5 to 595.5) does not include the refuges, the development paradigm and land cover information are similar. The study indicates that in 2010, 70 percent of the floodplain was agricultural cropland, 9 percent forest, 7 percent grassland, and 4 percent urban. Most of the transition to agriculture and the decline in floodplain forests occurred before the mid-1950s, whereas much of the loss of shrubland (75 percent) and grassland (49 percent) occurred after the mid-1950s (Dixon et al. 2010).

A 21-class national land cover dataset developed by the Multi-resolution Land Characteristics Consortium using 2001 Landsat imagery was used to understand the geographic distribution of land use (U.S. Geological Survey [USGS] 2003). This imagery is medium resolution data with 30-meter pixels, so features less than 100 feet are generalized. However, across large areas this imagery is useful for understanding which parts of the landscape have retained natural cover types and which have been developed for human uses. Figure 3-10 shows the resulting imagery and depicts land cover emphasizing lands in the Missouri River floodplain. Cropland, pasture, and grassland now cover the vast majority of the region. The cities of Omaha and Blair in Nebraska and Council Bluffs and Missouri Valley in Iowa stand out due to their developed cover types. Forests, wetlands, and open water are all relatively minor components. The outline of the floodplain is accentuated in the figure by a white transparent mask over non-floodplain areas, and can also be discerned on the landscape by the abrupt change from the flat agriculture lands in the river valley to the mixed forest/grassland cover types on the bluffs.

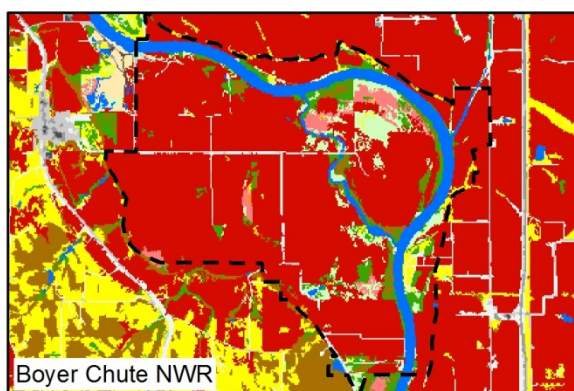
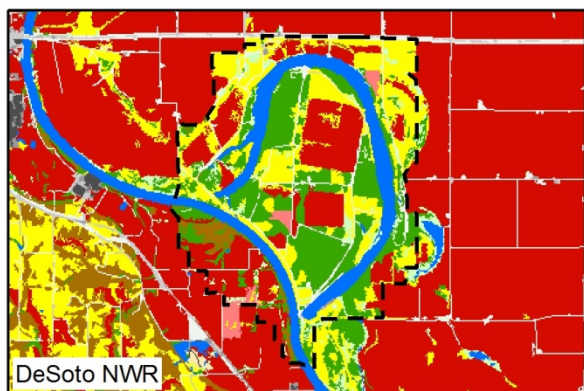
Close-ups of DeSoto and Boyer Chute Refuges are included in figure 3-10 to provide additional detail for the refuges. The limitation to using this data at a fine scale is fairly clear in the case of Boyer Chute NWR. The data does not accurately distinguish grassland areas of the refuge from surrounding cultivated cropland; some restored wetlands are also indiscernible. It does, however, portray the extent of the riparian forests and woodlands, show the limited coverage of successional shrublands, and illustrate the intensity of agricultural development. On DeSoto NWR the grasslands and forests are discernible, but few wetlands are visible, and much of the West Side Unit is shown as agriculture. Finer resolution and more accurate cover type assessment of lands owned and managed by the Service within the authorized refuge boundaries can be found in the Habitat section of this chapter.

Figure 3-10: National Land Cover Data in the Area of the Refuges



National Land Cover Data (2001) - Focus on the Missouri River Floodplain

- | | | | |
|-----------------------------|-------------------|---------------------|----------------------------|
| Open Water | Barren Land | Grassland | Authorized Refuge Boundary |
| Developed, Open Space | Deciduous Forest | Pasture/Hay | County Boundary |
| Developed, Low Intensity | Coniferous Forest | Cultivated Cropland | |
| Developed, Medium Intensity | Mixed Forest | Woody Wetland | |
| Developed, High Intensity | Scrub/Shrub | Herbaceous Wetland | |



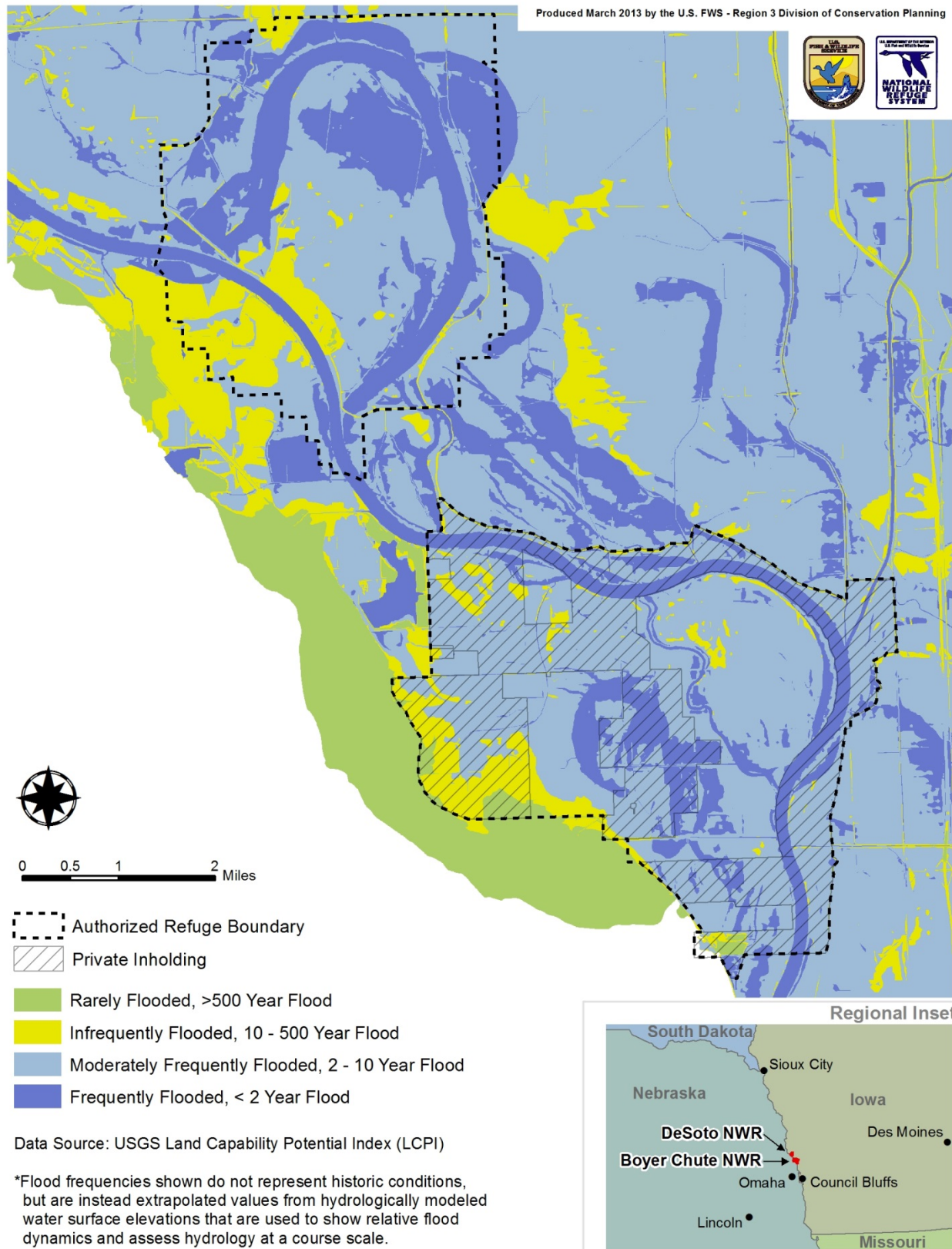
Physical Environment

The Physical Environment section describes the abiotic resources associated with the refuges including topography, geology, climate, soils, water, and air. These underlying, non-living components of an ecosystem provide the stage on which wildlife, habitat, and people interact.

Topography and Geology

Contained entirely within the Missouri River floodplain, the land surface of the two refuges is relatively flat, and much of the refuge lands are within the 10-year floodplain level (figure 3-11). Elevation on DeSoto NWR ranges from 987 feet (301.1 meters) above MSL in low areas with ponds and in areas adjacent to DeSoto Lake, to 1,014 feet (309.2 meters) MSL on levees and roads. In Boyer Chute NWR's authorized boundary, elevations range from 976 feet (297.6 meters) MSL in lower wetland areas and drainage ditches, to 1,092 feet (332.9 meters) MSL on the small south-central points that rise onto the bluff (Jacobson et al. 2007). The elevation data show depressional areas of both refuges such as the wetlands on the outer rim of DeSoto Lake and Boyer Chute NWR's Mud Lake and Horseshoe wetland complexes.

The bedrock in the area of the refuges is made up of sedimentary deposits from the Late Carboniferous system, Pennsylvanian series, and Missourian stage sedimentary deposits. On the Nebraska side of the river, the bedrock is classified into the Kansas City group (Burchett 1959, 1986). This geologic formation underlies approximately 19 percent of Washington County and is located primarily in the southeast corner of the county. The group is made up of limestone and shale deposits and has an approximate maximum thickness of 200 feet. The limestones range in color from dark to light gray and brownish gray, and range in structure from very thin beds to massive, argillaceous and fossiliferous deposits with thin layers of chert, pyrite, and mica near the base. The color of the shales varies from shades of gray to greenish gray, red, and black and may be slightly sandy, calcareous, carbonaceous, fissile, and fossiliferous. On the Iowa side of the river, the bedrock underlying the refuges is considered to be part of the Bronson group (limestone, shale) and the Upper Cherokee group (shale, sandstone, limestone) both occurring in south-central and southeast Iowa (Witzke et al. 2010). In the Bronson group, sandstones and coals are uncommon, while marine fossils are prevalent. Ancient oceans expanded (producing limestone beds) and receded (producing shale beds) in cycles producing numerous layers of these sedimentary deposits. The Cherokee group contains alternating deposits of shale, clay, siltstone, lesser sandstone, thick coal beds, and minor but persistent limestone beds.

Figure 3-11: Extrapolated Flood Frequencies*

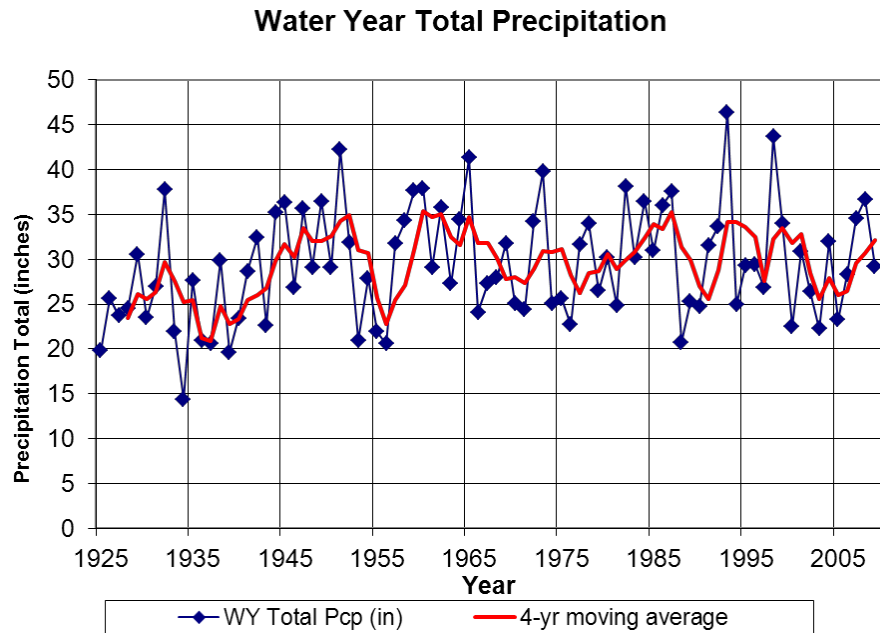
Climate

The refuges reside in a zone considered to have a humid continental climate, typical over large areas of land masses in the temperate regions of the mid-latitudes. The climate is typified by a zone of conflict between polar air masses pushing southward and tropical air masses pushing northward. Humid continental climates are marked by variable weather patterns and a large seasonal temperature variation. Summers are often warm and humid with frequent thunderstorms, and winters can be very cold with frequent snowfall and persistent snow cover.

Average annual precipitation is 26.5 inches. Rainfall during the warm season is 19.2 inches or 72 percent of total rainfall. The frost-free season generally falls between April 28 and October 11, and there is an average of 136 days per year below 32 °F. Annual average temperature is 49.3 °F. Summer average temperature is 75 °F with an average daily maximum temperature of 87 °F. Average winter temperature is 25 °F. Temperature extremes range from 113 °F to -28 °F. Average annual relative humidity is 68 percent. Evaporation from a Class A evaporation pan in Lincoln, NE (~70 miles southwest) averages 60 inches per year, 74 percent of which occurs between May and October. Sunshine occurs 64 percent of the total possible daylight hours. Average wind speed is 11 mph, and wind direction is predominantly north by northwest. Strongest winds occur in the spring, with area maximums at 109 mph.

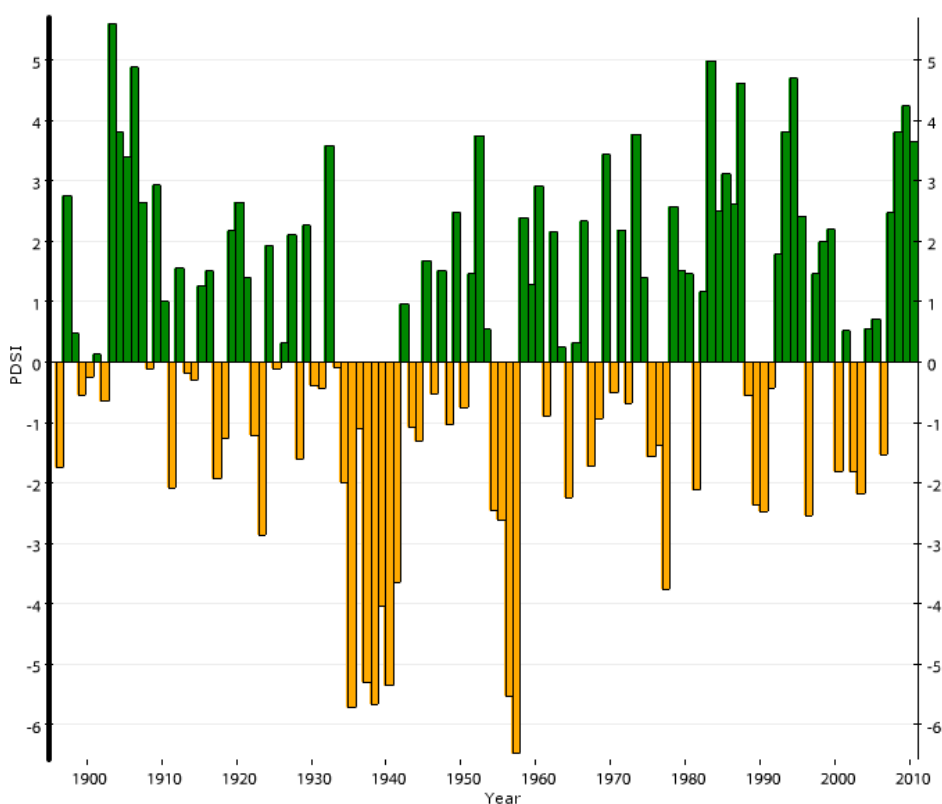
Precipitation data for the refuges is collected using the Parameter-elevation Regressions on Independent Slopes Model (PRISM), which uses point precipitation measurements, elevation data, and other spatial data sets to derive a continuous climatic data layer for the United States. PRISM data for the area of the refuges through 2009 indicates relatively consistent long-term trends (figure 3-12). Annual precipitation totals have roughly followed a 6–8 year cycle from wet to dry over the past 85 years, with the highest precipitation totals in 1993 and 2001 and the lowest totals in 1934 and 1939. On average, peak precipitation occurs during May and June, although monthly totals in certain years have exceeded 8 inches during April, May, June, July, and August over the last 34 years. After peak precipitation in early summer, the remainder of the year through December experiences a gradual decrease in precipitation (PRISM 2011).

Figure 3-12: Annual Precipitation in the Area of the Refuges (1925-2009)



Insight can be gained into the periodicity of annual wet and dry cycles over the long-term using the Palmer Drought Severity Index (PDSI). This index represents moisture conditions based on monthly temperature and precipitation data as well as the soil's water holding capacity at a location (Palmer 1965). A PDSI score ranging from 0.5 to -0.5 is within a normal range of variation. However, the scale extends to scores over 4 or under -4, which indicate wet and dry extremes respectively. The refuges fall into U.S. Climatological Division 25-06, East Central Nebraska, and 13-04, West Central Iowa. The annual PDSI calculations starting in the year 1895 are illustrated in figure 3-13 (NOAA, 2011). In general, dry weather runs in 10-year cycles on the prairie and severe drought in 20-year cycles (Zohrer 2006).

Figure 3-13: Palmer Drought Severity Index (PDSI) for the Refuges



Predicted Climate Change

The increase of carbon dioxide and other greenhouse gasses in the earth's atmosphere resulting from the burning of fossil fuels has been linked to the gradual rise in surface temperature, commonly referred to as global warming. In addition to rising air and water temperatures, there are a number of other effects associated with a changing global climate including intense heat waves; shrinking permafrost zones, winter snow cover, sea ice, and glaciers; ocean acidification; changing precipitation patterns and associated effects on water availability (drought, flooding); a general decrease in open water areas and soil moisture levels; increasing fire severity—intensity, extent, and frequency; migrating plant productivity and agricultural zones; habitat shifts at all scales from ecosystems and biomes to specific sites; dislocation of species as habitat ranges experience shifts, reductions, and/or expansions; increasing issues with plant and animal pathogens and pests—both exotic and endemic; and more.

Several examples of potential climate change impacts on wildlife have been identified. The following are just a few issues that may require further attention as climate change progresses (Green et al. 2000; Schneider and Root 2002).

- Habitat available for coldwater fish, such as trout and salmon, in lakes and streams could be reduced.
- Forest distributions and compositions may change, with some species shifting their range northward, higher in altitude, or being replaced as other tree species move in to take their place.
- Ducks and other waterfowl could lose breeding habitat due to more severe and frequent drought events.
- Changes in the seasonality of life cycle stages such as migration and nesting could put some animals out of sync with the life cycles of their prey species.
- Herpetofauna may have trouble meeting the moisture conditions required for reproduction and respiration in their local habitats, and they may have difficulty dispersing through inhospitable environments.
- Animal and plant species, including invasive or pest species, shift their ranges north in latitude as winter climatic conditions become more moderate, and the warm seasons lengthen.

The resiliency of natural systems is tied to biodiversity. The diversity of organisms may be one of our greatest weapons against climate change; each organism will react and respond differently (Scott et al. 2009). Biological communities will not shift or remain intact because of the variability in each organism's sensitivity to climate change, size, mobility, lifespan, and the availability of food, shelter, and other resources it requires (Karl, Melillo, and Peterson 2009). In response, we must assess and provide for increased representation and redundancy across seasonal, geographic, and ecologic thresholds. Initial prioritization of action should be directed to those species for which climate change poses the greatest threat, namely those with limited distributions, highly specific ecological niches, and/or limited mobility. These include plants and animals that are highly temperature-sensitive or are confined to high altitudes or polar areas (Scott et al. 2009).

The DOI issued Secretarial Order Number 3226 in January 2001 requiring all federal agencies with land management responsibilities within the DOI to consider potential climate change impacts as part of long-range planning efforts. This report was amended in January of 2009 to further expand and define bureau climate change, carbon sequestration, and energy conservation responsibilities.

A climate change study by Magness et al. (2011) on the NWRS gave DeSoto and Boyer Chute Refuges a low exposure rating estimating a 0.011 °C (DeSoto NWR) and 0.0019 °C (Boyer Chute NWR) rise in temperature per year based on historic rates of change between 1950 and 2006. The paper also indicated that DeSoto and Boyer Chute Refuges have a low sensitivity to climate change because they are not near the edges of the Temperate Grassland, Savanna, and Shrubland biome (Olson et al. 2001) and contain little critical habitat for threatened and endangered species. They also are considered to have a low adaptive capacity, because they contain little elevation change, a small latitude range, have very little of their watersheds permanently protected, and have a high watershed road density. Based on these conditions, the refuges' resilience and vulnerability to climate change were considered moderate.

Mitigation and Adaptation

According to the 2009 report, "Global Climate Change Impacts in the United States" there are two broad categories of responses to global climate change: mitigation and adaptation. Mitigation refers to actions taken before change occurs—efforts to reduce climate change as we move forward from the present and curb its effects before they increase in severity or reach critical thresholds. Adaptation measures can be applied both before (anticipatory) and after (reactive) climate changes have occurred and are actions aimed at avoiding or coping with harmful impacts and taking advantage of new opportunities presented by new climatic and environmental conditions (Karl, Melillo, and Peterson 2009; FWS 2009b).

There are many ways that refuges currently help mitigate the onset of climate change including increasing ecological resiliency and reducing environmental stressors. Refuges will also play a critical role in adaptation strategies in the future. Table 3-1 (next page) lists a number of examples in which refuges contribute to climate change mitigation and adaptation.

Table 3-1: Refuge Contributions to Climate Change Mitigation and Adaptation

Challenge Associated with Climate Change	Refuge Mitigation/Adaptation Potential
Rising ambient air temperatures caused by increasing greenhouse gasses	Sequester carbon in vegetative biomass and serve as “sinks” for greenhouse gasses. Move towards agency-wide carbon neutrality. Contribute to renewable energy development efforts.
Increased water temperatures from solar radiation	Manage for forest canopy adjacent to waterways.
Changing precipitation frequency and intensity leading to flooding or drought	Provide floodplains as protection against surges and reservoirs to buffer periods of drought. Enhance wetland and bottomland habitats for groundwater recharge and filtration of waterborne pollutants (fertilizers, pesticides, excessive sediment).
Disrupted ecological processes that sustain basic life support functions	Tailor refuge management to protect or, if necessary, restore essential ecological processes and services such as pollination, seed dispersal, soil formation and stabilization, primary production, photosynthesis, and air, water, and nutrient cycling.
Rising sea levels and increasing tropical storm intensities	Buffer coastal areas with natural cover types to minimize socioeconomic losses as waters advance inland and storms pass from the oceans onto land.
Changes in wildfire frequency and intensity	Use controlled burn programs to reduce fuel loads on the refuge, and provide trained fire professionals to off-refuge areas in need.
Loss of species and their required habitats	Protect lands with a diversity of habitats for declining species and spearhead efforts to protect species of concern. Protect genetic diversity and serve as a source area for repopulation efforts.
Geographical shifts in biomes and species' ranges	Serve as ecological hubs in a greater network of conservation lands allowing for species migration.
Altered species phenologies and interactions (competition, predations, parasitism, and disease)	Provide natural, minimally-altered settings for the evolutionary process and wildlife interaction.
Advancement of exotic invasives, pest species, pathogens, and contaminants	Control and eradicate invasives on refuge lands, providing habitat for endemic species. Direct efforts to reduce species susceptibility to disease, pathogens, pests, and contaminants.
Limited scientific understanding of long-term climate change implications	Develop inventory and monitoring sites for ecological and climatic variables. Conduct directed research to address climate change topics. Continue to build scientific capacity and expertise in the agency. Foster collaboration in the conservation science community.
General lack of knowledge and understanding regarding climate change	Increase climate change education, training, and outreach both within the agency and to external audiences. Tailor environmental education and interpretation programs to include climate change topics. Provide conservation support to partners. Collaborate and share information and resources, both internally and externally.
Inadequate legal, regulatory, and policy framework to address climate change	Assist in the review and revision of environmental laws, regulations, policies, guidance, and protocols to increase incentives and eliminate barriers to conservation actions addressing climate change. Revise grant programs to direct funding to projects that address climate change.

Soils

Soils of the Missouri River floodplain are highly variable, ranging from light sandy soils that drain quickly to dense clays that are nearly impermeable to water. The soils of both refuges were recently formed from coarse to fine-textured alluvium (river-deposited sediments). The variation in local soil characteristics are a consequence of historic annual flood cycles and the continual migration of the pre-channelized river across the floodplain. The mouth of the Boyer River meets the Missouri River at the eastern edge of Boyer Chute NWR resulting in the accumulation of sediments and the formation of Boyer Island. Overall, the soils on both refuges are generally low-to-moderate in organic matter and are calcareous—ranging from neutral to moderate alkalinity. Available phosphorus is generally low, while available potassium is generally high. Permeability ranges from rapid to slow, depending on site-specific alluvium deposition history. Sand, loam, and clay layers vary over short distances; in some areas clays and loams form the upper layer of the soil and are underlain by fine sand and sandy loams. Other areas on the refuges contain soils consisting entirely of clay or entirely of sand. Still other areas have sandy loams over clay or clay loams.

Figures 4-14 and 4-15 provide additional detail on the extent and distribution of soils across the authorized refuge boundaries. The soil types with the greatest extent within the authorized boundaries for both refuges are either in the Albaton-Haynie-Sarpy association or are in the Onawa series. They are nearly level, except for short slopes along old channels and drainageways, and on a few ridges in the sandy areas. The three soils in the association are deep, nearly level, formed in alluvial bottomlands and differ primarily in their sediment type and the resulting drainage; Albaton is clayey and poorly-drained, Haynie is silty and well-drained, and Sarpy is sandy and excessively-drained. Onawa, the other soil series on the refuges with a large area of coverage, is very deep, somewhat poorly-drained alluvial soil with a layer of clay over loam (USDA NRCS 2011).

A number of soils have moderate (500–1,000 acres) and minor (200–500 acres) coverage on the refuges. Included are Cooper, Modale, and Moville (silt underlain by clay and somewhat poorly-drained); Grable (silt underlain by sand and well-drained); Sarpy and Wathena (sandy and moderately well-drained to excessively-drained); Onawet (silty clay loams and very poorly-drained); Forney and Luton (clay and poorly-drained); Percival (clay underlain by sand and somewhat poorly-drained); Omadi (loam and moderately well-drained); and Salix (a mix of silty clay loam and moderately well-drained) (USDA NRCS 2011).

The drainage classes associated with refuges' soil types are illustrated in figure 3-16. This information, in combination with the flood frequency map (figure 3-11), can be used to identify the wetland and upland restoration potential of sites across the refuges. On DeSoto NWR concentrations of well-drained soils form a band running diagonally northeast to southwest in the center of the refuge. These correspond with areas that are a part of the oxbow bend of the river and the island formed within the oxbow. Areas north of DeSoto Lake, and on the central portion of the West Side Unit have increased water retention and poorer drainage. The drainage on Boyer Chute NWR is a diffuse mosaic, with a higher concentration of well-drained soils in the east half (including Boyer Island) and large patches of poorly-drained soils that are remnants of previous Missouri River channel scars. The bluffs are evident on the refuge's western boundary as a solid band of well-drained soils.

Figure 3-14: Soil Types, DeSoto NWR

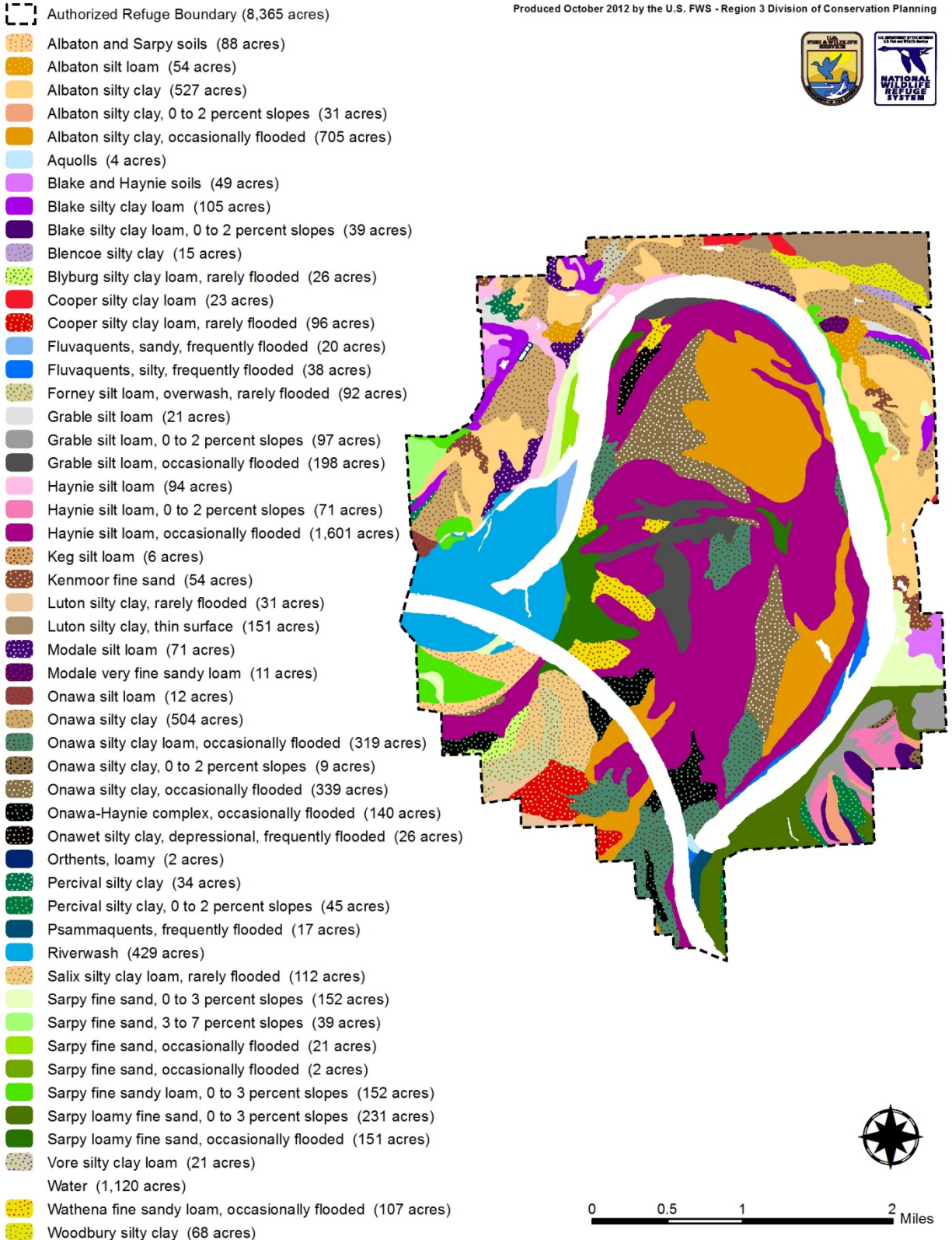


Figure 3-15: Soil Types, Boyer Chute NWR

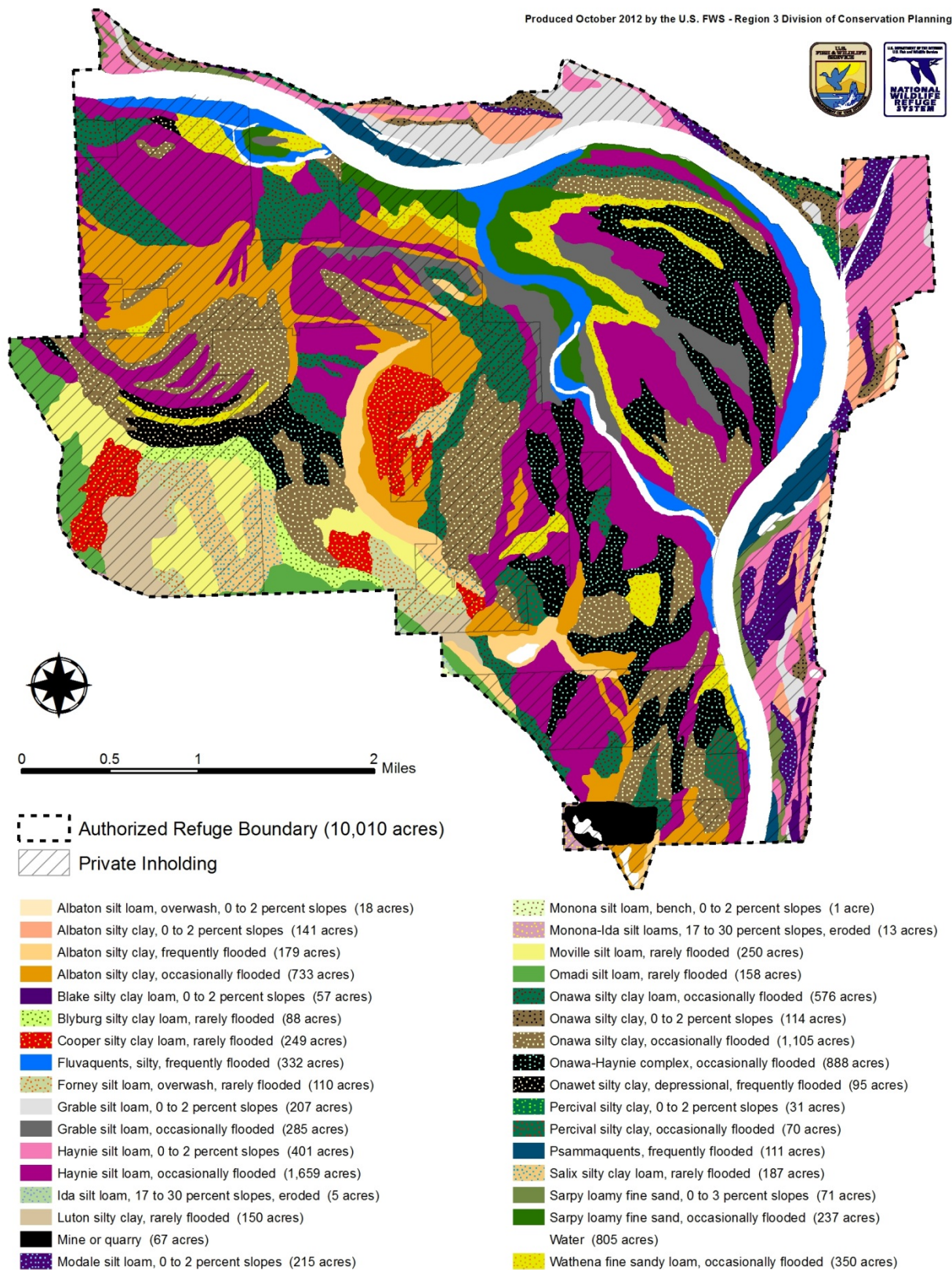
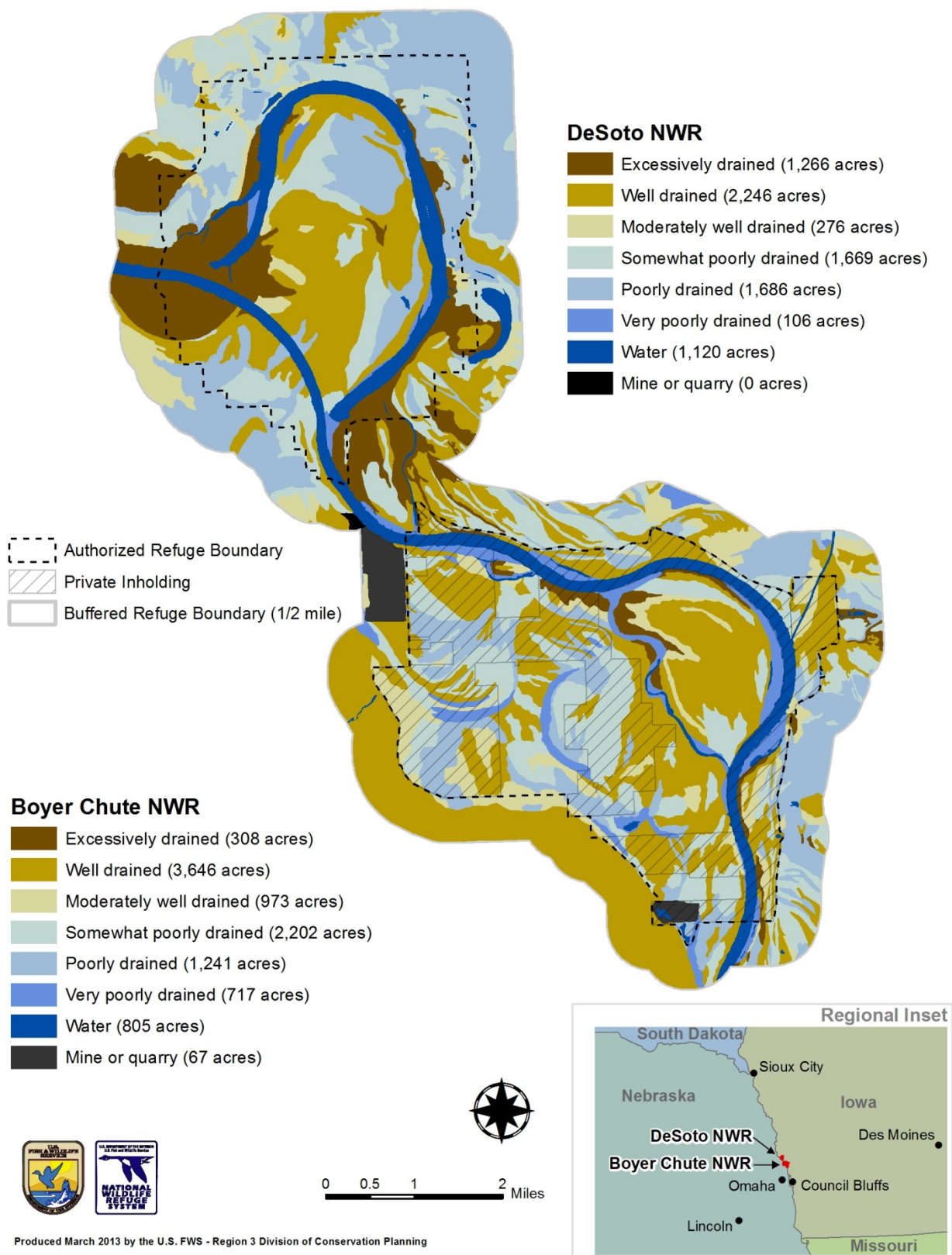


Figure 3-16: Soil Survey Drainage Classes



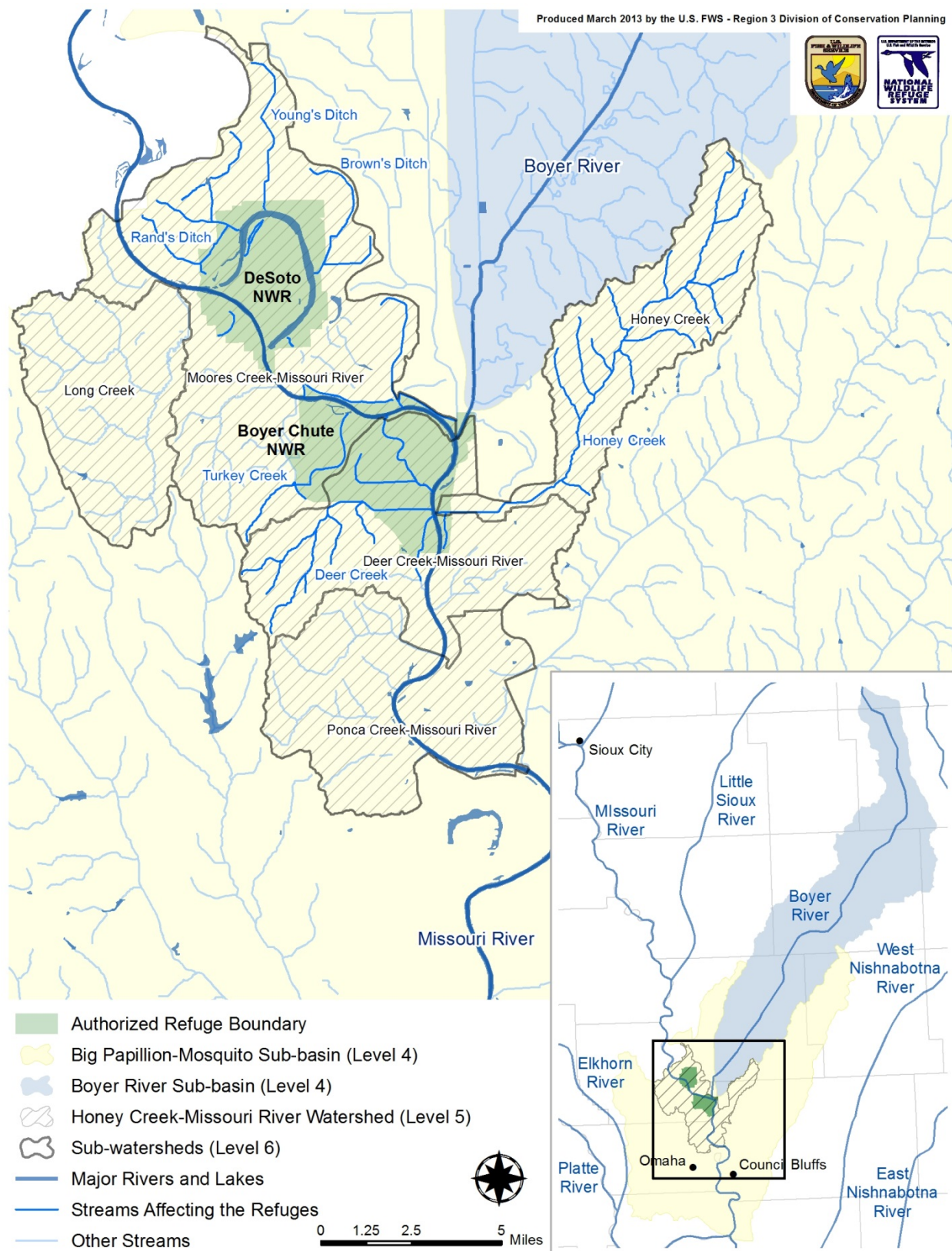
Water Resources

Refuge Hydrology

DeSoto and Boyer Chute Refuges are categorized within the hydrologic units of the USGS Hydrologic Unit Code (HUC) system as depicted in table 3-2:

Table 3-2: Refuge Hydrologic Unit Codes

HUC Level	Name	Sq. Mi.	HUC Number
1 Region	Missouri	529,350	10
2 Sub-region	Missouri-Little Sioux	9,140	1023
3 Basin	Missouri-Little Sioux	9,140	102300
4 Sub-basin	Big Papillion-Mosquito	1,160	10230006
5 Watershed	Honey Creek-Missouri River	182	1023000605
6 Sub-watershed (DeSoto NWR)	Moore's Creek-Missouri River	65	102300060504
6 Sub-watershed (Boyer Chute NWR)	Moore's Creek-Missouri River	65	102300060504
	Deer Creek-Missouri River	34	102300060505

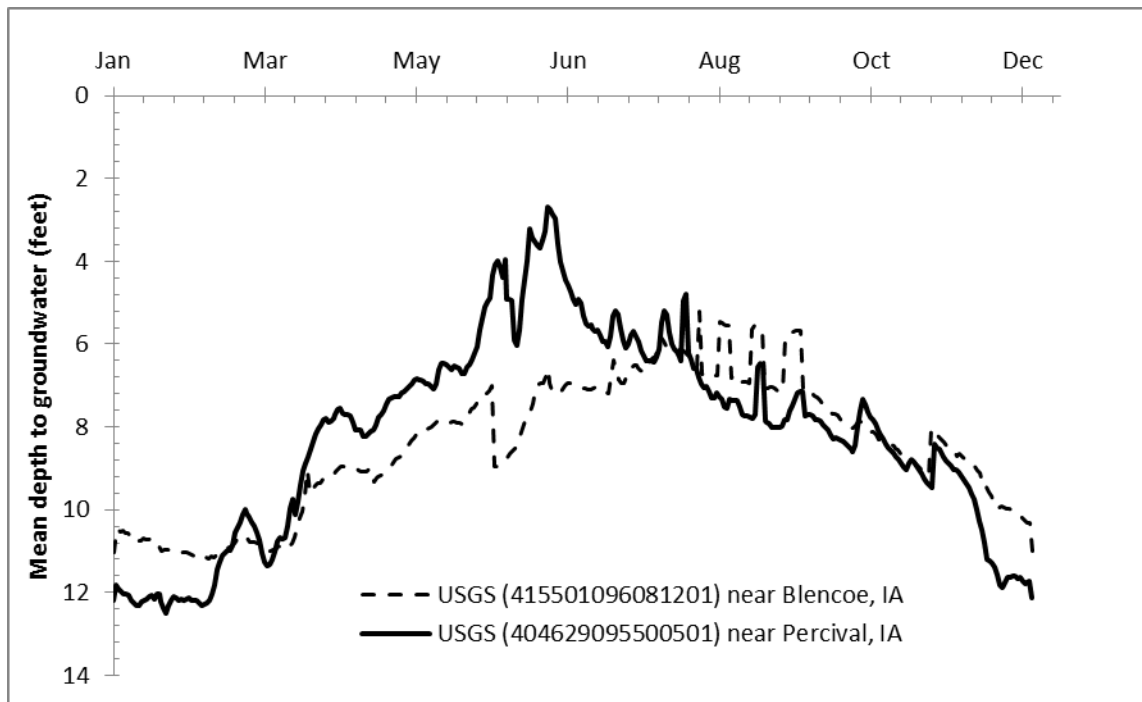
Figure 3-17: Watershed and Hydrology of the Refuges

All of DeSoto NWR and the northwest portion of Boyer Chute NWR fall within the Moore's Creek – Missouri River sub-watershed (Level 6, HUC 12), while the southeast portion of Boyer Chute NWR falls within the Honey Creek – Missouri River sub-watershed (Level 6, HUC 12). Figure 3-17 depicts the drainage areas as well as the rivers, streams, and ditches associated with the refuges. The drainage basins associated with the refuges have relatively small upstream areas, and all water ultimately flows into the Missouri River. Boyer Chute NWR contains two additional drainage systems that flow in from the east (Iowa). These drainages travel only short distances through the authorized refuge boundary before emptying into the Missouri River. The bigger of the two is the Boyer River and its sub-basin, which has its own 1,089 square-mile watershed (Level 4, HUC 8), and the second is the Honey Creek sub-watershed (Level 6, HUC 12), which drains a 27 square-mile area.

The majority of the water that flows from the sub-watershed through DeSoto NWR on the east side of the Missouri River flows to DeSoto Lake. The drainage area for the lake is 12,563.46 acres (19.63 square miles) (Iowa Department of Natural Resources 2012), and contains three major drainage ditches: Young's, Brown's, and Rand's. There are also a few smaller, unnamed drainage channels and large areas of surface flow across the refuge. The flat topography of the floodplain and variable soils also afford natural ephemeral wetland areas. A number of old Missouri River channel scars on and adjacent to the DeSoto NWR retain water during flood stages. One of these on the south end of DeSoto Lake releases water south along the east edge of Wilson Island State Recreation Area before draining to the Missouri River. Another of these scars on the west side of the Missouri River takes on water from the main river channel during high water periods.

On Boyer Chute NWR, two streams flow eastward through the refuge from the bluffs on the western edge of the floodplain: Turkey Creek to the north and Deer Creek to the south. Both streams have been modified for improved drainage and are maintained by the Fort Calhoun Drainage District. Two water control structures were installed by the Papio-Missouri River Natural Resource District and one was installed by refuge staff to divert water to restored wetland basins on the refuge. High Missouri River flows can cause flooding on the refuge and turn the ditches and creeks into backwater areas. In more extreme high water conditions, the refuge may experience overbank flooding from the Missouri River. In other situations, the Missouri River may be acting as a hydraulic dam preventing drainage from other parts of the refuge. Seasonal groundwater levels can also impact the ability of surface water to drain off the refuge.

Water level data for the Missouri River is regularly collected by USGS gauges upstream of the refuges, at Boyer Chute, and at several groundwater monitoring sites located throughout the Missouri River floodplain. The Missouri River gauge upstream of the refuge in Decatur, Nebraska does not indicate many large fluctuations—not surprising considering modern regulation of Missouri River flows. A review of Missouri River water levels over the past 20 years shows that the regulated water levels of the Missouri River are relatively consistent. Notable exceptions include summer flood events in 1993, 1995, 1996, 1997, 2001, 2010, and 2011. Long-term data show that the Missouri River tends to crest and remain at higher water levels beginning in mid-March. Figure 3-18 uses data from USGS groundwater monitoring sites at Blencoe, Iowa (30 miles north of the refuges) and Percival (60 miles south of the refuges) to show floodplain groundwater trends. The available data spans the years from 1995–1996 and 2008–2011, and indicates a median depth to groundwater of approximately 10 feet. The graph also shows that groundwater response is approximately a month after the Missouri River peaks, water levels peak mid-summer and are relatively low from late-September through late-April, and a number of spikes suggesting water levels are especially responsive to rain events.

Figure 3-18: Groundwater Trends in the Area of the Refuges

Water Rights

The refuges have a system of ditches, creeks, wells, and water control structures for moving water within the refuges to fill the various impoundments.

Water law in the state of Nebraska is governed by prior appropriation water law, meaning that during shortages, water is appropriated to those individuals and entities that hold the oldest water rights. This is different than the neighboring state of Iowa, which governs its water law under riparian water law doctrine and allows equal rights to riparian land owners.

In accordance with Nebraska state water law, the Boyer Chute NWR maintains five surface water rights and has eight wells registered to account for water withdrawals and diversions used for habitat management on the refuge. The five surface water rights total 842.65 acre-feet per year, while the eight groundwater wells allow for the supply of significantly more water. Most of these rights are supplemental, meaning the water sources are commingled to supply the refuge needs for optimum operation. Currently, water management activities at DeSoto NWR do not require permitting under Iowa state water regulations (<25,000 gallons per day), and water is neither pumped nor diverted from the portions of the refuge located in Nebraska.

The main season of water use is from mid-March until early December. This varies with water conditions as determined by annual precipitation, snowmelt, and availability of water from creeks and supply ditches. Adequate water is important to provide spring and fall migration stopover habitat for migratory birds.

Water Contamination

Contamination of water resources on DeSoto NWR consists predominantly of sediment and agricultural runoff that enters the refuge via sheet flow (non-point sources), drainageways, and the Missouri River. Occasional flood events can also bring contaminants onto refuge lands and waters. Three drainage ditches (Young's, Rand's, and Brown's) drain neighboring agricultural fields, enter the refuge, and outlet into DeSoto Lake.

Groundwater samples on DeSoto NWR indicate elevated iron concentrations. Wetland units fed by groundwater sources incur iron flocculate, limiting primary productivity. Treatment methods are prohibitively expensive, and using alternative water sources is recommended.

Prior to the establishment of Boyer Chute NWR the Papio-Missouri River Natural Resources District retained Jacobson Helgoth Consultants, Inc. to do an environmental site assessment of the Boyer Island and West Chute units. They concluded, "No information was found which indicates that the properties have been affected by hazardous waste, PCBs [polychlorinated biphenyl], or other toxic substances or pollutants." Further, "With the exception of the small dump sites . . . no information was found which would indicate previous use for industrial, military or landfill purposes." The quality of groundwater and surface water are normal for the area. Water pumped from irrigation wells shows signs of considerable iron content. No known industrial or agricultural contaminants are known to exist. Other potential contaminant sources within the Boyer Chute NWR approved acquisition boundary are residential septic systems and agricultural non-point source runoff.

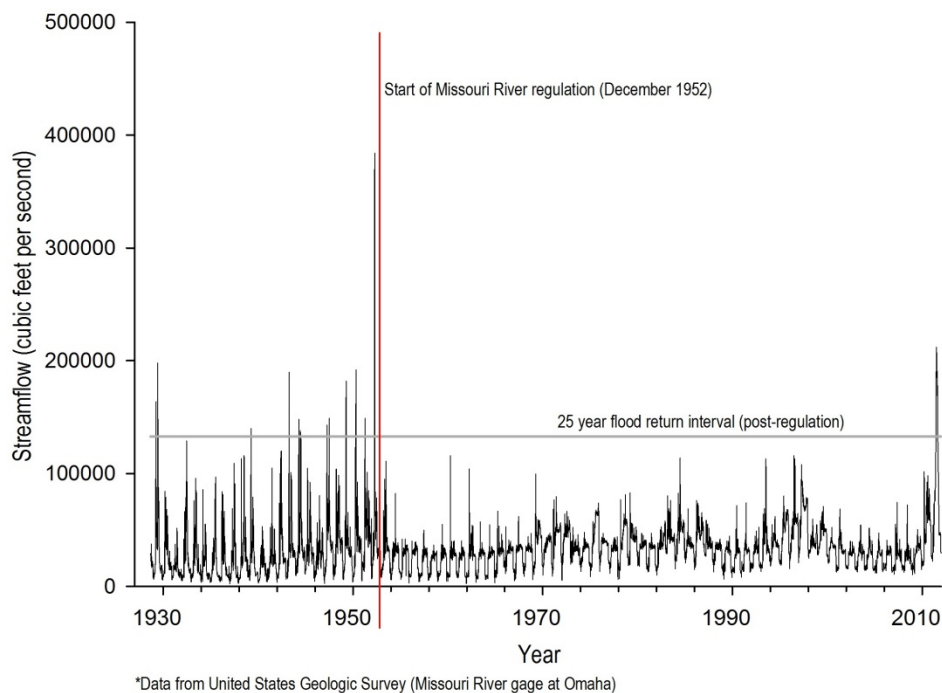
Treated sewage effluent from the Fort Calhoun Sewage Treatment Plant on the western boundary of the authorized refuge boundary previously flowed through the refuge, emptying into Turkey Creek and then entering the Missouri River. However, the Fort Calhoun Sewage Treatment Plant is no longer in service. Through a renewable 20-year inter-local agreement signed in July of 2007, Fort Calhoun, Nebraska opted to construct piping and conveyance facilities to transport its sanitary wastewater to a treatment facility in Blair, Nebraska.

Missouri River System

The Missouri River's impact on the floodplain landscape has been greatly reduced over the past century, yet it retains a role in reshaping the mosaic of habitats during floods. The river once played a much larger role, as the dynamic landscape of the Missouri River Basin continually reshaped its channel and floodplain through a never-ending process of creation and destruction, deposition and erosion. However, numerous Flood Control Acts and the Missouri River Bank Stabilization and Navigation Project were used to control erosion and protect land along the river. Over the past century, the Missouri River has been converted from a free-flowing river into a series of reservoirs and channelized waterways, effectively separating the river from its floodplain. Since 1890, the length of the Missouri River between Sioux City, Iowa and St. Louis, Missouri has been shortened by about 75 miles or almost 10 percent (USACE 2004). This vast engineering program has had devastating impacts on fish and wildlife populations and habitat. Roughly 168,000 acres of natural channel and 354,000 acres of associated floodplain habitat have been lost on the lower 730 miles of river. These accreted lands have since been developed for agricultural, residential, and industrial uses. The shallow water habitats essential to fish spawning and rearing of young have been reduced by 90 percent in some areas. In addition, islands and sandbars, important nesting habitat for migratory birds and other species, have been virtually eliminated. Moreover, riparian forest habitat has been reduced from 76 percent of floodplain vegetation in the 19th century to just 13 percent by 1972.

The flow cycles of the Missouri River have always varied seasonally and annually, but a substantial change occurred in December of 1952 with the beginning of flow regulation. Preregulation seasonal flow fluctuated more dramatically, with peak flows in the spring and lower flows the remainder of the year. In the post-regulation period spring flow starts early but are moderated to avoid flooding, water levels are then held artificially high and stable through the summer to late fall, finally water levels are drastically reduced during the winter (non-navigation) season. Figure 3-19 depicts the nature of the flow change from year-to-year. Before regulation the peaks were higher and the troughs lower, with a greater frequency of larger flood events. Aside from the 2011 flood year, post regulation has a much more stable and moderated trend.

Figure 3-19: Missouri River Mean Daily Streamflow at Omaha, Nebraska (1928-2012)*



In addition to flow volumes and timing, the sediment load was an important component of the historic Missouri River system. The river was a naturally turbid river, and continuous bank erosion and slack water deposition were common. Today, many of the native fish species in the Missouri River, including the pallid sturgeon, are specially adapted for life in turbid waters like those that were present in the historic river. The suspended sediment load in the river has decreased from 69 to 99 percent, depending on location and proximity to the main stem dams. Releases from Gavins Point Dam are cooler than historic river temperatures, free of sediment, low in nutrients, and saturated with dissolved oxygen. As distance increases from Gavins Point Dam the water temperature, turbidity, and nutrients increase from tributaries.

With the implementation of the Clean Water Act water quality in the Missouri River has improved over the last 30 years. Sources of pollution in the river include runoff of fertilizers,

pesticides, and herbicides from a predominantly agricultural watershed, as well as discharges from municipal wastewater treatment facilities and other urban industrial operations.

A U.S. Army Corp of Engineers (USACE, Corps) 2004 report on Missouri River stage trends indicates that there has been a downward trend/stage decrease on the Missouri River above Omaha, Nebraska (i.e., the channel has become deeper). This change is a result of a more linear channel, reduced sediment loads from upstream reaches, increased bed erosion, and a downward incision of the channel. In the absence of other factors, greater volumes of water would be necessary in the future to achieve the same levels of overbank flooding. The same study indicates that south of Omaha the stage has been increasing (i.e., the channel is becoming shallower). This shift is attributed to increased land surface runoff, tributary sediment inflows, and deposition within the main channel.

Current Management

Water quality management of the Missouri River is under the jurisdiction of the individual states through which the river passes.

The Nebraska Department of Environmental Quality (NDEQ) has placed the segment of the Missouri River between Sioux City, Iowa and Bellevue, Nebraska on the state's impaired waters list for 2010. This segment was listed as impaired for aquatic life, and a fish consumption advisory has been issued (NDEQ 2010). No information was available for the streams and ditches passing through the Nebraska side of the authorized boundaries.

The Iowa DNR has also placed the segment of the Missouri River between the water supply intake at Council Bluffs, Iowa (river mile 619) and the confluence with the Boyer River, which is just south of DeSoto NWR and includes the segment of the river that borders the Boyer Chute NWR backwater restorations, on the state's 2010 impaired waters list. This segment of the river is considered impaired for drinking water use because of arsenic levels (Iowa DNR 2010). The same 2010 data classifies the Boyer River from Dunlap, Iowa south as impaired due to the presence of *E. coli* (*Escherichia Coli*).

Air Quality

Greenhouse gasses, fine particles, ozone, air toxins, mercury, and lead are all airborne pollutants that affect human health and the health of natural ecosystems. The protection of air quality has been formally monitored and regulated since the passage of the Clean Air Act in 1970, and its subsequent revisions in 1977 and 1990 have intended to keep policy at pace with the evolving state of science and technology. The threats associated with global climate change have reinvigorated efforts to monitor both point sources of contaminants and non-point sources such as transportation and residential combustion. The EPA is responsible for establishing policy and guidance, which are used by the individual states to develop specific State Implementation Plans and Smoke Management Programs.

There is one air quality monitoring station for Washington County, Nebraska, located in Blair, which monitors for National Ambient Air Quality Monitoring Standards.

Criteria Air Pollutants

To protect public health, the Clean Air Act established concentration limits on six criteria air pollutants: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, particulate matter, and lead. The 2002 National Emission Inventory (NEI) database documented 10 facilities in Washington County (of 492 in the State of Nebraska) whose emissions are estimated for one or more criteria air pollutants by state and federal agencies. The list includes a diversity of industrial businesses in Fort Calhoun and Blair, Nebraska including a power plant, a feed company, manufacturing enterprises, stone processors, and a number of construction companies. In 2002, the total quantity of criteria pollutants emitted yearly by these facilities was approximately 165 tons. Washington County's 2002 rank among Nebraska's 93 Nebraska counties for the criteria air pollutants was 15th for particulate matter (<2.5 micrometers), 19th for sulfur dioxide, 20th for ammonia, 22nd for particulate matter (<10 micrometers), 23rd for carbon monoxide, 28th for nitrogen oxides, and 32nd for volatile organic compounds. Overall, Washington County contributed 0.001 percent of the state's total annual point source criteria pollutant emissions, which in 2002 was 155,000 tons (EPA 2011).

Criteria air pollutant emission in Harrison County, Iowa is negligible.

Hazardous Air Pollutants

The NEI lists 188 hazardous air pollutants that are known to or suspected to cause serious health problems. The 2002 NEI identifies three facilities in Washington County, Nebraska that emit hazardous air pollutants. The three facilities include a landfill, a concrete company, and a manufacturing enterprise. In this list, the number of hazardous pollutant types emitted by each facility ranges from 9 to 28, and the combined emission volume of these point sources is less than 1 percent of the total estimated state emissions. 2002 data estimate that approximately 54,928,285 pounds of hazardous air pollutants are emitted yearly in Nebraska from all sources, point and non-point (EPA 2011). In 2002, the county ranked number 17 of all 93 Nebraska counties in the quantity of hazardous air pollutants emitted at 1.14 percent of the state total (EPA 2011).

According to 2002 data, there is only one site in Harrison County, Iowa that emits hazardous air pollutants. A manufacturing facility emits 21,500 pounds of mixed isomers annually. The county ranks 48 of 79 Iowa counties for its release of hazardous air pollutants.

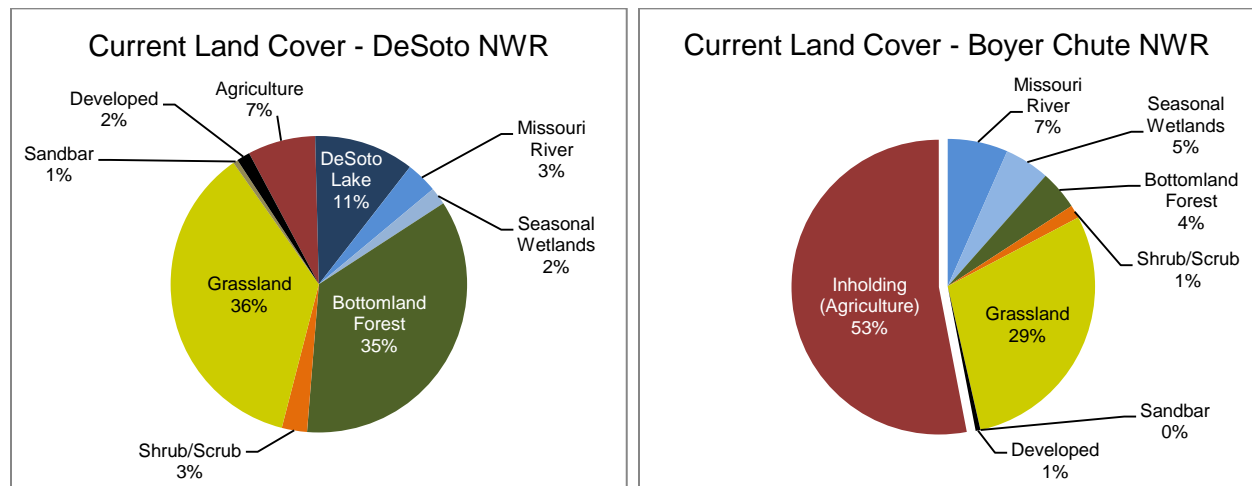
Current Management

Prescribed burning is the refuge management activity with the greatest effect on air quality. The management of smoke is incorporated into planning prescribed burns and, where possible, the suppression of wildfires. The areas surrounding the refuge are Class II air quality zones, or areas where moderate change in air quality are allowable. Class I areas, which allow no change from current air quality standards—such as federal wilderness or national parks, are not present. Wildland fires are expected to be of short duration with minimal effects on long-term air quality. Prescribed fire use on the refuge will not reduce long-term air quality and will adhere to all current air quality standards. Sensitive areas are identified and precautions are taken to safeguard visitors and local residents. Smoke dispersal is a consideration in determining whether a prescribed burn is within prescription guidelines. Generally, fine grass fuels and small burn unit sizes (80–600 acres) generate low volumes of smoke for short durations (four–five hours).

Habitat

Habitats on both refuges are completely contained within the Missouri River alluvial floodplain and are therefore a mixture of bottomland forest, open woodland, shrub/scrub, wet and dry prairie, seasonal wetland, and open water habitats (figure 3-20). Agriculture is also a managed cover type on DeSoto NWR. The land cover percentages documented in the 2001 DeSoto NWR CCP were slightly higher for forest (42 percent), much higher for agriculture (25 percent), and much lower for grassland (20 percent).

Figure 3-20: Current Land Cover Quantities on DeSoto and Boyer Chute Refuges



Past management of the refuges has favored mesic habitats generated by infrequent and low-severity flood conditions. However, approximately 95 percent of the surface area of both refuges was inundated during the 2011 flood. The post-flood vegetation response will vary from site to site, and the previously stable refuge habitats are likely to succeed and change over the next few years. Water has always been a primary driver in the succession of refuge habitats. Before the Missouri River was dammed and channelized, floodwaters and heavy sediment loads would continually shape and reshape this landscape, creating and erasing river system features that evolved through time from open water and wetland to upland and back again. Fire regimes and large herds of grazing animals were also historically important to changes in this river valley landscape. Today, many of these broader landscape processes have been reduced or eliminated from the system. The refuge incorporates prescribed fire into habitat management to simulate historic processes where possible. Aside from active habitat management conducted by refuge staff, many factors interact to shape the refuge vegetative communities including human-altered and remnant native hydrology; seasonal water tables, moisture regimes, and flood/drought cycles; and local relief and soil characteristics.

Habitat monitoring on both refuges consists of periodic onsite evaluations. Annual aerial photography missions have been scheduled to document habitat response to the 2011 flood, and ground truthing will be required to verify ground conditions. Water level monitoring on refuge wetlands and DeSoto Lake are taken at staff gauges periodically but not recorded.

The habitats at DeSoto NWR are approximately one-third grassland and one-third forest with the remaining third a mixture of open water, agriculture, and minor components such as shrub/scrub, developed areas, seasonal wetlands, and sandbar habitat. The grassland component is a mixture of mesic grasslands and wet prairie. Forests contain bottomland tree species, and density ranges from dense young stands, mature open savannas, to late successional cottonwood forest. The distribution of these cover types can be seen in figure 3-21.

Figure 3-21: Current Land Cover, DeSoto NWR

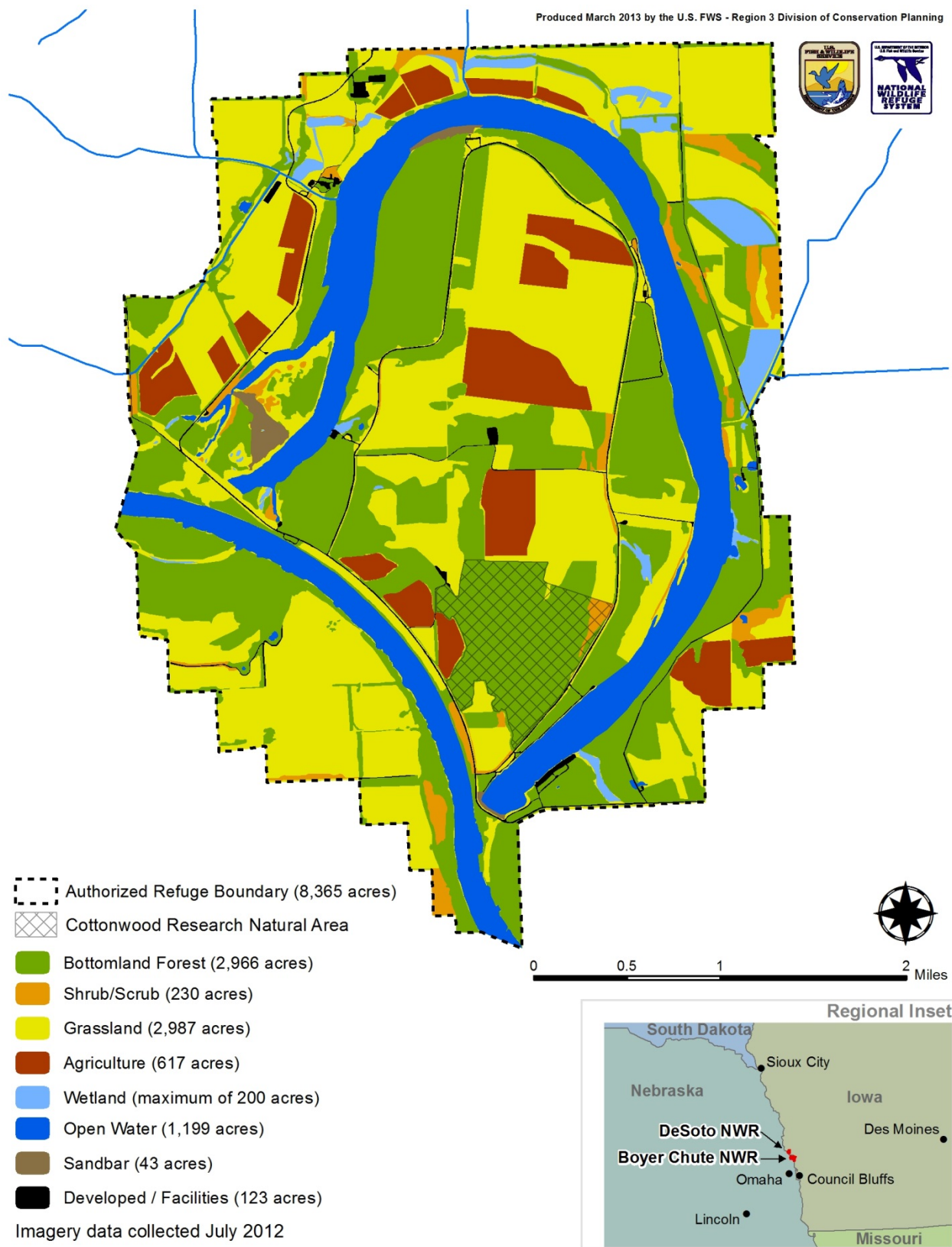
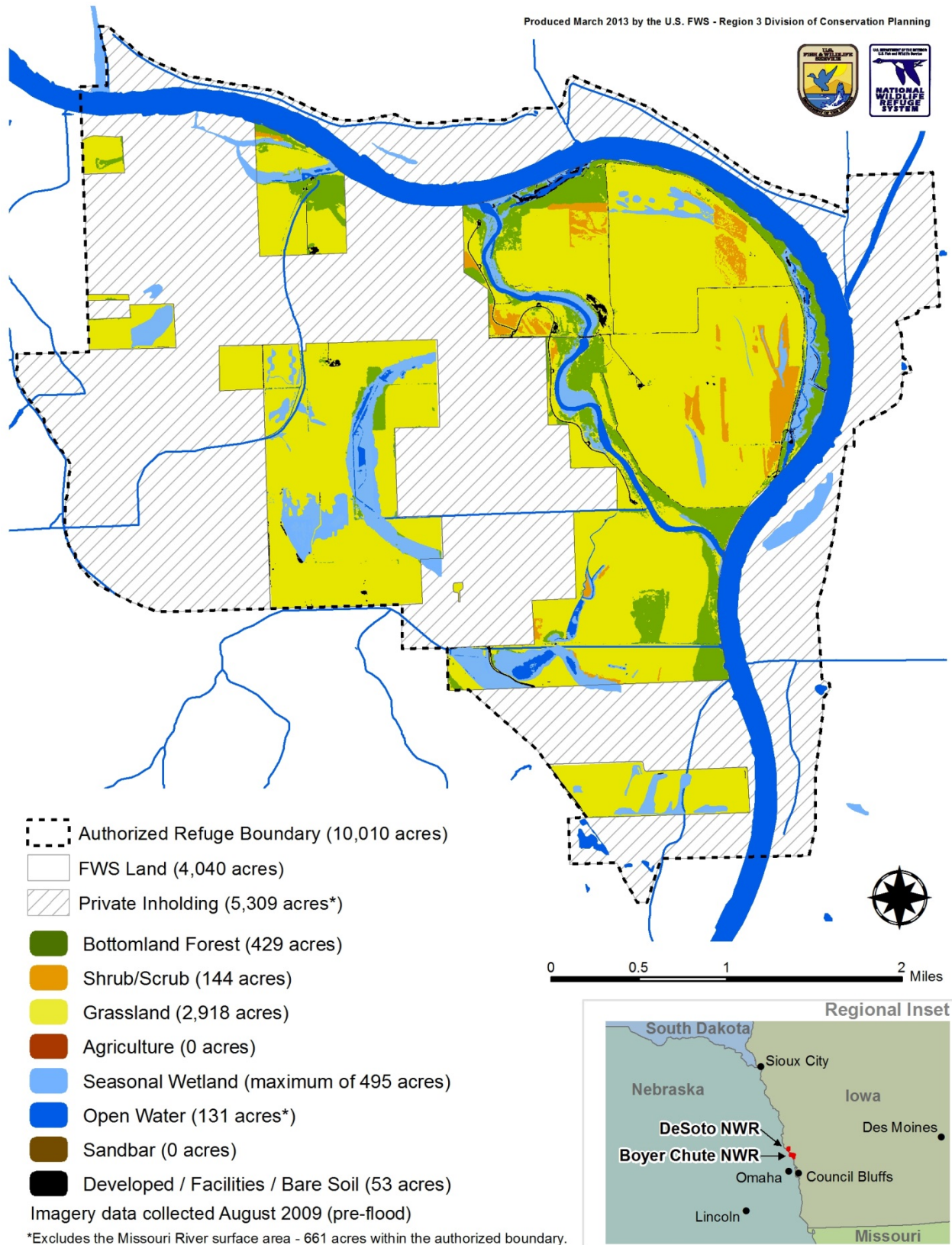


Figure 3-22: Current Land Cover, Boyer Chute NWR



Nearly all of the land that now comprises the authorized boundary for Boyer Chute NWR was farmed prior to the creation of the refuge in the 1990s. Restoration and rehabilitation of wetland and upland habitats have been and will continue to be an important part of refuge management activities. According to restoration records maintained by the refuge, habitat restoration has occurred on 2,350 grassland acres, over 370 wetland and riverine acres, and approximately 570 acres of woodland and shrubland.

In 2010 a mapping project conducted by the Region 3 Division of Conservation Planning, in coordination with refuge staff, classified the lands and waters of Boyer Chute NWR into cover types and general vegetation classes. The project used a mosaic of color-infrared image tiles flown in August of 2009. Image segmentation was used to classify one-meter cells into spectral categories, which were then associated with cover type classes equivalent to the formation level of the National Vegetation Classification Standard. Those areas in private ownership are predominantly agricultural cover types and were excluded from this analysis. Figure 3-22 illustrates and summarizes refuge vegetation based on the 2009 (pre-flood) land status. According to this data, over 60 percent of the refuge is classified as prairie, and when combined with wet meadow areas (10 percent), nearly three-quarters of the Service-owned lands fall into a mixed grassland and forb cover type. Wetlands and open water constitute approximately 12 percent of the refuge. Forests and open woodlands located primarily adjacent to waterways and wetlands constitute another 15 percent of the refuge. Finally, areas with some level of development such as buildings, roads, and parking lots, make up approximately 1 percent. This landscape has changed dramatically since the 2009 imagery was collected, including changes associated with major flooding in 2010 and 2011 and work done by the Corps to create shallow water habitat in the form of backwaters and side channels.

Missouri River Channel

The importance and potential of the Missouri River as a navigation channel was quickly recognized by early American explorers. By the mid-1800s, the river was already heavily traveled by steamboats and keelboats. As demand for commercial transportation grew in the second half of the 19th century, so did demand to “tame” the river by removing woody debris, snags, and other hazards to boat traffic. The first half of the 20th century was marked by intensive channelization of the river and the beginning of reservoir construction, including six major flood control dams in the Missouri’s upper reaches. These dams and channelization efforts did help reduce flooding but in so doing, altered the natural flood cycle and sediment transport on which the ecosystem depended. In 1997, the Missouri River was designated as the most endangered river system in the country (American Rivers 1997).

In the stretch of the Missouri River that passes by the refuges, the river runs at approximately 990.6 above MSL during normal flows, increasing to 994.2 MSL for the 10-year flood level, and 996.6 MSL for the 50-year flood elevation level. Normal flows from November through February are approximately 16,000 cubic feet per second (cfs) and 33,000 cfs between March and October each year.

DeSoto NWR originally contained approximately nine miles of the Missouri River’s channel. In 1960 this extent was reduced to slightly over three river miles (641.1 through 644.7) when the DeSoto–Bertrand Bend of the Missouri River was cut off and a new, shorter channel was excavated by the Corps. The new channel arcs southeast across the bottom of the refuge separating the West Side Unit from the rest of the refuge, it creates an island of Nebraska land on the east side of the Missouri River, and also forms a small pocket of Iowa land on the west

side of the river. The West Side Unit lies only 0.8 miles from the north side of Boyer Chute NWR's authorized boundary. A large extraction site, the Fort Calhoun Quarry (Martin Marietta Materials), lies between the refuges on the west bank. Although the precise surface acreage of the Missouri River channel changes slightly over time, recent estimates indicate that it spans approximately 286 acres of surface area within DeSoto NWR. Over time the Missouri River has incised its channel in the stretch passing through DeSoto and Boyer Chute Refuges.

The Missouri River runs just inside Boyer Chute NWR's authorized boundary on the north and east, including eight miles of river channel from river milepost 640 in the northwest to river milepost 632 in the southeast. Three major riverine feature restorations have been undertaken by the Corps on Boyer Chute NWR. The first is the Boyer Chute itself, a large side channel restored in 1994. A natural chute formed there long ago, but deteriorated after a river wall and shale dike were constructed across the upstream-end of the chute in 1937 as part of the Flood Control Acts and Missouri River channelization era. The chute closure was undertaken in 1937 to force water through the main river channel for navigation, and it gradually silted in over time forming a linear strip of seasonal and permanent wetlands in the footprint of the old chute.

In 2009–2010, the Corp restored two additional Missouri River aquatic habitat sites on Boyer Chute NWR. The first site is a side channel area called "Lower Calhoun Bend Side Channel" on the north end of the Boyer Island Unit. It was dredged to be a 2,700-foot long chute with a nine-acre main channel and two additional channels that form during high water (adding an additional two acres). The main channel was cut 76 feet wide and 5 feet below the construction reference plane. This feature was virtually erased by the flooding that occurred in 2011. The second site, Boyer Bend Backwater, is a 39-acre restoration on the east side of the Boyer Island Unit. The backwater averages 76 feet wide, and is nearly 6,900 feet (1.3 miles) long. The southern end remains open to the river, while the northern end is closed with rock. The rock closure includes a 30-inch diameter corrugated metal pipe to allow a trickle flow into the backwater. An additional 715 feet of backwater is included as an auxiliary connection to the river. The backwater cut through seven old river dikes, requiring the removal of 1,180 cubic yards of rock. Roughly four to seven acres of trees were removed for the excavation of the backwater and used in the construction of timber assemblages for fish habitat. This feature was also greatly altered by the 2011 floods but was in the process of being rehabilitated during the writing of this CCP.

Current Management

The Corps has primary jurisdiction over the main channel of the Missouri River. There are a number of wing dikes installed and maintained in the main channel to direct flow away from banks and side channels, and the sides of the river have been armored using rip-rap in sections (see figure 3-23). Six chevrons have been constructed by the Corps in the DeSoto NWR stretch of the Missouri River channel to create sandbar habitat and nine in the Boyer Chute NWR stretch. On the east bank of the DeSoto NWR stretch of the Missouri River, 12 sites have been de-armored to encourage bank erosion. Refuge management maintains a regular dialogue with the Corps regarding riverine restorations on the Lower Missouri River.

Wetlands and Open Water

DeSoto NWR has approximately 200 acres of seasonal wetland habitat and approximately 22 acres of ponds. This includes 170 acres in large, managed wetland complexes: Headquarters, Red Barn, Botos, Lone Tree, and Wood Duck. There are also a number of small sloughs,

channels, and shallow areas associated with DeSoto Lake (see figure 3-23). The refuge can actively manage the majority of these seasonal wetland acres by diverting or pumping water from DeSoto Lake, drainage ditches, and groundwater sources. Approximately 30 acres also occur as unmanaged wetlands, side-chutes, and drainage ditches on the refuge.

DeSoto NWR currently has a 12.2-mile levee system that is also depicted in figure 3-23. The 2011 floods impacted this levee system, and at the time of writing conversations were ongoing regarding the future of flood control infrastructure in the area.

Boyer Chute NWR contains approximately 460 acres of wetland/moist soil habitats and riverine features (figure 3-24 and table 3-3). Approximately 207 of these wetland acres allow some form of water level management, while the remaining wetland acreage is unmanaged and follows seasonal moisture trends. As mentioned in the previous section, three riverine features have been created by the Corps: Boyer Chute, Boyer Bend Backwater, and Lower Calhoun Bend Side Channel—the latter of which was erased by the 2011 floods.

The National Wetlands Inventory

The National Wetlands Inventory (NWI) is an extensive, ongoing survey by the Service of aquatic habitats across the United States. The NWI is based on interpretation of aerial photographs, not ground surveys, and its criteria differ somewhat from those used in jurisdictional wetlands delineations for permitting by the Corps under Section 404 of the Clean Water Act.

The existing NWI information indicates that DeSoto NWR has 1,680 acres of wetlands spanning 31 different types (figure 3-25). DeSoto Lake and the Missouri River account for approximately two-thirds (1,084 acres) of the total NWI acreage, forested wetland comprise another 385 acres, emergent wetlands are 200 acres, and ponds make up another 13 acres. The majority of the identified wetlands are clustered near the upstream-end of DeSoto Lake on the west side of the refuge.

The NWI for Boyer Chute NWR depicts the Missouri River channel, the Boyer Chute before its restoration by the Corps, a number of riparian woodland, shrubland, and emergent habitats along these major waterways as well as small lakes and ponds in the vicinity of the refuge (figure 3-25). The NWI information identifies 20 different wetland types spanning 1,350 acres within the authorized boundary of Boyer Chute NWR. Over half the acres (56 percent) comprise the Missouri River and the Boyer Chute. There are also 376 acres of forested wetlands, 170 acres of emergent wetlands, and just over 50 acres of ponds and lakes. Few seasonal wetlands, restored basins, or flood-prone areas are delineated, and the drainage modifications resulting from agricultural development prevalent throughout the area are not well documented in the NWI.

Figure 3-23: Water Resources, DeSoto NWR



Figure 3-24: Water Resources, Boyer Chute NWR

Produced March 2013 by the U.S. FWS - Region 3 Division of Conservation Planning

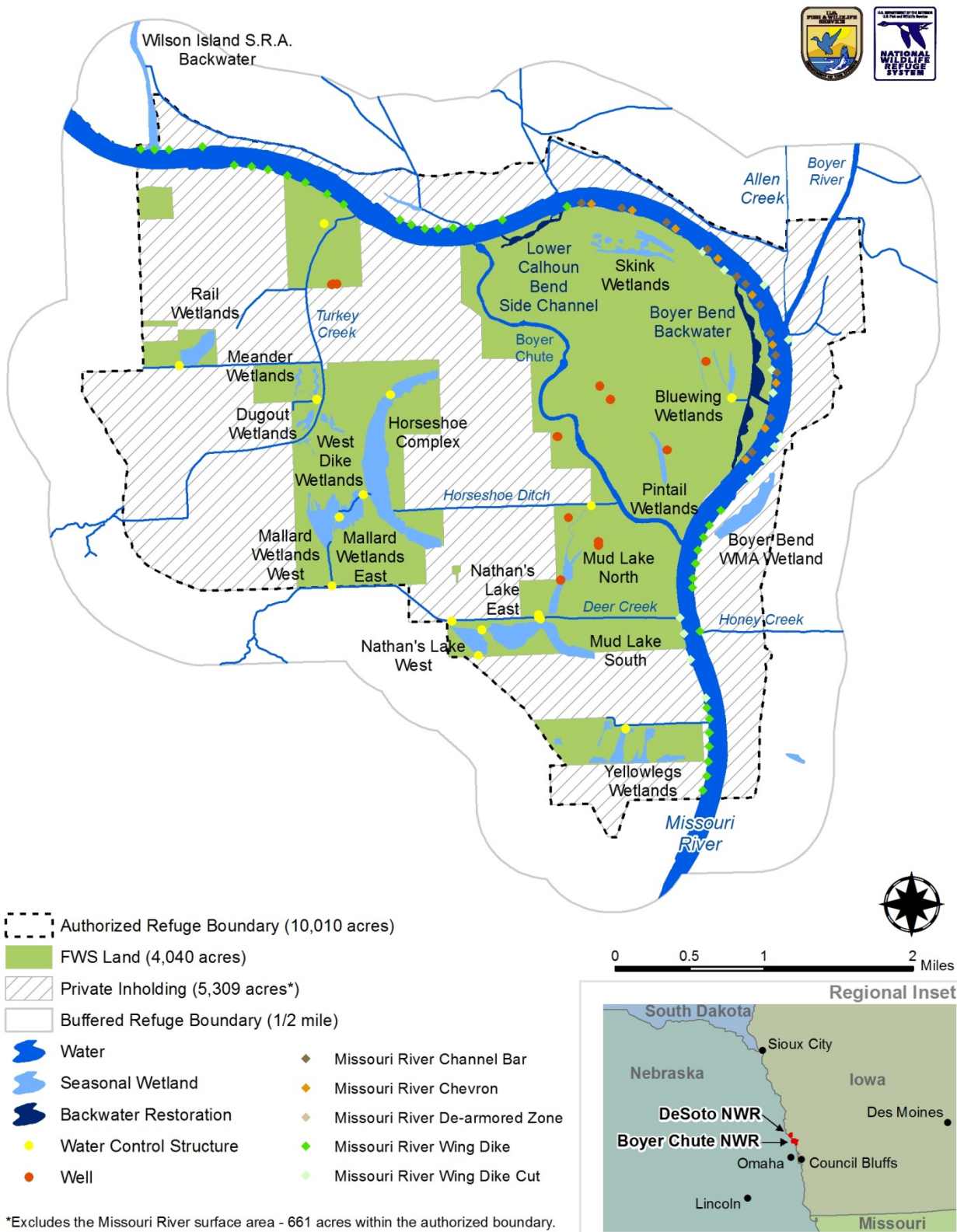


Figure 3-25: National Wetland Inventory

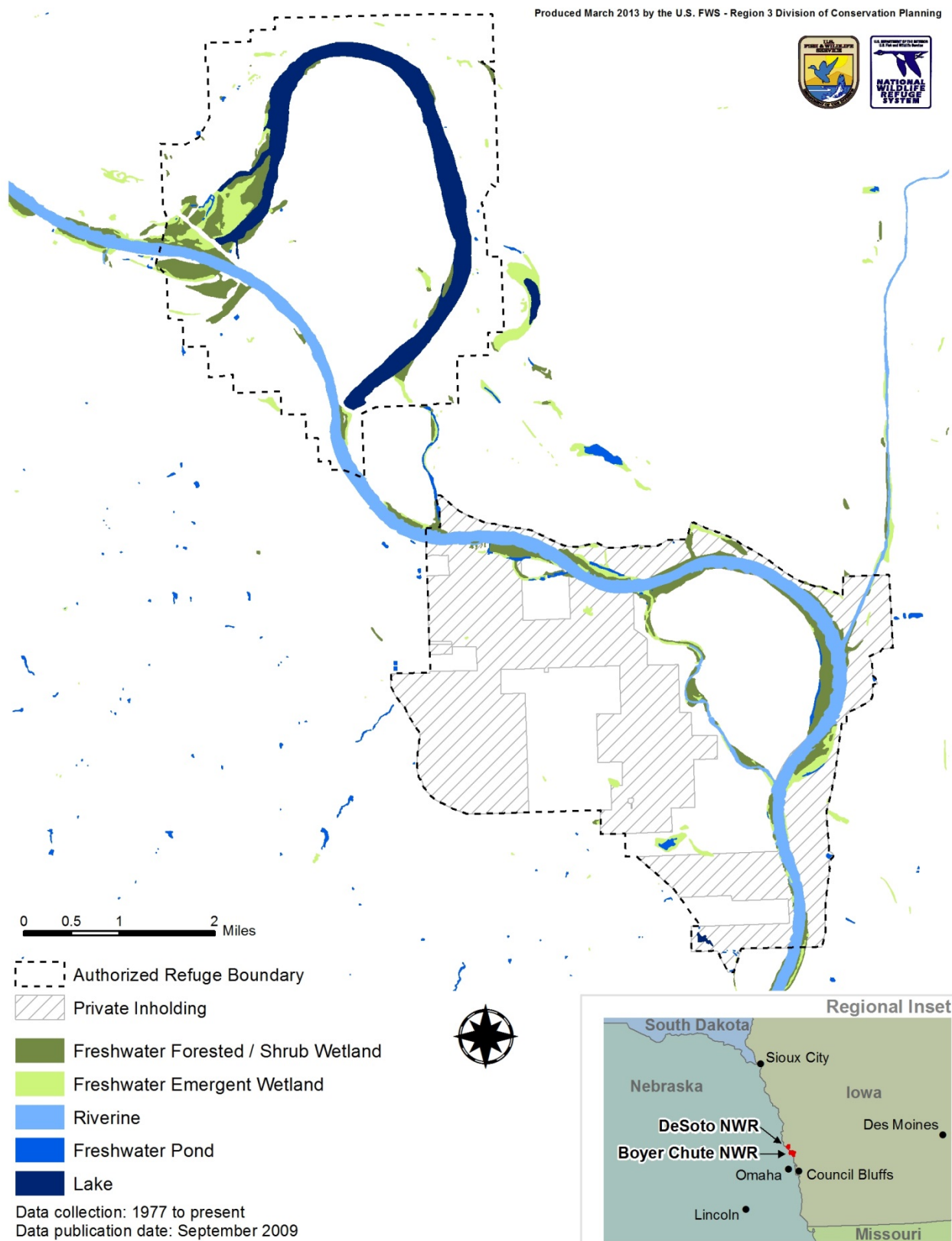


Table 3-3: Aquatic Habitat at Boyer Chute NWR

Feature Name	Management Capability	GIS Acres*
Bluewing Wetlands	Yes	7.5
Boyer Bend Backwater	-	36.6
Boyer Bend Wildlife Management Area (WMA) Wetland	-	30.0
Boyer Chute	-	57.4
Dugout Wetlands	-	4.2
Horseshoe North (north of water control structure)	Yes	15.4
Horseshoe South	-	91.2
Lower Calhoun Bend Side Channel	-	8.8
Mallard Wetlands East	Yes	18.6
Mallard Wetlands West	Yes	26.5
Meander Wetlands	Yes	5.2
Mud Lake North	Yes	15.2
Mud Lake South	Yes	19.3
Nathan's Lake East	Yes	27.9
Nathan's Lake West	Yes	16.5
Pintail Wetlands	Yes	7.1
Rail Wetlands	Yes	21.2
Skink Wetlands	-	21.9
West Dike North	-	3.7
West Dike South	-	1.1
Yellowlegs Wetlands	Yes	26.8
TOTAL ACRES	207	462

*All GIS acreages are approximate calculations of areal extent based on 2010 aerial imagery.

Current Management

Water control structures are used to manage water levels. Additional management actions include pumping water between units, disking wetlands, and prescribed burning. Water is typically pumped into units in the fall to provide stopover habitat for migratory waterfowl.

DeSoto NWR's wetlands consist of historic scours, side channels, oxbows, and natural depressions. Several factors have limited the size and extent of wetland habitats on the refuge in the past, including the following:

- Many wetland areas were modified to trap sediment in the past as a part of the Corps' Bank Stabilization and Navigation Project.
- Missouri River channel training structures and greater control of the river's water levels have virtually eliminated the natural overbank flooding that once occurred within the floodplain—along with the natural wetland complexes that were created and replenished by these flood events.

- DeSoto Lake's water levels have been maintained below certain thresholds to avoid drainage issues with upstream landowners.
- A number of restorable wetland areas have been left unrestored to facilitate the agriculture program.

DeSoto NWR has 170 acres of managed seasonal wetlands in five wetland complex management units. Each complex is comprised of a number of smaller sub-units. The wetlands are managed to provide a diversity of habitats and vegetation structure (forests, annual emergent vegetation, dense perennial vegetation, mudflats, and open water) for use by migratory birds. Refuge wetland complexes are illustrated in figure 3-23, and include:

- Headquarters (21 acres)
- Red Barn (34 acres)
- Botos (32 acres)
- Lone Tree (75 acres)
- Wood Duck (8 acres)

The Headquarters Complex has three sub-units connected by ditches and stop-log structures. Water is pumped from a well to feed this complex. The Red Barn Complex was created in 2004 and has two sub-units. Water is pumped into these units from two separate wells. The Botos Complex has four sub-units that are connected by stop-log structures. This complex is fed by the same well used for a portion of the Red Barn Complex. The Lone Tree Complex is composed of two moist soil units. The south unit has four cells interconnected by water control structures. Water is pumped into the south unit seasonally from a well at the southeast corner of the unit. The north unit consists of two cells interconnected by stop-log structures. The Wood Duck Complex is filled by a ditch system and/or water pumped from DeSoto Lake. Five of the wells that feed these wetland complexes were installed in 2003 and 2004, and electric pumps are used to extract groundwater. These seasonal wetland complexes are filled each spring and fall to accommodate migratory birds passing through the area. During the summer the water levels are drawn down to promote plant growth.

Climatic conditions and rain events largely dictate the water availability within most of Boyer Chute NWR's wetlands. Refuge staff work to maintain productive wetland habitat for waterfowl feeding and resting and for other wildlife by maintaining a healthy balance of open water and emergent vegetation. Periodic soil disturbance is used to stimulate annual forb germination. Water level management and herbicide application are also used to control undesirable emergent and aquatic vegetation such as river bulrush, cattails, and phragmites.

Boyer Chute NWR is able to manage water levels in 12 wetland units using 16 water control structures. Six of these wetland units (approximately 124 acres) use water-control structures to divert water from Deer Creek into the basins. In non-drought years there is adequate drainage in Deer Creek to supply the needed water to all six wetlands. The units that utilize Deer Creek diversion structures include:

- Mallard East (19 acres)
- Mallard West (26 acres)

- Nathan's Lake East (28 acres)
- Nathan's Lake West (17 acres)
- Mud Lake South (19 acres)
- Mud Lake North (15 acres)

Five additional wetlands encompassing approximately 76 acres also have water control structures to provide management capability but are entirely dependent upon precipitation or Missouri River flooding to supply water. These wetland units include:

- Rail (21 acres)
- Meanders (5 acres)
- Horseshoe North Impoundment (15 acres)
- Yellowlegs (27 acres)
- Bluewing (8 acres)

Water levels in the Bluewing wetland (8 acres) can also be managed by pumping water from a nearby well into the basin. A suction line can be dropped into the center-pivot irrigation well casing in the northwest portion of the wetland and a 6-inch trash pump can be used to add water to the area.

There also are a number of wetlands on the refuge in which climatic conditions largely dictate water availability because a direct water source is unavailable. Boyer Chute NWR has 232 acres of these unmanaged wetlands, including:

- Skink (22 acres)
- Pintail (7 acres)
- Dugout (4 acres)
- West Dike North (4 acres)
- West Dike South (1 acre)
- Boyer Bend Backwater (37 acres)
- Lower Calhoun Bend Side Channel (9 acres)
- Horseshoe Lake Complex – unimpounded areas (91 acres)
- Boyer Chute (57 acres)

The Boyer Chute, Boyer Bend Backwater, and Lower Calhoun Bend Side Channel have been designed to remain connected to the Missouri River. Their water levels are entirely dependent on Missouri River flows.

The Horseshoe Lake Complex is a large, drained wetland feature with very little active water management. Water exits the complex via an open ditch two-thirds of the way down the east side of the bend and ultimately discharges into the Boyer Chute. The southern tip of the

wetland complex (approximately 5 acres) is on private property. Restoration of this wetland complex is a high priority for the refuge.

There is one additional 30-acre wetland area not owned or managed by the Service but located within the authorized boundary, Boyer Bend WMA Wetland. This wetland is owned and managed by the Iowa DNR.

The Fort Calhoun Drainage District maintains an easement on Deer and Turkey Creeks, permitting access for maintenance.

DeSoto Lake

DeSoto Lake is a large, prominent, and central feature of DeSoto NWR. The surface area of the lake varies seasonally, but average total surface area ranges from 800–900 acres. The water volume has been estimated at approximately 6,390 acre feet. According to a 2006 USGS study, average water levels in the lake range from 986.5 to 989.5 feet above MSL, constituting a difference of 156.5 acres of surface area (Elliot et al. 2006). Multiple drainage ditches extend over 24 linear miles and drain 12,563.46 acres (19.63 square miles) of predominantly agricultural private land in the watershed before entering DeSoto Lake via three primary inputs (Iowa DNR 2012). Water levels in DeSoto Lake are influenced by four major factors related to precipitation in the watershed: runoff from the three aforementioned agricultural drainage ditches (Young's, Rand's, and Brown's Ditches) that release into the lake, Missouri River flows, sheet flow over the land surface, and local groundwater levels.

Bathymetric maps were created by the Service in 1967 using five-foot contour intervals, then again by the Iowa Conservation commission in 1979 using four-foot contour intervals, and finally again in 2006 by the USGS. All work prior to 2006 did not document the survey density and/or water surface elevations and thus are of limited comparability with other studies. The 2006 study created high-precision maps of depth, elevation, and substrate condition based on a water surface level of 988.76 feet above MSL. Results indicate an average depth of 7.6 feet and a maximum depth of 21.98 feet. Overall, the west arm of the lake is substantially shallower (no point greater than 11.5 feet) than the central or eastern portions, and the deepest areas occur on the outside of the central and eastern sections, opposite sandbar deposition areas (see figure 3-26). These depth features are consistent with those found in other bends of the Lower Missouri River and are a legacy of the bend's previous riverine conditions. Substrate in areas under four feet is primarily soft silt and fine sand; clay is rare. A considerable amount of soft silt is located near ditch outlets. Assuming similar lake levels in 1979, comparison of the three lake bathymetry studies indicates an overall shallowing trend; maximum depth in 1967 was recorded as 34.9 feet, 26 feet in 1979, and 21.98 in 2006. According to these numbers, estimated sedimentation rates for the deepest parts of the lake from 1967–1979 were 8.9 inches per year, and from 1979–2006 were 1.8 inches per year (Elliot et al. 2006).

Figure 3-26: DeSoto Lake Bathymetry (2006)



Current Management

Past management of the DeSoto Lake prioritized open water habitat for the sport fishery. Walleye, channel catfish, flathead catfish, white bass, largemouth bass, and northern pike are typically stocked in the lake. The upper end of DeSoto Lake and a limited number of shoreline areas provide shallow water habitat conditions and cattail marshes. The central and lower portions of the lake are managed for open water habitat. DeSoto Lake has been managed without connectivity to the Missouri River throughout most of its history to maintain the stocked sport fishery. At times managed connectivity was created via water control structures on either end of the lake. At the time of writing, the fish passage barrier at the southern end of DeSoto Lake was not functional due to damage sustained during the 2011 flood. This lower end of the lake can also be opened and free-flowing to the Missouri River. When Missouri River levels are high and above the inlet elevation, lake management is designed to allow for water intake. Winter lake levels are maintained high to reduce fish kills; spring drawdowns are used to accommodate spring runoff from the watershed; and a fall drawdown occurs to provide food resources for waterfowl.

To improve the lake's fishery and reduce the rough fish populations the lake was drawn-down in 1985, treated with 9,000 gallons of Rotenone, and then re-stocked with sport fish. Additional improvements to the fishery have included installing an artificial aeration system with 16 helixers on the northeast side of the lake in 1985 to raise dissolved oxygen levels (damaged during 2011 flooding); providing additional cover, bottom structure, and habitat diversity in the form of rock jetties, underwater piers, and brush piles; armoring the banks of the lake to prevent erosion; and adding an electric fish barrier between the lake and the Missouri River (not functioning at the time of writing).

Lake management and monitoring continues to be conducted in coordination with the Service's Columbia, Missouri Fisheries Office, the Iowa DNR, and the Nebraska Game and Parks Commission (NGPC). The lake's fish monitoring program has included electroshocking and creel censuses. One additional method used to reduce the lake's rough fish population has been permitting private commercial harvesters to net buffalofish and carp. This activity has occurred between April and October with the year's take ranging from 7,000–18,000 pounds.

The three drainage ditches that terminate in DeSoto Lake are a substantial source of suspended sediment. There are pending water quality issues related to turbidity and algae, and the lake is currently listed as a state impaired water by the Iowa DNR under section 303(d) of the Clean Water Act. Watershed farmers are encouraged to put buffer strips of native vegetation along drainage ditches. Water from agricultural ditches is pumped into refuge wetlands to filter drainage when possible. Limited water quality monitoring is conducted in the lake.

Grasslands

Grasslands were a major component of the Missouri River floodplain ecosystem prior to large-scale conversion to agriculture. The extent and distribution of different grasslands types in the river valley varied over time in response to disturbance frequency and severity. Because the Missouri River valley at DeSoto and Boyer Chute Refuges is located in bottomlands between the tallgrass prairie ecosystem to the east and the shortgrass prairie ecosystem to the west, the refuges support native grass species that are found in tallgrass, shortgrass, and wet prairies.

Historically, uplands and well-drained areas of the refuges would have contained warm and cool season grasses with occasional forbs and shrubs. Northern tallgrass prairie remains an important habitat on the refuges. Tallgrass prairie was once the Midwest's largest and most biologically productive ecosystems, but it has been reduced to less than one-tenth of one percent of its original extent and has become functionally extinct due to fragmentation, fire control, and the extirpation of keystone species. Today's remaining prairie remnants are generally small, and woody encroachment further threatens the habitat quality.

Some of the native upland grasses found in the tallgrass prairies of the refuges include sideoats grama (*Bouteloua curtipendula*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), Canada wild rye (*Elymus canadensis*), big bluestem (*Andropogon gerardii*), sand lovegrass (*Eragrostis trichodes*), eastern gamagrass (*Tripsacum dactyloides*), Indiangrass (*Sorghastrum nutans*), buffalo grass (*Buchloe dactyloides*), blue grama (*Bouteloua gracilis*), green needle grass, (*Nassella viridula*), Virginia wildrye (*Elymus virginicus*), and western wheatgrass (*Pascopyrum smithii*).

Flood conditions like those experienced in the mid-1990s and 2010–2011 occur infrequently in modern times due to river regulation. This, combined with increased drainage systems for agriculture, have reduced the occurrence of wet prairies in the Missouri River floodplain. Nonetheless, in low areas or during prolonged or extreme precipitation events, ground and surface water levels can lead to saturated soil conditions and ephemeral wetlands. In these areas the prairie community may transition to include wet prairie species that can survive long periods of inundation such as prairie cordgrass (*Spartina pectinata*), sedges (*Carex sp.*), and switchgrass (*Panicum vergatum*).

DeSoto NWR supports approximately 2,987 acres of grasslands distributed throughout the refuge. The majority of the refuge's grasslands contain warm season grasses, but a number of areas have been planted to cool season grasses.

When established, Boyer Chute NWR's authorized boundary contained no virgin tallgrass prairie; all grasslands had been cleared and were being used for agriculture. However, native tallgrass prairie has been reestablished in many areas of the refuge. Grasslands and herbaceous vegetation now comprise approximately 2,918 acres of the refuge.

Current Management

Prior to flooding in 2010 and 2011, both refuges' grasslands were actively managed for upland (mesic) prairie species to support grassland birds. Grassland habitats were established and maintained through prescribed burns, mowing, haying, seeding (local ecotype), and hydrological restorations. Grazing has not been used on either refuge to date. Annual noxious weed inspections were conducted and treatments were applied as necessary. Post-flood upland grassland management will continue in many areas, but some grasslands on the refuges may shift to favor larger sedge meadow components as a result of the 2010 and 2011 floods. Grassland management is also guided by studies conducted on the refuges, such as work in the late 1990s (Van Dyke 2004) indicating that grassland birds respond better to burning than mowing and that they are sensitive to the shape and size of the management unit.

Grassland restorations take place during the dormant winter season or spring season and are typically performed using Truax drills and a broadcast seeder. The broadcast seeder is first used to disperse larger, coarse, combine-harvested grass seeds; the smaller forbs are then applied in a second seeding. Three different seed sources have been used in recent years for

grassland restorations: a standard commercial seed mix, a mix from Waterfowl Production Areas in the Rainwater Basin area of Nebraska (100 to 200 miles west of the refuges), and a local ecotype mix (collected within a 50-mile radius of the refuges). The local origin seed is sourced from two local vendors that have exclusive harvesting rights to a number of virgin prairies in Iowa.

An important component of grassland management is a prescribed fire program. Historically, fires served as large disturbance mechanisms in the tallgrass prairie, but historic fire intervals are unknown. It is estimated that fires occurred in one- to five-year intervals in eastern Nebraska (Schneider et al. 2005). Native Americans regularly burned the prairie to drive game animals, and lightning fires occurred frequently. Grasslands can burn whenever there are dry solids, even in mid-summer when foliage is green. Fires that occurred across the prairies in the past burned tens of thousands of acres at a time. The spread of these fires was affected locally by topographic relief and fuel quantities, the latter of which was affected by herds of American bison (*Bison bison*).

On the refuges, fire management for tallgrass prairie involves a 3- to 5-year cycle of prescribed burning. The refuges are a combination of Condition Class 3 lands, as defined in table 3-4, and native or restored lands more accurately classified into Condition Classes 1 and 2.

Table 3-4: Habitat Condition-based Fire Management Guidelines

Condition Class	Example Fire Regime Management Options
1	Fire regimes are within the historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historical range. Where appropriate, these areas can be maintained within the historical fire regime by treatments such as prescribed fire.
2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range. Where appropriate, these areas may need moderate levels of restoration treatments, such as prescribed fire and mechanical treatments, to be restored to the historical fire regime.
3	Fire regimes have been substantially altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been appreciably altered from their historical range. Where appropriate, these areas may need high levels of restoration treatments, such as mechanical treatments, before fire can be used to restore the historical fire regime.

Forests

The quantity, composition, and age structure of the refuges' wooded habitat-types have changed greatly over the past century. Historic accounts of the Lower Missouri River (circa 1892) estimate just under 20 percent of the floodplain was in forested and shrubland cover types (Dixon et al. 2010). Cottonwood, oak, black walnut, and hickory are mentioned in Lewis

and Clark's description of the area. Much of both refuges may historically have been bottomland forest, cottonwood parkland, and shrub/scrub habitats kept in a continual state of succession by the meandering and migration of the Missouri River channel. The Missouri River Valley was then a corridor of braided, sinuous channels, sandbars, backwaters, sloughs, and marshlands all connecting the river to its floodplain. Willows colonized bare islands and sandbars, to be succeeded by cottonwoods, which in the process of plant community succession were replaced by silver maple, box elder, red mulberry, and American elm. Today, cottonwood (*Populus deltoides*) is the dominant canopy tree in the forests and woodlands. On the refuges it is concentrated primarily along the banks of the Missouri River, Boyer Chute, DeSoto Lake, and in large blocks within the oxbow formed by DeSoto Lake. Reaching 100 feet or more in height, cottonwoods tower above all other trees in the floodplain. The majority of the existing cottonwoods appear to be between 50–100 years of age, and extensive mortality has been occurring in these stands for several years. One benefit of the older cottonwood stands is roosting and cavity nesting habitat for birds. Concerns have been raised regarding minimal regeneration of this species. Historically, flood pulses were important disturbance mechanisms for floodplain vegetation and new germination occurred in disturbed areas, but these events have been virtually eliminated since Missouri River flow regulation was stabilized circa 1952. The reduced frequency, or absence, of these flood pulses (and the sediment loads they once transported) has reduced or prevented the formation of the bare, moist, sand substrates required for recruitment seedbeds and the cyclic regeneration of cottonwood and willow stands.

Other common floodplain trees on the refuges include black willow (*Salix nigra*), sandbar willow (*Salix interior*), silver maple (*Acer saccharinum*), black walnut (*Juglans nigra*), boxelder (*Acer Negundo*), American elm (*Ulmus americana*), eastern red cedar (*Juniperus virginiana*), and the exotic Siberian elm (*Ulmus pumila*). Many cottonwood areas are being encroached upon by shade-tolerant species that are not flood dependent, including hackberry (*Celtis occidentalis*), red mulberry (*Morus rubra*), green ash (*Fraxinus pennsylvanica*), and most noticeably, roughleaf dogwood (*Cornus drummondii*). These species may result in greater mast production (fruit and nut) as they increase in prevalence.

According to aerial imagery from July of 2012, DeSoto NWR has approximately 2,966 acres of bottomland forest and open woodlands with an additional 230 acres of shrub/scrub habitat for a total of 3,196 total combined acres (see figure 3-21).

Vegetative analysis of the 4,040 acres at Boyer Chute NWR currently owned and managed by the Service estimates approximately 15 percent (573 acres) of the refuge is bottomland forest forests and cottonwood parkland (429 acres) or shrub/scrub habitat (144 acres) (see figure 3-22). The coarser-resolution 2001 National Land Cover Dataset (NLCD) (see figure 3-10) provides a similar estimate (approximately 528 acres). When the NLCD is expanded to the entire 10,010 acquisition boundary, the quantity of forest does not increase dramatically (approximately 790 acres), because the vast majority of non-Service lands in the authorized boundary have been cleared for agriculture (Homer et al. 2007). In fact, many of the larger cottonwood trees on the east side of the Boyer Chute were harvested just prior to purchase by the Papio-Missouri Natural Resource District.

Current Management

Forest management on both refuges is predominantly passive. A few sites have been disked, seeded, flooded, or burned in the past. Refuge staff has used numerous methods to increase the size and diversify the age structure of cottonwood stands. Attempts to plant new forest stands have been met with limited success due to dry soil conditions and deer depredation.

The most successful efforts at cottonwood restoration have been a result of natural reversion after large flood events. There is little or no tree harvest on the refuges. Moderate to high tree mortality is expected following the 2010 and 2011 floods and management will identify recruitment areas, allow natural regeneration, and support the establishment of new stands in appropriate areas.

Sandbar Habitat

Missouri River sandbar habitat is rare but essential for two federally listed species of bird. Least Terns and Piping Plovers have not been recorded nesting on DeSoto NWR since the 1970s. Historic sandbars on the refuge, including the old main sandbar (the spoil pile on the northwest, or inlet, arm of DeSoto Lake) and three sandy beaches adjacent to DeSoto Lake, have succeeded to other habitat types, and woody encroachment has been encouraged in certain areas to avoid wind erosion.

At times in the past sandbar habitat areas on DeSoto NWR were disked annually to remove encroaching vegetation. Despite these efforts, these areas were only marginally suitable for nesting birds because of vegetation establishment and easy access to ground predators like raccoons, skunks, and mink. However, these sandbar areas have been used by waterfowl for loafing and by nesting turtles.

In the past on Boyer Chute NWR no management effort has been directed to creating or maintaining sandbar habitat.

Current Management

Several new sandbars were deposited on both refuges after the 2011 flood, but the location of these features makes them undesirable for Interior Tern or Piping Plover habitat. They are located next to forested areas, and on DeSoto NWR they are far from DeSoto Lake. Ongoing inventories and monitoring will help determine the future management of these sites as sandbars or successional bottomland forest.

Agriculture and Cooperative Farming

Agriculture is the primary land use in the counties that surround the refuges. More natural habitat have been converted to cropland than to any other cover type, and much of this transition occurred by the middle of the 20th century.

Most of the land that comprises DeSoto NWR was cleared and used for agriculture in the 1940s and 1950s. In fact, an additional 350 acres of the refuge was cleared to plant crops in 1963–1964. At one time nearly half (3,714 acres) of DeSoto NWR was cultivated to provide food for migratory waterfowl with the rationale that cropland provided food, loafing areas, and cover for migratory birds and other wildlife. The cropped acreage has been reduced over time so that by the time the 2001 CCP was written just under 2,000 acres remained in cultivation. The 2001 CCP planned for the reduction of cropland on DeSoto NWR to 475 acres by 2016.

No farming occurs on any lands owned by the Service within the authorized Boyer Chute NWR boundary. However, most of the private land within the boundary is currently utilized for agricultural production.

There are a number of benefits and challenges associated with agriculture for the refuges due to their location in the Missouri River floodplain. For over a century levees and impoundments have been constructed to make farming possible on lands within the natural floodplain zone of the Missouri River. These lands offer highly fertile alluvial land with ready access to irrigation. However, yields are regularly reduced by flood events and seasonal high water tables. Agricultural use keeps otherwise marginal floodplain land values high, and engineered drainage alters local hydrology and natural drainage patterns. The land conversion also adversely impacts wildlife species by decreasing habitat availability, quality, and connectivity thereby increasing overall fragmentation of habitat. In addition, runoff from crop fields and pastureland contribute to non-point sources of pollution. Many agricultural processes can also lead to increased erosion, sedimentation, and eutrophication in the watershed lakes, ponds, wetlands, streams, and rivers. Many of these substances, such as organochlorines and organophosphates, are known to be toxic to fish and wildlife via direct exposure, bioaccumulation, and bio-magnification (Cox 1991).

Current Management

In 2012, 16 agricultural fields comprising approximately 617 acres of DeSoto NWR were farmed by three local cooperators. Farm field locations on the refuge remain fairly static, but crops types have a three-year rotation of corn, soybean, and wheat/clover. The refuge receives a 25 percent share, which provides additional food stores for migratory birds.

No agriculture has occurred on Service-owned land on Boyer Chute NWR since 2004; however, nearly all inholdings (5,309 acres, or 53 percent of the total authorized boundary) are farmed annually. Cooperative farming occurred on the refuge in the past as means to transition newly acquired lands from cropland to native cover types.

In 2011, the Midwest Region of the Service completed an environmental assessment (EA) for row crop farming and the use of genetically modified glyphosate tolerant (GMGT) corn and soybeans on refuge lands (FWS 2011e). Under the selected alternative, beginning in 2012, the use of farming on Refuge System lands in the Midwest Region can continue only in specified management situations: for achieving multiple objectives that include habitat restoration, habitat management, supplemental food for wildlife, and/or attracting wildlife for viewing and photography. In addition, the use of GMGT crops can be used only for habitat restoration. Similarly, the Service's ecological integrity policy specifies that GMGT crops cannot be used on refuge System lands unless they are "essential to the accomplishment of refuge purposes." If a refuge proposes the use of GMGT crops under any circumstances an approval process, including an eligibility questionnaire, is required to explain and justify the need. Currently, GMGT crops are not used on DeSoto NWR.

Special Management Areas

In 1972, Cottonwood Research Natural Area (RNA) was established alongside the Missouri River at the southeastern arm of DeSoto Lake (see figure 3-21). This 320-acre zone has an overstory of mature cottonwoods, a midstory of roughleaf dogwood, and an understory of poison ivy and horsetail species. The RNA has been used by Bald Eagles as a roosting site. No active management is conducted in this area. To date, no specific research has been conducted in this area.

Invasive Plant Species

Invasive species enter new areas and often cause harm to the environment, the economy, and in some cases human health. Invasive species are a growing challenge in wildlife and habitat management, because there are increasing numbers of invasive species, and because introductions occur across all habitats on land and water. The introductions are often irreversible, the controls for invasive species are often expensive and/or toxic, and invasive species often have negative impacts to native species in the form of displacement and competition.

In Washington County alone there are 84 invasive plant species documented by the Early Detection and Distribution Mapping System, a database maintained by the University of Georgia's Center for Invasive Species and Ecosystem Health (University of Georgia 2011). Many of these have spread to the refuges—including some that were introduced intentionally (i.e., smooth brome grass was planted as a ground cover by DeSoto NWR staff early in the refuge's history).

The following list includes some of the more common invasive species on the refuges:

- Canada thistle (*Cirsium arvense*)
- musk thistle (*Carduus nutans*)
- leafy spurge (*Euphorbia esula*)
- purple loosestrife (*Lythrum salicaria*)
- common reed (*Phragmites australis*)
- Siberian elm (*Ulmus pumila*)
- Chinese elm (*Ulmus parviflora*)
- tree of heaven (*Ailanthus altissima*)
- bull thistle (*Cirsium vulgare*)
- garlic mustard (*Alliaria petiolata*)
- white mulberry (*Morus alba*)
- reed canarygrass (*Phalaris arundinacea*)
- smooth brome grass (*Bromus inermis*)
- honeysuckle (*Lonicera* sp.)
- autumn-olive (*Elaeagnus umbellata*)
- cats claw vine (*Macfadyena unguis-cati*)
- cotoneaster (*Cotoneaster* sp.)
- crown vetch (*Coronilla varia*)
- dame's rocket (*Hesperis matronalis*)
- tall fescue (*Festuca elatior*)
- henbit (*Lamium amplexicaule*)

- common mullein (*Verbascum thapsus*)
- multiflora rose (*Rosa multiflora*)

Concentrations exist and vary by habitat; examples include garlic mustard and honeysuckle in forests, phragmites in wetlands and along water edges, reed canarygrass in wet meadows, and smooth brome in grasslands.

Current Management

Management for invasive species is achieved, where possible, through eradication, reduction, containment, and prevention. Invasive species are controlled in a variety of ways on the refuges, including prescribed burns, mechanical removal (e.g., plowing, manual removal), chemical applications (e.g., glyphosate), biological controls (e.g., the musk thistle seed head weevil), and flooding. In the wake of large flood events such as those in 2010 and 2011, the species, distribution, and severity of invasive species can change drastically. A few examples of treatments practices for some of the more common and problematic invasive plant species are described in the following paragraphs.

Thistles have been a primary invasive species management target because of their common occurrence in grassland restorations. The refuges use Aminopyralid (Milestone®) herbicide to eradicate Canada and musk thistles.

Smooth brome grass is found along many existing roads and trails on the refuges and often expands from these edges into restored grasslands. Both mechanical (plowing) and chemical (glyphosate) controls have been used.

Common reed (phragmites) is on the Department of Interior Species of Concern list, and genetic evidence has confirmed the existence of both native and introduced genotypes in North America. Several Phragmites clones have been discovered on the refuges, both native and exotic. Glyphosate herbicides have been used to control their spread. Mowing and prescribed burns are other tools that can be used to control this species.

Honeysuckle and autumn olive are invasive shrubs found throughout the refuges. On DeSoto NWR they are found near locations where they were planted as a landscape plant shortly after the establishment of the refuge (such as near the Visitor Center). Treatment includes mechanical removal (cutting) in the fall and chemical (glyphosate or 2 percent triclopyr) application.

There are concerns regarding the increase of reed canarygrass on the refuges following the 2011 flood.

Wildlife

The lands and waters of DeSoto and Boyer Chute Refuges host a diversity of wildlife, including over 250 species of birds, more than 60 fish species, 35 species of mammals, 30 species of reptiles and amphibians, and numerous invertebrates. Moreover, the refuges are well within the potential range of numerous additional species. Further wildlife inventorying and monitoring are likely to yield additions to the refuges' species lists (appendix B), and a changing climate may impact the ranges of the species that occur on the refuges. The refuges' wildlife inventory

includes a number of state and federally listed species such as the Interior Least Tern, Piping Plover, pallid sturgeon, and others.

As a part of comprehensive conservation planning, national wildlife refuges are charged with identifying their Resources of Concern—species or groups of species that are considered high conservation priorities for management. The process begins by compiling comprehensive lists of refuge species by taxa. These lists are then refined through a series of filters to arrive at a subset of potential focal species that the planning team evaluate for selection. The process is designed to be science-based, transparent, and well-documented. The final selections are species or groups of species chosen for their ecological significance, management implications, legal relevance, feasibility, and potential to enhance conservation partnerships. Table 3-5 summarizes the results of this process for DeSoto and Boyer Chute Refuges. Additional information on this process can be found in the introduction to appendix B.

Table 3-5: Potential Focal Species for Refuge Management

Landscape	Habitat	Potential Focal Species	Other Benefitting Species*
Missouri River	Missouri River channel	[none selected, managed by the Corps]	gulls (m), terns (m), swallows (b), waterfowl (m)
Missouri River	secondary channel/backwater area	[same as wetlands]	[same as wetlands], plus Black-crowned Night-Heron (m, pb)
Missouri River floodplain	DeSoto Lake	[same as wetlands]	[same as wetlands], plus pelicans (m, sv)
Missouri River floodplain	wetlands	shorebirds (m), waterfowl/dabblers (m, wv) including Northern Pintail, marshbirds (m, b), and wading birds (m, b)	Mallard, Wood Duck, swallows (b, m), terns (m), gulls (m) including Franklin's Gull (m, sv), secretive marshbirds (b, m) including Least Bittern (b, m)
Missouri River floodplain	bottomland mesic grassland	Eastern Kingbird (b)	Northern Harrier (m, b), Bobolink (b, m), wrens (m) including Sedge Wren (m, b), rails (m, b) including Yellow Rail (m), Dickcissel (b)
Missouri River floodplain	wet meadow	rails (m, b)	Yellow Rail (m), Sora and Virginia Rail (b, m), wetland sparrows (m) including Nelson's Sparrow (m)
Missouri River floodplain	bottomland forest	Red-headed Woodpecker (b)	Rusty Blackbird (m, wv), Bald Eagle (b, m, wv), Mallard (m, b, wv); passerines (m)
Missouri River floodplain	cottonwood parkland	Red-headed Woodpecker (b)	Orchard Oriole (b), Bald Eagle (b, m, wv), other raptors (b, m, wv)
Missouri River floodplain	shrub/scrub	Black-billed Cuckoo (b)	Bell's Vireo (b), warblers (m), vireos (m), and thrushes (m)
Missouri River	sandbar	Piping Plover (m, pb), Interior Least Tern (m, pb)	Hudsonian Godwit (m), terns (m), shorebirds (m), and gulls (m, wv)

*Abbreviation Key: (m) migrant, (b) breeder, (pb) potential breeder, (sv) summer visitor, non-breeding, (wv) winter visitor

According to the 2001 DeSoto NWR CCP, population objectives were set for snow geese (help reduce the mid-continent population by 5 percent annually) and deer (a maximum of 30–35 deer per square mile, or 330–380 wintering deer on the refuge). No population objectives have been established for Boyer Chute NWR.

Birds

The refuges provide habitat to many migratory and resident bird species (see appendix B for the refuges' bird list). A broad spectrum of birdlife is represented, from resident game birds such as quail, pheasant, and wild turkey to shorebirds, waterfowl, neotropical migrants, short distance migrants, resident songbirds, hawks, owls, and other raptors.

The Missouri River Valley is noted for its large-scale migrations of water birds and waterfowl including White Pelican, Double-crested Cormorant, Greater White-fronted Goose, Canada Goose, and a large percentage of the mid-continent Snow Goose and Ross's Goose populations (the latter species limited to a few hundred birds). Also included are several species of dabbling duck including the Mallard, Green-winged Teal, Northern Pintail, Blue-winged Teal, Ring-necked Duck, Lesser Scaup, Wood Duck, and Common Merganser. When the 2001 DeSoto NWR CCP was written, hundreds of thousands of snow geese were using DeSoto NWR for resting and feeding, primarily in November and December. Roughly 70,000 ducks, primarily mallards, stop at the refuges during the fall migration.

The Missouri River is a major raptor flyway for the eastern Great Plains, but most of the birds follow the eastern loess bluffs in Iowa southward. Detailed data for migratory raptors in this region can be derived from the Hitchcock Nature Center located five miles southeast of the refuges in Pottawattamie County, Iowa. Monthly tallies can be obtained from the Hawk Migration Association of North America. Dominant raptors utilizing this site and occasionally occurring on the refuges include Turkey Vulture, Broad-winged Hawk, Swainson's Hawk, Red-tailed Hawk, Northern Harrier, Osprey, Bald Eagle, Peregrine Falcon, and Merlin. Maintenance and restoration of riverside gallery forest offers shelter for migrant raptors. A number of Bald Eagle roosting sites are located at or near the refuges. Bald Eagles migrate across the refuges in late November and December; well over 250 have been observed on the refuges at one time.

A considerable number of shorebirds utilize the Missouri River Valley during spring and fall migrations, although species diversity is typically greatest in spring when suitable habitat is more readily available. The refuges have a low diversity of shorebirds species and a low overall quantity of shorebirds from what would be expected based upon refuges along the same general north–south valley alignment such as Squaw Creek NWR to the south (Missouri) and Big Stone NWR to the north (Minnesota). Lack of habitat for shorebirds may be the reason for this. A deficit of available habitat likely exists most years in mid-summer to late summer and autumn. Species that occur in moderate to large numbers in other sections of the Missouri River Valley include Black-bellied Plover and American Golden-Plover (mainly during spring for both species), Semipalmated Sandpiper, Least Sandpiper, White-rumped Sandpiper (mainly late spring), Pectoral Sandpiper, Dunlin, Stilt Sandpiper (more common in spring), Long-billed Dowitcher, Wilson's Snipe, Hudsonian Godwit, Buff-breasted Sandpiper, Red-necked Phalarope (mainly spring), and Wilson's Phalarope (mainly spring). Shallow water foraging areas and exposed flats attract the above species from April 20 to June 5 and from July 1 through the end of October.

Large numbers of Black Tern and Forster's Tern and the federally listed interior Least Tern utilize the Missouri River as a migration corridor to northern breeding grounds, especially in spring. Other species such as Franklin's Gull, Bonaparte's Gull, and Caspian Tern also utilize this stretch of river. All of these species seek roosting islands either in the main channel of the river or use adjacent marshes as resting areas during migration.

Three species of concern in the Midwest Region of the Service that are found in this area in good numbers are the Red-headed Woodpecker, Whip-poor-will, and Orchard Oriole. All three species utilize open, lightly grazed or periodically burned savanna habitat. The woodpecker and the oriole are also found in bottomland forest, especially cottonwoods. The woodpecker prefers older, mature cottonwoods with numerous dead branches and snags, while the oriole prefers younger, denser cottonwoods.

Streamside and upland thickets in this region also attract two species near the northwest portion of their breeding range—Bell's Vireo and Blue Grosbeak. Suitable habitat for both species includes dense and tall thickets that result from periodic burn regimes followed by a several-year burning moratorium.

The Missouri River Valley is a major flyway and stopover site for thousands of migrant swallows including all regularly-occurring eastern North American species. Tree snags near water, bulrush, native cattail, and other tall wetland grasses in ponded areas allow local populations of these birds to roost at night. Identification and protection of these roost sites in mid to late summer is beneficial to these bird populations.

Like other refuges situated along major migration corridors, the aerial habitat is considered a separate habitat in its own right providing a major foraging habitat for Whip-poor-wills, migrant waterfowl and water birds, shorebirds, raptors, and day-flying passerines such as swallows and Chimney Swift; as well as breeding birds with aerial courtship displays such as Red-tailed Hawk and American Woodcock. Future development of wind turbines and power lines on nearby bluffs could be a major hazard to some of these species.

DeSoto NWR has been recognized as an Important Bird Area (IBA) by the Audubon Society in both Iowa and Nebraska. Boyer Chute NWR was designated a Nebraska IBA in 2005. The IBA program identifies sites that are critical to the survival of bird species and promotes the conservation of these sites to maintain healthy bird populations. It is part of an international program overseen by National Audubon Society and BirdLife International in over 150 countries around the world.

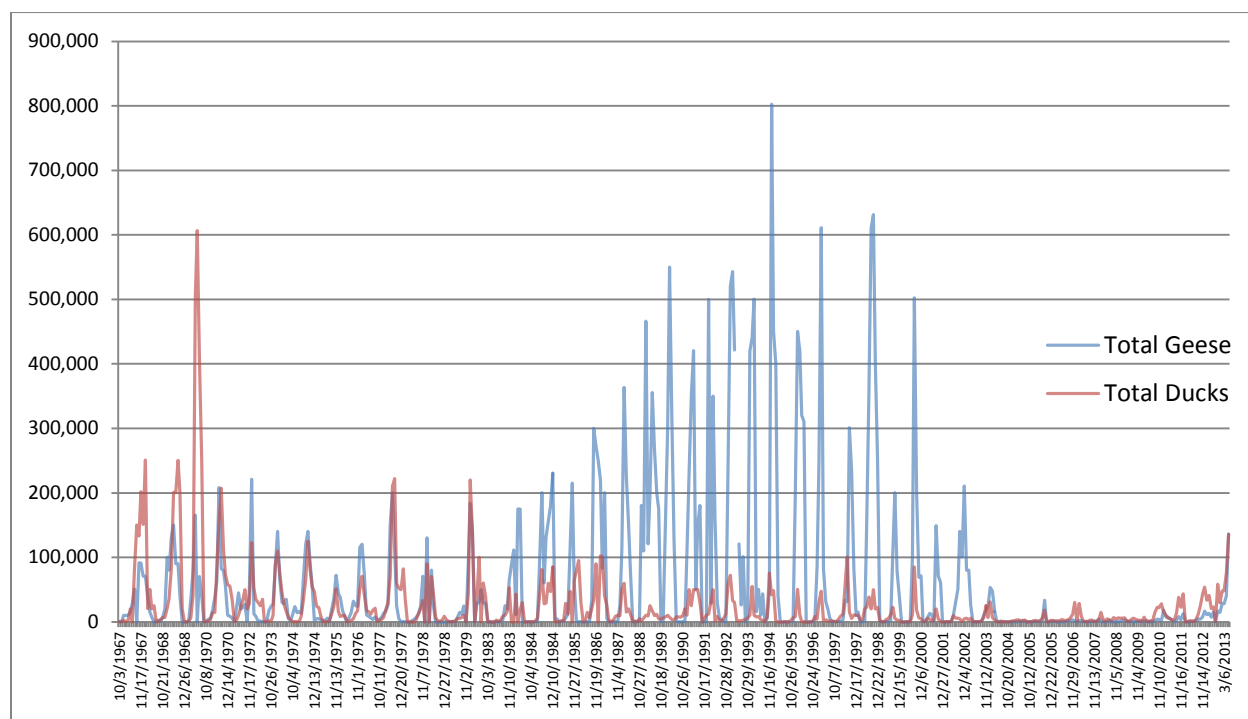
Current Management

The refuges' management for birds involves both habitat management and monitoring/survey efforts. Refuge habitat restorations have prioritized warm season, high diversity prairie and larger, unfragmented blocks of forest and grassland habitats. As a result, the refuges' grasslands and forests host substantial numbers of trust species and birds of conservation concern (McCarty and Wolfenbarger 2009).

Grassland habitats are actively managed for grassland birds such as Dickcissel, Loggerhead Shrike, Grasshopper Sparrow, Henslow's Sparrow, Bobolink, and Eastern Meadowlark. Grassland habitat management includes prescribed fire, mowing, seeding, and hydrological restorations. Annual Christmas and spring bird counts, weekly counts during migrations, and other periodic point counts are conducted.

The refuges currently contain nearly thirteen miles of Missouri River waterfront habitat (counting Service-owned lands only); full acquisition would result in over 22 miles of riverfront habitat. DeSoto Lake and Missouri River side channels, chutes, and backwaters also provide shoreline habitat. In addition, the refuges also contain permanent and seasonal wetlands, which are managed to provide productive habitat for migratory waterfowl, shorebirds, wading birds, and secretive marshbirds. Wetland water levels are adjusted, where possible, to maintain a balance of open water, emergent vegetation, and mud flat areas. Use of refuge wetlands by ducks, geese, coots, shorebirds, and wading birds is monitored weekly during both spring and fall migrations. Migratory waterfowl numbers have increased in recent years on both refuges (figure 3-27). Weather in recent years has played a role in the increasing migratory waterfowl numbers on DeSoto NWR. In addition, two management actions have been undertaken to support the increasing trend: an increase in wetlands and food on the refuge, and the establishment of the closed areas to provide refugia. Additional wetlands are being restored to attract greater numbers of migratory birds. Waterfowl counts are conducted weekly during the spring and fall migrations. Over twenty waterfowl species use the refuges as a stopover. Those in greatest abundance on the refuges include Mallards, Canada Geese, and Wood Ducks, with peak total waterfowl numbers during fall migrations ranging from 10,000 to 70,000 birds (28,000 in 2010 and 42,000 in 2011).

Figure 3-27: Migratory Goose and Duck Trends at DeSoto NWR, 1967-2013



Many of the monitoring efforts on the refuges have been conducted in collaboration with partner organizations utilizing volunteers. Boyer Chute NWR began breeding bird surveys in the late 1990s, which were replaced by the Monitoring Avian Productivity and Survivorship (MAPS) program when a banding station was established on the refuge in 2001. Christmas bird counts are conducted each year in December, and annual spring bird counts occur in May. Both have

been conducted regularly in cooperation with the Omaha Chapter of the Audubon Society. Both refuges have had Wood Duck nesting box programs in the past.

Mammals

At least 30 mammal species have been observed on the refuges with over twice that number of species unconfirmed but expected to occur based on their known breeding ranges (see appendix B for the refuges' list of mammals). A wide variety of mammals including white-tailed deer, bobcats, coyotes, red foxes, badgers, raccoons, opossums, skunks, muskrats, mink, beavers, squirrels, rabbits, woodchucks, and smaller species such as long-tailed weasels, gophers, mice, voles, and shrews can be found on the refuges. These species spend much of their time in uplands, but will use wetland and riverine areas as well for water, food, and shelter during dryer periods.

No federally listed mammal species have been confirmed on the refuges, but state listed species such as the spotted skunk, eastern pipistrelle, and southern flying squirrel have ranges that overlap the refuges. Bison and elk were once important keystone species of this prairie landscape but were extirpated in the early 1900s.

Current Management

The only mammal species that is actively managed and monitored on the refuges is white-tailed deer. When possible, aerial surveys are used to monitor the deer population. Flooding in 2010-2011 greatly reduced the area available to deer. The current deer population on the refuges is unknown because of the animal movement associated with the flood.

In order to maintain healthy habitats, the refuges have tried to manage for less than 20 deer per square mile. Excessive deer populations can also negatively affect plant communities on the refuges through selective over-grazing and reduced plant regeneration within the browse line. Few natural deer predators remain to keep deer populations in check, and deer herds can increase by 30 to 40 percent annually when protected and provided optimum habitat conditions (West Virginia DNR 1999). Optimum and maximum carrying capacity estimates for deer on the refuges vary, and habitat conditions themselves vary from year-to-year based on the dynamics of the floodplain. In general, abrupt declines in the local deer population can adversely affect the genetic structure of the herd. Conversely, when population levels exceed carrying capacity, deer become more susceptible to disease (e.g., hemorrhagic disease and chronic wasting disease), resulting in higher mortality.

Deer management is typically conducted through the refuge hunting programs. The hunting program provides the most effective tool for deer management on the refuges and facilitates the collection of harvest data. Managing for quality habitats and healthy wildlife populations through hunt programs supports the refuge goal of maintaining viable wildlife populations associated with tallgrass prairies and bottomland forests. Hunt programs also provide important recreation opportunities for the public.

Fish and Other Aquatic Species

The Missouri River Basin supports 156 native fish species, of which 33 are now listed by the states within the basin as rare, endangered, or threatened (Hesse et al. 1989). In addition to state listings, the pallid sturgeon has been federally listed as endangered since 1990. It is

estimated that both annual catch and species diversity of commercial fish in the Missouri River declined by over 80 percent between 1947 and 1963 (Funk and Robinson 1974). Much of this change is the result of modifications to the river channel and tributaries and land use changes in the drainage basin. Some of the system changes responsible for declining fish populations include the removal of snags, loss of floodplain connectivity, alteration of the hydrograph, loss of sediment transport, altered water temperature, fish bypass, and sport and commercial fish harvest (Hesse et al. 1993).

Of the 156 fish species in the basin, 92 species are found in the Lower Missouri River and are associated with the refuges—64 of which have been confirmed on the refuges (see appendix B for a complete list). The refuges have played a part in a larger, basin-wide effort to increase habitat for a variety of native fish species, including many species that have experienced drastic population declines over the past century. The restoration of floodplain wetlands and riverine habitats such as chutes, backwaters, side channels, and sloughs benefit species of concern like the pallid, shovelnose, and lake sturgeon; sturgeon and sicklefin chub; longnose and shortnose gar; blue and flathead catfish; sauger, burbot, paddlefish, blue sucker, and silvery minnow.

In addition to rare, declining, threatened, and endangered species, more common fish species, including game species, are present in the refuges' aquatic habitats. Channel catfish, bigmouth buffalo, and freshwater drum are examples of larger fish species that are well adapted to the backwaters, chutes, and side channels provided at Boyer Chute NWR.

Non-native fish such as common and bighead carp are also abundant in the Missouri River ecosystem. Large numbers of these exotic species can be seen in shallow backwaters and tributaries of the river. Refuge staff has noticed an increase in the number of Asian carp on the refuges, from just a few scattered sightings in the past, to large numbers in just about every shallow water habitat on the refuges.

Stocked game fish in DeSoto Lake include largemouth and white bass, black and white crappie, channel and flathead catfish, bluegill, walleye, and northern pike.

Current Management

The Corps is responsible for managing the Missouri River, with an emphasis on maintaining flows for navigational purposes. The biological opinion document for managing the Missouri River and associated listed species issued to the Corps by the Service in 2000, and its 2003 amendment, encourage flow enhancement, shallow water habitat restoration, unbalanced flow regulation, species propagation, monitoring, and adaptive management (FWS 2000a, 2003).

Reasons for listing the pallid sturgeon include habitat modification (loss, degradation, and contamination), lack of reproduction, commercial harvest, and hybridization. Beneficial management activities for the species include restoring braided channels, seasonal flow patterns, turbidity, and microhabitat diversity. Additional information on the pallid sturgeon and associated recovery efforts can be found in the Threatened and Endangered Species section of this chapter (FWS 2000a, 2003).

In collaboration with the Corps, habitat has been created on Boyer Chute NWR in the form of side channels, backwaters, and shallow water areas for pallid sturgeon and other riverine species. Nearly 60 acres of riverine habitat was created by the restoration of the Boyer Chute in 1994. In addition, the Corps restored approximately 45 acres of backwater and side channel habitat along the Missouri River on Boyer Chute NWR in 2009–2010. These restoration

activities have created spawning and nursery habitat as well as resting areas for native fish species. An additional benefit achieved by reconnecting wetlands and floodplain streams to the main river channel is increased sediment release into the river system. This influx raises water temperature, increases available food resources for aquatic invertebrates, and increases the overall biological productivity of these waters.

DeSoto Lake is an important part of DeSoto NWR's management for fish and aquatic species. In order to improve the lake fishery and reduce the rough fish populations, the lake was drawn-down in 1985, treated with chemicals (9,000 gallons of Rotenone), and then re-stocked with sport fish. Additional measures to improve the fishery have included an artificial aeration system with 16 helixers installed in 1985 to raise dissolved oxygen levels (damaged during 2011 flooding); providing additional cover, bottom structure, and habitat diversity (rock jetties, underwater piers, and brush piles); armoring the banks of the lake to prevent erosion; and adding an electric fish barrier between the lake and the Missouri River (also damaged during the 2011 flood).

Fish monitoring for DeSoto Lake includes electroshocking and creel censuses. Lake management and monitoring continues to be conducted in coordination with the Iowa DNR and Nebraska GPC, including stocking the lake with walleye.

In addition to the populations of fish and aquatic species associated with the Missouri River, riverine habitat restorations, and DeSoto Lake, additional aquatic habitat is provided by the refuges' wetlands and small open water basins.

Reptiles and Amphibians

Surveys have documented 24 species of reptiles and amphibians on the refuges, with over 60 total species expected to occur locally (see appendix B for the refuges' reptile and amphibian list).

On Boyer Chute NWR, surveys conducted throughout refuge wetlands by the University of Nebraska-Lincoln in the summers of 2004 and 2008 have confirmed nine amphibians species, and the refuge overlaps the ranges of at least 14 additional species. These species are all fairly common toads and frogs that are associated with off-river seasonal wetlands where fish predation is less of a concern. However, they also occur in riverine habitats including the Missouri River channel, Boyer Chute, and associated side channels and backwaters. Common amphibian species include gray tree frogs, leopard frogs, and cricket frogs.

Reptile species found on the refuges include six turtle species, eight snake species, and one species of skink. Common reptile species include snapping turtles, false map turtles, softshell turtles, bull snakes, and garter snakes.

Current Management

No routine management or monitoring of herpetofauna is currently conducted on either refuge.

Threatened and Endangered Species

There are a number of federally listed or state listed species of conservation concern that have ranges and habitats that overlap DeSoto and Boyer Chute Refuges. In the context of the Lower Missouri River ecosystem as a whole, three species of fish, one mussel, three mammals, two birds, one beetle, and five species of plant are considered federally endangered or threatened (NRCP 2002, FWS 2004, FWS 2011b, Whitmore and Keenlyne 1990). Table 3-6 summarizes species that are currently listed with a federal, state, or Lower Missouri River conservation status and that are associated with the refuges habitats. In the table, E indicates an *endangered* species, T indicates a *threatened* species, C indicates a *species of concern*.

Table 3-6: Refuges' Potential Species of Concern, including Conservation Status

Species Name	Scientific Name	Federally listed ¹	State listed in Washington Co., NE ²	State listed in Pottawattamie Co., IA ³	State listed in Harrison Co., IA ³	Lower Missouri River Ecosystem ⁴
Bald Eagle	<i>Haliaeetus leucocephalus</i>			C	C	
Barn Owl	<i>Tyto alba</i>			E	E	
Interior Least Tern	<i>Sterna antillarum</i>	E		E	E	E
Piping Plover	<i>Charadrius melodus</i>	T		E	E	T
Pallid sturgeon	<i>Scaphirhynchus albus</i>	E	E	E	E	E
Sturgeon chub	<i>Macrhybopsis gelida</i>		E			
Niangua darter	<i>Etheostoma nianguae</i>					T
Topeka shiner	<i>Notropis topeka</i>					E
Lake sturgeon	<i>Acipenser fulvescens</i>		T			
Pink mucket pearlymussel	<i>Lampsilis abrupta</i>					E
Indiana bat	<i>Myotis sodalis</i>	E				E
Gray bat	<i>Myotis grisescens</i>					E
Gray wolf	<i>Canis lupus</i>					E
Least shrew	<i>Cryptotis parva</i>			T		
Plains pocket mouse	<i>Perognathus flavescens</i>			E	E	
Southern bog lemming	<i>Synaptomys cooperi</i>				T	
Eastern massasauga rattlesnake	<i>Sistrurus catenatus catenatus</i>	C				
Great plains skink	<i>Eumeces obsoletus</i>			E		
Ornate box turtle	<i>Terrapene ornata</i>			T		
Western worm snake	<i>Carphophis amoenus</i>			T		
American burying beetle	<i>Nicrophorus americanus</i>					E
Dusted skipper	<i>Atrytonopsis hianna</i>			C	C	
Ottoo skipper	<i>Hesperia ottoe</i>			C	C	
Regal fritillary	<i>Speyeria idalia</i>			C		
Wild indigo dusky wing	<i>Erynnis baptisiae</i>			C		
Leonard's skipper	<i>Hesperia leonardus</i>				C	
Olympia marble	<i>Euchloe olympia</i>				C	

¹ FWS 2010a

² NGPC 2008

³ FWS 2007, FWS 2011a, Iowa DNR 2013

⁴ NRCP 2002, FWS 2004, FWS 2011b, Whitmore and Keenlyne 1990

Three federally listed species have been associated with refuge habitats in the past: pallid sturgeon, Interior Least Tern, and Piping Plover.

The pallid sturgeon was federally listed as endangered in 1990, can reach a length of up to six feet, can weigh as much as 80 pounds, and occurs in the Missouri, Mississippi, and Yellowstone Rivers. There are over 3,300 miles of riverine habitat in the pallid sturgeon's range, yet it is rarely encountered in the Lower Missouri River. This is primarily due to the loss of key backwater and side channel habitat required by the species.

The Interior Least Tern (*Sterna antillarum*) was federally listed as endangered in 1985. This species lives along large rivers and may sometimes be found hunting fish in shallow wetlands and along pond/lake shorelines. Terns nest from late April to August using barren to sparsely vegetated sandbars along rivers, sand and gravel pits, or lake and reservoir shorelines. They scrape a shallow hole in an open sandy area, gravelly patch, or exposed flat—preferably in the middle of a river far from predators—laying two to three eggs. They also often nest in small colonies of 2–20 pairs to provide increased protection from predators. The wide river channels dotted with sandbars that are preferred by the terns have been replaced by narrow forested river corridors. Recreational activities on rivers and sandbars can disturb nesting terns causing them to abandon their nests. Current estimates suggest 4,700 to 5,000 adult birds remain.

Piping Plovers (Northern Great Plains population) were federally listed as threatened in 1986. These birds make their nests on open, sparsely vegetated sand or gravel beaches adjacent to alkali wetlands and on beaches, sandbars, and dredged material islands of major river systems. They winter along South Atlantic, Gulf Coast, and Caribbean beaches and barrier islands, then arrive in their breeding grounds from mid-March through mid-May, remaining for three to four months per year. They lay three to four eggs in shallow scraped depressions lined with light colored pebbles and shell fragments; chicks hatch within 30 days. Small sand dunes, debris, and sparse vegetation provide shelter from wind and extreme temperatures.

Current Management

Throughout their combined histories, the refuges have undertaken efforts to support all three federally listed species historically associated with their habitats.

Boyer Chute NWR has worked with the Corps to help restore aquatic and riverine habitat types essential to the endangered pallid sturgeon. In addition to the Boyer Chute itself, two projects were completed along the Missouri River at Boyer Chute NWR in 2009–2010. These projects created nine acres of side channel habitat and 37 acres of backwater habitat. The chute and backwater habitat benefit many native fish species by providing warm water nurseries for young-of-the-year native fishes (such as chubs and minnows) and juvenile pallid sturgeon. These habitats may be critical to the early life stages of the pallid sturgeon and are thought to be essential to the success of the species. Research continues on the importance of chute and backwater habitats to larval pallid sturgeon during the drifting phase and downstream migration period that follows (FWS 2000a, 2003). In addition to providing nurseries, the development of these habitats offers multiple benefits to the ecosystem and its aquatic wildlife, such as improved water quality, enhanced water temperature diversity, potential spawning areas for native species, protection from high river velocities, and greater connectivity to the floodplain (Edwards 1983).

In 2004, the Service's Gavins Point Fish Hatchery released 52 pallid sturgeon into the Boyer Chute. Several of those pallid sturgeon have been recaptured at various locations in the region,

including (from north to south) Sandy Point Bend, DeSoto Cutoff, Boyer Bend, Bellevue Bend, Otoe Bend, and Upper Brownville Bend.

The historic presence of sandbar-nesting species such as the Interior Least Tern and Piping Plover was dependent on habitat provided by large, natural river dynamics that have been nearly eliminated in this portion of the Missouri River. Dams and channelization along the Missouri River, managed for barge traffic, disrupted these natural fluctuations and the sandbars disappeared. In 1890, sandbar habitat encompassed 35,273 acres along the Missouri between Nebraska and Iowa; in 1976 sandbars covered only 57 acres.

Piping Plover data in DeSoto NWR's files document an average annual peak migration population of 55 birds on the refuge from 1960–1970. Nesting records include a total of 45 nests and 135 young from 1963 to 1965, but there are no nesting records for the period from 1966 to 1970.

The annual number of migrating Least Terns observed on DeSoto NWR from 1960 to 1970 averaged 36 individuals. From 1972 to 1982 the average number observed declined to seven. Sources indicate that the last documented Least Terns to nest on the refuge did so in 1968 and 1973 (Kent and Dinsmore 1996, Iowa Ornithologists' Union 1968 and 1973).

Both species were observed on the spoil pile on the northwest, or inlet, arm of DeSoto Lake created in 1958–59 by cutting the new river channel, and the 1,800-foot strip of the former north swimming beach. Public access to both areas (just over 40 acres) was halted in 1988 to avoid disturbance and maintain the sites for these species. However, the last Piping Plover nest recorded on DeSoto NWR was found in 1977. As mentioned previously, the primary issue associated with the decline of these bird species is the loss and degradation of nesting sandbar habitats required by these species. The Piping Plover is also highly sensitive to disturbance. Ever since DeSoto Lake was separated from the Missouri River, vegetation has encroached onto the majority of the refuge's sandbars, and the habitat suitable for these two species has declined. Occasional development of the required breeding habitats for these species occurs after large flood events, and the renewed use of these habitats is encouraged by the refuges. However, maintaining appropriate conditions long-term through management prescriptions is prohibitively expensive and less effective than naturally created sandbar habitat. Unless the Missouri River channel is allowed to meander, the river flows are returned to historic regimes, and the river's sediment load increases, the habitat for these species will remain limited in Nebraska and Iowa. The refuges continue to monitor for the reoccurrence of these species locally—particularly following large-scale, landscape-modifying flood events.

As natural sandbar nesting habitat began to disappear in Iowa and Nebraska, the birds began to look elsewhere to nest, finding places like sand and gravel mining operations suitable. In Iowa, the Interior Least Tern is currently known to nest at only two sites—one near Council Bluffs and the other near Sioux City. Both sites contain fly ash deposits from power plants.

The refuges provide appropriate habitat and are within the expected range of other federally listed species in table 3-6, such as the Indiana bat and eastern massasauga, but there are no known confirmed observations of these species on the refuges.

Invasive Animal Species

Within the Missouri River, common, bighead, and grass carp are the most frequently encountered invasive fish species. Large numbers of Asian carp have been seen on the refuge in recent years. Because they are planktivorous and attain such a large size, these carp have the potential to deplete local zooplankton populations (Laird and Page 1996). A decline in the availability of plankton can lead to reductions in populations of native species including all larval fishes, some adult fishes, and the native mussels that rely on plankton for food.

Zebra mussels, an aggressively invasive bivalve, have shown up in the refuges' reach of the Missouri River in this past decade. Zebra mussels can decimate populations of native freshwater mussels, impact fisheries, clog water intake pipes, foul boat hulls, and disrupt aquatic ecosystems. Economic impacts of zebra mussels in North America during the next decade are expected to be in the billions of dollars (Missouri Department of Conservation 2010).

Current Management

Past management sought to control fish passage into DeSoto Lake—particularly non-native carp species, but flood damage to the lake's water control structures has reduced this management capability. Currently riverine fish can enter the lake through the refuge's water control structures. State partners conduct annual fisheries surveys to monitor carp populations in the lake.

Aside from invasive fish species, no other invasive or exotic animal species management is conducted at the refuges. The refuges remain actively engaged with partners working on aquatic species management in the Missouri River for fish, mollusks, and plants. Additional invasive animal species in the region, both aquatic and terrestrial, are being carefully monitored, including feral hogs, which have been sighted in both Nebraska and Iowa in recent years.

People

The People section of this chapter contains background on the various human dimensions of the refuges. Included are a portrait of the local communities, the diversity of public uses and visitor services available, refuge administration and infrastructure, support provided by partners and the public, and management of historic and cultural resources.

Socioeconomic Setting

In west-central Iowa, the entrance to DeSoto NWR is located less than 8 miles west of Missouri Valley, Iowa on U.S. Highway 30 and is only 6 miles east of Blair, Nebraska. The refuge is split between three counties: Washington County in Nebraska and Pottawattamie and Harrison Counties in Iowa. The entrance to Boyer Chute NWR is located three miles east of Fort Calhoun, Nebraska in Washington County. Some of the unacquired lands of the authorized refuge boundary also span Pottawattamie County in Iowa.

On the Iowa side of the Missouri River, the largest towns in Harrison County (population 14,928) are Missouri Valley (population 2,838) and Logan (population 1,534). Pottawattamie County to the south has a larger population of 93,158 because it contains the city of Council Bluffs (population 62,230). On the Nebraska side of the Missouri River, Washington County has a population of 20,234, which includes Blair (population 7,990) and Fort Calhoun (population 908).

Blair, the Washington County seat, is located 13 miles north of Fort Calhoun. Fifteen miles south of Boyer Chute NWR in Douglas County is Omaha, Nebraska, with a 2010 population of 408,958. Iowa has just over 3 million people, and Nebraska has approximately 1.82 million people of which approximately one-third live in the Greater Omaha–Council Bluffs Metropolitan Area. The Greater Omaha–Council Bluffs Metropolitan Area, contains almost 900,000, making it the 60th largest metropolitan area in the United States (U.S. Census Bureau 2010).

Development in the floodplain near DeSoto and Boyer Chute Refuges has come predominantly in the form of agriculture with only minor residential development. Development pressures in the area immediately surrounding the refuges have been low to moderate over the past half century, with Missouri Valley's population decreasing by about 20 percent, Fort Calhoun's population doubling over the past 50 years, and Blair's increasing by 62 percent over the same time period (table 3-7).

About a dozen farmsteads are located within Boyer Chute NWR's authorized boundary—primarily on the Nebraska side of the river. There are also three residential developments/trailer courts on the edge of the Missouri River within the authorized boundary—two on the Nebraska side and one in Iowa. In Nebraska, on the northwest corner of the refuge lies Desoto Park Estates, and to the southeast is the smaller development on North River Lane. Across the river in Iowa lies a dispersed housing development in the area of the Goosehaven Loop Road.

Table 3-7: Population Change over Time in the Cities and Towns near the Refuges

City	1960	1970	1980	1990	2000	2010
Missouri Valley, Iowa	3,567	3,519	3,107	2,888	2,992	2,838
Fort Calhoun, Nebraska	458	642	641	648	856	908
Blair, Nebraska	4,931	6,106	6,418	6,860	7,512	7,990
Omaha, Nebraska (City Only)	301,358	346,929	314,255	335,795	390,007	408,958

Demographics and Housing

The racial makeup of Harrison County is 98.3 percent White, 1.2 percent Hispanic, 0.4 percent American Indian, 0.3 percent Asian, and 0.2 percent Black or African American. The racial diversity increases very slightly in Washington County with 97.2 percent White, 2.1 percent Hispanic, 0.6 percent Black or African American, 0.3 percent Asian, and 0.2 percent American Indian. Douglas County, immediately to the south of Washington County and containing the city of Omaha, is 76.4 percent white, 11.6 percent Black or African American, 11.2 percent Hispanic, 2.7 percent Asian, and 0.7 percent Native American (U.S. Census Bureau 2010).

The average age of Harrison County residents is 42.9, with 75.9 percent over the age of 18 and 17.8 percent over 65 years of age. Females are in the slight majority at 50.6 percent. Washington County residents are slightly younger overall, with an average age of 40.8 years, 74.8 percent over the age of 18, and 14 percent over 65 years of age. Females are again in the slight majority at 50.2 percent (U.S. Census Bureau 2010).

Only 1.9 percent of Harrison County's residents speak a language at home other than English, while 2.6 percent of Washington County's population speaks a language at home other than English. The most abundant ancestral origins claimed by Harrison County residents include German (43.7 percent), Irish (19 percent), English (11.1 percent), and Danish (5.1 percent). Similarly, Washington County residents claim German (44.3 percent), Irish (15.8 percent),

Danish (12.7 percent), English (10.3 percent), Swedish (6.5 percent), and Czech (5.3 percent) origins.

In Harrison County 63.1 percent of men and 57.5 percent of women in the county are currently married, 24.8 percent of men and 18.3 percent of women have never been married, and 7.3 percent of men and 9.9 percent of women are divorced. In Washington County 62.4 percent of men and 59.1 percent of women in the county are currently married, 28.1 percent of men and 21.7 percent of women have never been married, and 6.7 percent of men and 8.7 percent of women are divorced (U.S. Census Bureau 2010).

In Harrison County, there are 6,096 occupied households of a possible 6,760 housing units (90.1 percent occupancy), with an average owner-occupied household size of 2.55 people. The numbers are slightly higher in Washington County, where there are 7,454 occupied households of a possible 8,270 housing units (90.1 percent occupancy), with an average owner-occupied household size of 2.68 people (U.S. Census Bureau 2010).

Employment and Income

In Harrison County, 67.3 percent of adults over 16 years of age are employed. The largest employment sectors include education and health care (22.3 percent), manufacturing (13.3 percent), and retail (10.4 percent), with 6.2 percent engaged in agriculture or forestry. Also, 14.9 percent are employed by the government and 10.4 percent are self-employed. The mean household income is \$62,488, and 6.2 percent of families have incomes below the poverty line (U.S. Census Bureau 2010).

Just over 69.4 percent of the population over age 16 in Washington County is employed. The largest employment sectors include education and health care (22.0 percent), manufacturing (11.2 percent), and retail (10.1 percent), with 4.3 percent in agriculture or forestry. Government employees make up 11.1 percent and 7.8 percent are self-employed. The mean family income is \$91,307, a third higher than in Harrison County, and only 2.6 percent of the population lives below the poverty line (U.S. Census Bureau 2010).

Education

Of Harrison County's residents, 91.2 percent of those over 25 years of age have completed a high school level of education, with 9.1 completing associate degrees, 15.9 having bachelor's degrees, and 3.4 percent with graduate or professional degrees. In 2010, a quarter of the population was enrolled in school (3,648), with 18.8 percent of those enrolled in post-secondary education (U.S. Census Bureau 2010).

In Washington County, 93.4 percent of those over 25 years of age have attained a high school diploma. Of this total, 9.0 percent have an associate degree, 27.4 have a bachelor's degree, and 6.6 percent have a graduate or professional degree. In 2010 over a quarter of the county population was enrolled in school (5,681), with 26.0 percent of those enrolled in post-secondary education (U.S. Census Bureau 2010).

Economic Value of the Refuge to the Local and Regional Economy

Visitors to DeSoto and Boyer Chute Refuges spend money on a wide variety of goods and services, including food, lodging, transportation, outdoor apparel, binoculars, cameras,

ammunition, and fishing tackle. Economic benefits also include annual payroll to 15 employees, tens of thousands of dollars' worth of materials and equipment, and services purchased from local vendors.

In 2006, DeSoto NWR was included in a national study of economic benefits provided to local communities by national wildlife refuges. The study found that there were 283,781 visits to the refuge in 2006, primarily associated with non-consumptive uses (261,581), fishing (20,000), and hunting (2,200). Most visitors were residents (64 percent). Visitors spent an estimated \$2.9 million related to recreation at the refuge (residents: \$1.9 million and non-residents: \$1 million). The final adjusted economic benefit provided by the refuge after the spending had cycled through the economy was \$2.6 million. This figure takes actual visitor expenditures and adds financial benefits to locals who earned income from the visitors' activities. Calculations predict that this economic activity also generated the equivalent of 52 jobs for the local economy. Spending on recreation in 2006 also generated \$364,500 in tax revenue. Finally, it is estimated that for every one dollar in budget expenditures at DeSoto NWR (\$1.5 million in the 2006 fiscal year), \$4.26 worth of recreation-related expenditures and net economic value were generated (Carver and Caudill 2007).

In 2004, Boyer Chute NWR was included in the national study of economic benefits provided to local communities by national wildlife refuges. The study notes that there were 22,044 visits to the refuge in 2004, primarily associated with hiking trails (16,816) and fishing (2,086). Visitors spent an estimated \$123,000 related to recreation at the refuge (residents: \$80,400 and non-residents: \$42,600). The final adjusted value after the spending had cycled through the economy was \$192,900. This figure takes actual visitor expenditures and adds financial benefits to locals who earned income from the visitors' activities. Calculations predict that this economic activity also generated the equivalent of three jobs for the local economy. Spending on recreation in 2004 also generated \$26,700 in tax revenue. Finally, it is estimated that for every one dollar in budget expenditures at Boyer Chute NWR (\$494,100 in the 2004 fiscal year), \$0.67 worth of recreation-related expenditures and net economic value were generated (Caudill and Henderson 2005).

The 2011 Nebraska Statewide Comprehensive Outdoor Recreation Plan provides additional information regarding recreation in the state (Nebraska Game and Parks Commission 2010). Nebraska has 2.4 percent of its total land and water base of 1,166,852 acres open to public recreation, with an additional 900,000 acres of privately-owned recreation lands and waters. Of the publicly available recreation lands, 51 percent are federally managed, 25 percent are managed by the NGPC, and 15 percent are enrolled in the Conservation Reserve Program. Recreation activities engaged in by Nebraskans that often overlap with national wildlife refuges include picnicking (77.4 percent), driving for pleasure (67.8), sight-seeing (66.7 percent), walking (65.3 percent), nature observation/photography (59.2 percent), and fishing (53.7 percent). Public use at the refuges currently accommodates a number of these activities.

The Iowa DNR estimates that nearly a quarter of the state population participates in hunting or fishing, that 1.3 million Iowans participate in wildlife-associated recreation annually, and that this recreation generates \$1.5 billion dollars annually—the equivalent of 16,000 jobs (Zohrer 2006).

Visitor Services

DeSoto NWR was established with the approval of the Migratory Bird Conservation Commission with the dual intention of providing for the needs of migratory birds and providing public recreation to local communities. Both refuges provide a number of facilities and opportunities for visitors, including all six of the priority uses established by the National Wildlife Refuge System Improvement Act of 1997: hunting, fishing, wildlife observation and photography, and environmental education and interpretation, as well as other wildlife-dependent recreation. DeSoto and Boyer Chute Refuges are open daily from sunrise to sunset. Following the 2011 floods, both refuges are managed out of DeSoto NWR.

DeSoto NWR has collected fees since 1987. Fees are collected as mandated by Congress under the Federal Lands Recreation Enhancement Act. At the time of writing, the entrance fee program was \$3.00 per vehicle and \$20.00 to 30.00 per commercial van/bus; federal Duck Stamps, Interagency passports and other such passes are accepted in lieu of the fee. A visitor survey conducted in 2011 shows 85 percent of the visitors surveyed feel the fee is about right; 13 percent feel it is too low or far too low; 88 percent agreed that the fee paid was justified by the value of the experience (Sexton et al. 2011). Boyer Chute NWR has no entrance fee, and there are no plans to collect a visitor fee.

For over two decades following its establishment, in addition to more traditional wildlife-dependent public uses, DeSoto NWR hosted diverse recreational activities such as picnicking, swimming, water skiing, and power boating. Many of these uses ended in the mid-1980s, well before the compatibility lawsuit against the Service in the 1990s questioned recreational uses that were not wildlife dependent. Visitation at DeSoto NWR has changed through time as a result of changes in recreation opportunities offered by the refuge, the addition of an entrance fees in 1987, and multiple years of flooding in the 1990s and in recent years. Just under 200,000 people visited the refuge annually in the 1960s. Annual visitation rose to nearly 350,000 in the 1970s, and then peaked in the 1980s at nearly 400,000 before decreasing to an annual average of 300,000 in the 1990s. In the late 2000s, average annual visitation hovered around 215,000, and then visitation dropped to record lows in 2010 and 2011 as a result of catastrophic flooding on the Missouri River, the closure of Wilson Island State Recreation Area, evacuation of the Steamboat Bertrand Museum Collection, and the seven-month closure of the refuge. The refuge and visitor center reopened to the public in January of 2012. In August of 2013, the Steamboat Bertrand Museum Collection was returned to DeSoto NWR. At the time of writing Wilson Island State Recreation Area remained closed. Table 3-8 shows DeSoto NWR's annual visitation counts over the past 10 years.

Visitation at Boyer Chute NWR began over Labor Day weekend in 1996. Since the refuge's inception, it has averaged just over 28,000 visitors per year. Similar to DeSoto NWR, visitation was greatly reduced in 2010 and 2011 due to long-duration, widespread flooding on the refuge. The history of visitation at Boyer Chute NWR appears in table 3-8 and is described in the sections that follow.

Table 3-8: Visitation at DeSoto and Boyer Chute Refuges

Fiscal Year	DeSoto NWR	Boyer Chute NWR	Comments
2002	176,009*	20,979	
2003	329,091*	16,375	
2004	362,427*	21,610	Last major snow goose migration
2005	216,000	25,439	
2006	253,510	26,141	
2007	211,263	27,286	
2008	191,639	26,936	
2009	254,770	29,582	
2010	175,445	15,000	Major flooding – Boyer Chute NWR and Wilson Island State Recreation Area
2011	146,250	16,868	Major flooding – both refuges
2012	128,890	11,250	Flood recovery – select area closures

*Data incomplete; this sum covers the months of January through September.

In 2011, DeSoto NWR was one of five refuges in the Midwest Region of the Service selected to take part in a visitor survey. Seventy percent of the original 203 participating visitors completed the survey. Widespread flooding in 2011 made it impossible to fully complete the second sampling period. Highlights of the results indicated that nearly 90 percent of visitors surveyed were familiar with the Service's conservation mission, half of surveyed visitors had come to the refuge on several occasions, and 63 percent were from communities in the area. Visitors indicated that the primary reasons for their visit were interpretation (28 percent), wildlife observation (15 percent), hunting (11 percent), and bird watching (10 percent); although they indicated that they engage in activities such as wildlife observation (61 percent), interpretation (45 percent), bird watching (44 percent), and auto tour driving (43 percent) while on the refuge. On average, visitors spend about \$35.00 per day in the local area. Nearly 90 percent of visitors were satisfied with the recreation opportunities, and approximately 95 percent were satisfied with the information, services, and overall conservation work done by refuge staff (Sexton et al. 2011).

Public Access and Facilities

Areas of DeSoto NWR open to the public from April 15 through October 14 include the area south of the headquarters and east of the entrance road, between the tour road and DeSoto Lake, and the area immediately surrounding the south end of DeSoto Lake near Wilson Island State Recreation Area. Only roads and trails in these public use zones are open the remainder of the year (October 15 to April 14). The area west of the Missouri River and the area southeast of DeSoto Lake are closed to the public except for the mushroom gathering season from April 15 through May 31. Finally, the areas of DeSoto NWR closed year round to visitors include the areas inside the tour road, north of the lake, and west of the entrance road. During the hunting seasons temporary access is permitted to some of these zones. Figure 3-28 depicts the visitor services infrastructure on DeSoto NWR.

DeSoto NWR provides a self-guided paved and gravel auto tour road through the refuge; bicycling is also permitted on the tour route. Kiosks and signs are located throughout the refuge for welcoming, orienting, and providing interpretive information to visitors. Information and orientation services are also available at the refuge headquarters near the north entrance to the refuge and at the Visitor Center.

Four satellite gravel parking lots with informational panels are maintained throughout the refuge for hunting access. Three wildlife observation trails are maintained: one at the Visitor Center (Visitor Center Trail) and two along the refuge tour route (Cottonwood Trail and Grassland Trail). Several accessible hunting blinds are available on the Center Island Unit. A covered environmental educational shelter is located at the Cottonwood trailhead; an environmental education gravel parking lot is maintained on the northeast corner of the refuge along U.S. Highway 30 to provide ranger guided school group access to the area. A large, accessible wildlife observation blind with two spotting scopes is located at Bob Starr Wildlife Overlook. Boating access to DeSoto Lake is provided at Middle Boat Ramp and hand-launch only access is available at the Steamboat Bertrand Discovery Site. Bank fishing is available seasonally along DeSoto Lake at Sandbar Chute, Bullhead Pond, Middle Boat Ramp, Lakeview Drive, Prairie Lane, Whitetail Drive, and the South Gate Area; an accessible fishing pier is located at the South Gate Area.

Figure 3-28: Current Visitor Services, DeSoto NWR



The Visitor Center at DeSoto NWR opened in 1981, with 26,000 square feet of space for the Steamboat Bertrand Museum Collection, interpretive exhibits, wildlife viewing galleries over DeSoto Lake, a theater, a small bookstore, an information desk, and numerous offices and meeting spaces. The building is maintained in good condition and has undergone major renovations over the past several years including new windows, a roof, lighting, and an entrance door. Additional repairs and modifications are being made to increase the building's ability to withstand future flood events. Annually 70,000 to 100,000 people visit the Visitor Center during open hours (9:00 a.m. to 4:30 p.m., seven days a week).

The Steamboat Bertrand Museum Collection has been housed in the DeSoto Visitor Center since the center was built in 1981. Flooding in 2011 caused the collection to be temporarily moved off-refuge. The Service is now conducting the first comprehensive inventory of the collection and is also in the process of updating the Visitor Center to better accommodate the collection and ensure a streamlined evacuation process should a future emergency arise. Curatorial staff are responsible for artifact loans, research and article publication, and technical assistance for inquiries from government agencies, museums, journalists, and researchers. Interpretation of the Steamboat Bertrand Discovery Site consists of a short trail leading from the parking lot to an observation platform, several interpretive panels, and a pond that formed at the completion of the Steamboat Bertrand excavation.

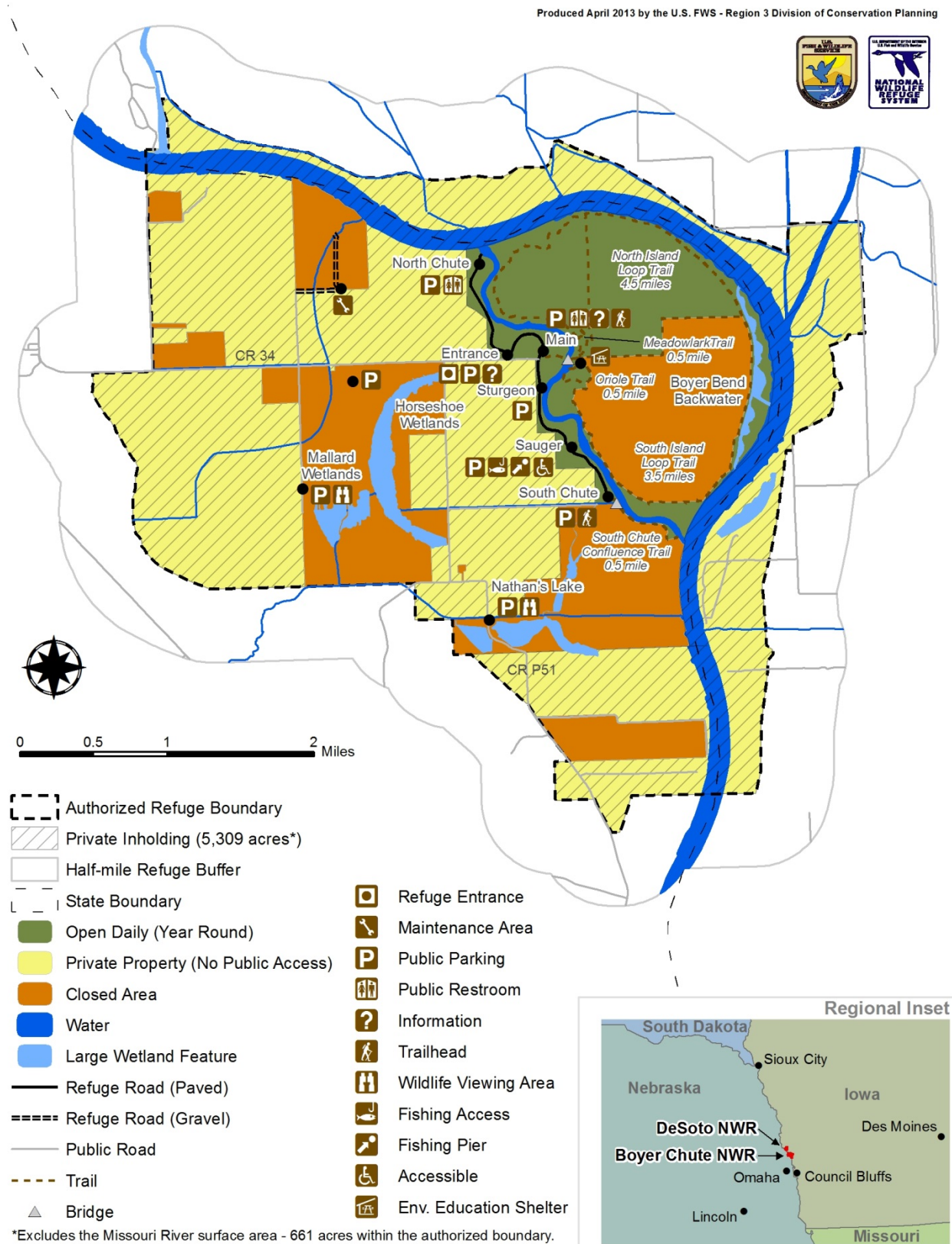
At Boyer Chute NWR (figure 3-29), all units are closed to the public except the West Chute and Boyer Island Units at the eastern end of County Road 34. All public use facilities are concentrated on these two units. The center of the south half of the Boyer Island Unit is also closed to the public. There is a heavy-duty bridge across the Boyer Chute that provides access to the Boyer Island Unit for both refuge staff and visitors. Its design has management implications, including safety concerns for boating in the chute, debris accumulation on the upstream side, and a reduction in the chute's ability to meander. Boyer Chute NWR allows mushroom gathering for personal use with no date restrictions in all open areas of the West Chute and the Boyer Island Units.

Boyer Chute NWR provides a self-guided, paved automobile tour road in the West Chute Unit. It also provides access to six parking areas and bank fishing opportunities along the chute, including one accessible fishing pier. Bicycling is permitted on the tour road. Informational and interpretive kiosks are located at the refuge entrance and at the main parking lot. There are approximately 10 miles of trails on the refuge. One of the five wildlife observation trails is located at the south end of the West Chute Unit tour road (South Chute Confluence Trail, 0.5 mile), and the other four are all located on the Boyer Island Unit [Oriole (0.5 mile), Meadowlark (0.5 mile), North Island Loop (4.5 miles), and South Island Loop (3.5 miles) Trails]. Several satellite gravel parking lots are maintained throughout the refuge for hunting access.

Boyer Chute NWR has a maintenance facility located at the intersection of Sands Lane and River Tree Road. The main shop building has three maintenance bays and was updated in 2009–2010. In addition to the main building, there are three pole sheds on the site used for equipment storage and general maintenance functions. Flooding in 2010 and 2011 has impacted the maintenance buildings and the use of this area.

Missouri River access is open to the public and managed by the Corps, not the refuges. There are no publicly accessible boat ramps to the Missouri River on either refuge, but access ramps can be found nearby in Blair, Nebraska and at Wilson Island State Recreation Area.

Figure 3-29: Current Visitor Services, Boyer Chute NWR



Public Use

Hunting

DeSoto NWR hunting opportunities include muzzleloader and archery deer, archery turkey, and special shotgun turkey hunts for youth and disabled hunters. Boyer Chute NWR has offered muzzleloader deer and waterfowl (shotgun) since 2004. State hunting license reciprocity exists for DeSoto NWR, which contains land in both Iowa and Nebraska but not on Boyer Chute NWR, because the refuge does not yet contain land on the Iowa side of the Missouri River. The refuge hunts are described in additional detail below and in figures 4-30 and 4-31.

Muzzleloader deer hunting is allowed at both refuges for managed, high saturation hunts. At DeSoto NWR this occurs in up to four hunt events annually, typically one of which is for bucks, the remainder are for antlerless deer; hunting zones vary between the two hunt types. At Boyer Chute NWR up to three antlerless muzzleloader deer hunt events occur annually on the five largest units: Boyer Island, West Chute, Nathan's Lake, Horseshoe Lake, and North-Central.

Archery deer hunting occurs at DeSoto NWR in the fall during the dates when Nebraska and Iowa have overlapping open seasons (early October to mid-January). This hunt is offered in two areas of the refuge: west of the Missouri River and the area southeast of DeSoto Lake.

Archery turkey occurs in the spring during the dates when Nebraska and Iowa have overlapping open seasons (mid-April to mid-May). This hunt is offered within two areas of the refuge: west of the Missouri River and the area southeast of DeSoto Lake.

Shotgun turkey hunting events occur on DeSoto NWR in April and May for youth and disabled hunters.

Waterfowl hunting (ducks, geese, and coots) has been allowed on Boyer Chute NWR in accordance with state and federal hunting regulations since the completion of the 2007 environmental assessment and follows the annual Service framework for the timing of migratory species hunting and the maximum allowable take. The area of the refuge designated for waterfowl hunting is defined as the immediate shoreline of the Missouri River, up to and including the high bank, and between both ends of the Boyer Chute (see figure 3-31). The majority of the hunters access the area by boat, but land access is also available. An estimated 20 waterfowl hunters use the refuge each season. DeSoto NWR does not currently have waterfowl hunting.

Small game hunting is not allowed on either refuge, although a fall youth pheasant hunt has been offered in the past on DeSoto NWR.

Trapping is not currently allowed on either refuge.

Figure 3-30: Hunting Program, DeSoto NWR

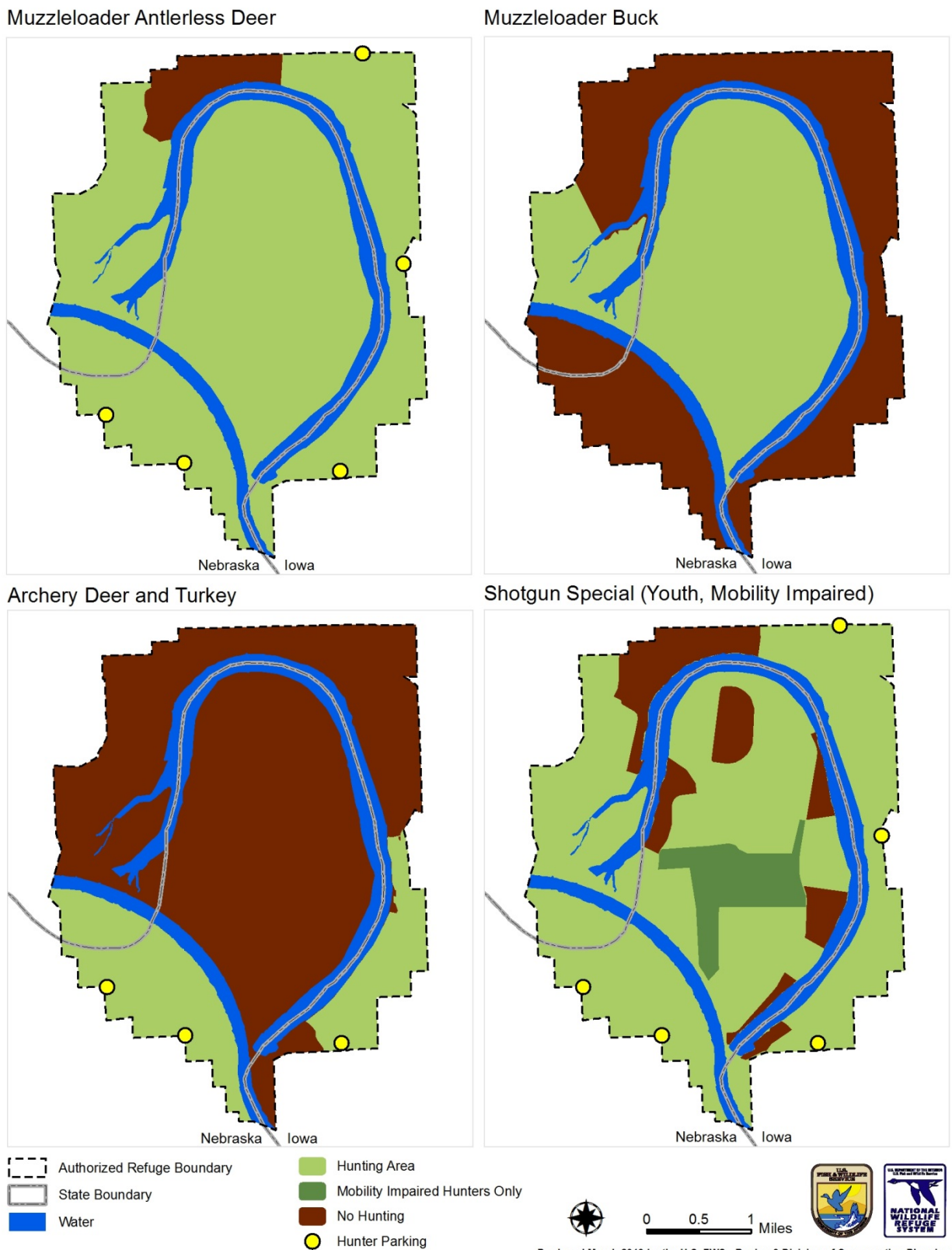
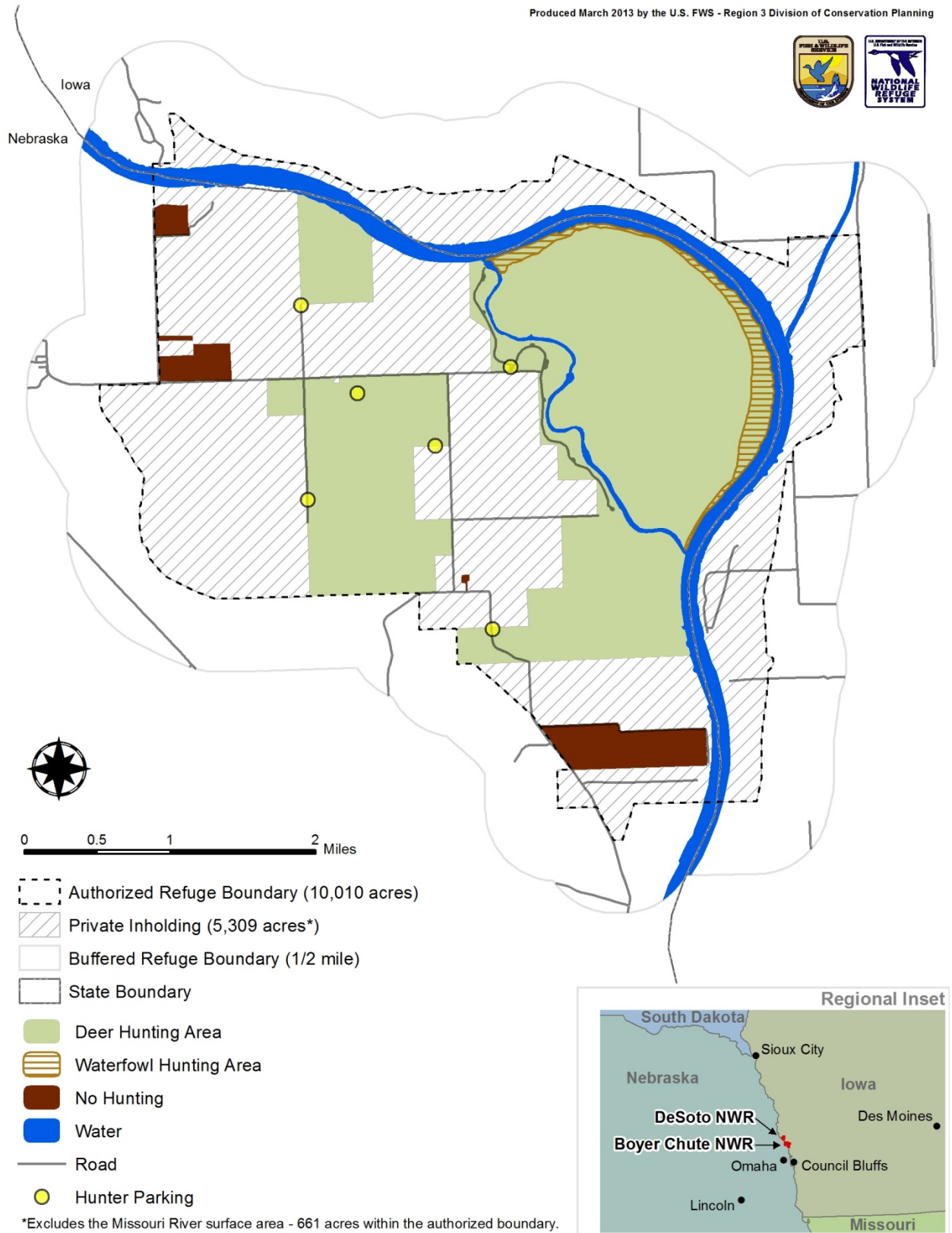


Figure 3-31: Hunting Program, Boyer Chute NWR



Fishing

DeSoto NWR provides anglers with opportunities to fish in DeSoto Lake from April 15 through October 14. In addition to bait and tackle, archery fishing for rough fish is permitted. Ice fishing on the lake is open from January 2 through the end of February. The lake supports a healthy fishery for bluegill, crappie, largemouth bass, white bass, and walleye. A number of fish habitat structures such as trees, rocks, and pallets have been added to enhance fish habitat. Motorized boating is permitted as long as visitors travel at no wake speeds (5 mph or less). The 2011 flood permanently damaged two DeSoto Lake boat ramps located at the Steamboat Bertrand Discovery Site and the South Gate. Hand-launch access remains available at the Steamboat Bertrand Discovery Site. In addition, a number of access points for bank fishing and one boat launch facility (Middle Boat Ramp) are available. Bank fishing locations include Sandbar Chute, Bullhead Pond, Middle Boat Ramp, Lakeview Drive, Prairie Lane, Whitetail Drive, and the South Gate Area. An accessible fishing pier is located at South Gate Area. No fishing is allowed in the small ponds dispersed throughout the refuge. Finally, boat fishing is permitted on the stretch of the Missouri River that passes through DeSoto NWR.

Boyer Chute NWR provides anglers with bank fishing opportunities along the Boyer Chute and the Missouri River and boat fishing on the Missouri River. In addition to bait and tackle, archery fishing for rough fish is permitted. Creel surveys indicate anglers catch a few shovelnose sturgeon as well as channel, blue, and flathead catfish; carp, skipjack herring, and drum are also caught. No off-river waters are open to fishing on the refuge, and ice fishing was permanently closed at Boyer Chute NWR in 2001 due to safety concerns on the Boyer Chute. There was an initial surge of interest in fishing in 1996 when the refuge opened, and then use stabilized in the early 2000s at 2,000 to 3,000 visits per year. Since 2005 use has hovered around 4,000 visits per year. Years with widespread flooding across the refuge (2010 and 2011) greatly reduce fishing visits and the refuge's ability to host and monitor fishing use. During normal river flows, light fishing occurs on weekdays, and larger numbers of anglers visit on weekends. Popular fishing spots include the north and south ends of the Boyer Chute, the area surrounding Boyer Chute Bridge, and the Sauger Pier. Litter associated with fishing can be problematic at times on the refuge.

Wildlife Observation and Photography

There are many opportunities to observe and photograph wildlife at DeSoto and Boyer Chute Refuges. Trails and public roads provide opportunities to see a diversity of big game, waterfowl, birds of prey, and songbirds in a floodplain landscape. The refuges provide thousands of acres of floodplain forests, prairies, and wetlands. These habitats benefit a broad diversity of wildlife including over 250 birds species, 35 mammal species, more than 60 fish species, and over 30 reptile and amphibian species. Large concentrations of waterfowl, primarily snow geese, once attracted great numbers of visitors to DeSoto NWR.

Visitors to the refuges may see Red-headed Woodpeckers, Barred Owls, Bald Eagles, Yellow-rumped Warblers, and Wild Turkey. Along the waterways, visitors may see Spotted Sandpipers, Great Blue Herons, Hooded Mergansers, and numerous species of waterfowl. The refuge habitats also attract mammals such as white-tail deer, beaver, muskrat, coyote, bobcat, badger, bats, and reptiles and amphibians including northern prairie skinks, softshell turtles, bull snakes, Woodhouse's toads, and leopard frogs. The species lists in appendix B provide additional information on wildlife that may be found on the refuges.

In addition to views from the observation galleries in the Visitor Center, DeSoto NWR visitors can enjoy the Steamboat Bertrand Discovery Site, three nature trails (Visitor Center, Cottonwood, and Grassland) extending a total of 1.76 miles, the Bob Starr Wildlife Overlook, the Missouri River Overlook, an auto tour route, and the South Gate Recreation Area. There are 11.5 miles of roads (10.9 paved, 0.6 gravel) available to the public year round, and an additional 7.0 miles of gravel roads open during non-migration periods.

Opportunities to observe wildlife are also abundant at Boyer Chute NWR. There are 2½ miles of paved roads that parallel the Boyer Chute with accessible parking areas, restrooms, and a fishing pier. Wildlife viewing is available from refuge roads, trails, and the Sauger Pier. On the West Chute Unit, the South Chute Confluence Trail runs a half-mile from the South parking lot to the Missouri River. There are also four trails on the Boyer Island Unit [Oriole (0.5 mile), Meadowlark (0.5 mile), North Island Loop (4.5 miles), and South Island Loop (3.5 miles)].

Visitation to the refuges continues throughout the winter season. At Boyer Chute NWR all available visitor facilities are open year round, sunrise to sunset. DeSoto closes approximately one-half of the refuge tour roads from October 15 through April 14 to provide refugia for migratory birds during the fall and spring migration periods. Weather permitting, visitors continue to participate in wildlife observation and photography throughout the winter at both refuges by driving and bicycling on tour roads, and snowshoeing and cross-country skiing on trails in open areas. DeSoto NWR is a popular destination for wildlife-dependent activities year round due to its well-maintained and plowed tour road and extensive Visitor Center featuring a theater, large wildlife viewing galleries, educational bookstore, public meeting space, natural history exhibits, and the Steamboat Bertrand Museum Collection display.

Environmental Education

DeSoto NWR operates a formal environmental education partnership with Blair Public Schools including an integrated curriculum developed with the school district for grades 3–12. The refuge is in the development stages of adding programs with other area schools, including an elementary school in Omaha. A number of other schools also utilize the refuges annually for self-guided or prearranged refuge staff-guided environmental education programs. DeSoto NWR hosts an average of over 5,000 student visits per year (5,951 in 2010; 6,321 in 2011; and 4,041 in 2012).

In partnership with staff at DeSoto NWR, Boyer Chute NWR hosts several environmental education classes each year. As part of the DeSoto NWR/Blair Public Schools Environmental Education Partnership, fifth grade students visit Boyer Chute NWR to study beavers and investigate signs of beaver activity on the refuge. As this partnership continues to grow it is likely that other grades from Blair Public Schools will visit the refuge. Other environmental education lessons are scheduled as requested.

Colleges and Universities periodically use the refuges for education and research, including Clarkson College, Creighton College, Dordt College, Drake University, Westmar College, the University of Nebraska, Iowa State University, Iowa Western Community College, the University of South Dakota, Morningside College, Hastings College, and Northwestern College.

Outreach and Programs

Onsite events hosted by DeSoto NWR in the past include Spring Migration Weekends/International Migratory Bird Day (IMBD) programs (February–March), Steamboat

Bertrand Days (April), National Volunteer Week/Earth Day/Spring Refuge Cleanup projects (April–May), Family Fishing Clinics (May–August), Teacher Workshop (June), Junior Refuge Manager programs (June–August), National Public Lands Day (September), National Wildlife Refuge Week/IMBD (October), Fall Migration Weekends/IMBD (November), Art-Of-The Wild wildlife art show (November), Backyard Bird Feeding programs (January–March), and wildlife-themed videos shown in the Visitor Center (weekends year round).

DeSoto NWR hosts weekend wildlife films, wildlife-related art exhibits, and winter and spring migration events. Online outreach efforts, including Facebook, facilitate public awareness of special wildlife viewing opportunities, programs, and exhibits available in the Visitor Center and refuge.

Events hosted by Boyer Chute NWR in the past included Bike to Boyer (2005–2010), National River Cleanup Week (2004–2007), National Trails Day (2007 and 2008), International Migratory Bird Day bird walk (2009), and Fontenelle Forest/Boyer Chute Butterfly Count (July). Since 2011, all refuge visitor services are based out of DeSoto NWR; public programs are intermittently scheduled at Boyer Chute or are included as part of programs (such as National Volunteer Week/Earth Day spring refuge cleanup projects, National Public Lands Day, and International Migratory Bird Day) being conducted and coordinated at DeSoto.

The refuges are also represented at outreach activities attended by staff. These events include Omaha's Henry Doorly Zoo (Earth Day) Party for the Planet (April), Nebraska Public Schools – Gifford Farm Park Family Nature Day (April), Omaha Public Schools Seventh Grade Career Day (April), University of Nebraska Medical Center's Nebraska Science Fest (April), Metro Omaha Resources for Exploring Nature (MORE) – Family Nature Nights (Spring/Fall), Wilson Island State Recreation Area Campfire Talks (June–September), and Omaha's Durham Museum – Teachers Workshop (October). Refuge-specific interpretive brochures and publications are sent to area tourism centers and are available for download from the refuges' website and Facebook pages.

Interpretation

Four primary interpretive themes form the foundation of interpretation and education on DeSoto and Boyer Chute Refuges. These themes offer visitors the opportunity to understand the natural and cultural resources of the refuges and the significance of these refuges nationally. The four themes are:

1. DeSoto and Boyer Chute Refuges provide sanctuary and a means of survival for migratory birds and other wildlife on the Missouri River floodplain by protecting, restoring, and enhancing diverse habitats that have largely disappeared from this important migratory bird corridor.
2. A mosaic of floodplain forest, grassland, wetland, sandbar, and riverine habitats are critical to the survival of diverse plant and animal life at the refuges—including rare, threatened, and endangered species such as the pallid sturgeon, Piping Plover, and Least Tern.
 - a. Innovative and science-based management techniques help preserve and restore native habitats and wildlife, especially migratory birds.
 - b. Wetlands are places of biological productivity, resilience, and beauty that provide resting and feeding areas for migratory birds, including Wood Ducks, Green-

winged Teal, Blue-winged Teal, Mallards, Great Blue Herons, egrets and many more.

3. Historic periods of exploration, settlement, and nation-building, including the passage of the Lewis and Clark Expedition (1804–1806) and Steamboat Bertrand (1865), heralded dramatic changes to the natural environment in the Missouri River Valley. These changes had substantial impacts on the wildlife and habitat in the Missouri River floodplain. Refuge resources and stories, such as those reflected by the Steamboat Bertrand Museum Collection, foster an appreciation for the impact of settlement in the Missouri River Valley and the refuges' role in conserving the river's unique natural history.
4. U.S. Fish and Wildlife Service staff and conservation partners work collaboratively in a dynamic and changing environment to understand, restore, and conserve biological communities on the refuges to benefit wildlife, and to promote an enduring appreciation for the refuges, the National Wildlife Refuge System, and Service trust resources.

In addition to the substantial interpretive facilities at the Visitor Center, DeSoto NWR also has kiosks with welcoming, orienting, and interpretive information located at the north and south entrances to the refuge, Visitor Center parking lot, and the Lewis and Clark Historic Campsite area. Informational and interpretive signs are located at the Middle Boat Ramp, Bob Starr Wildlife Overlook, Steamboat Bertrand Museum Collection and Discovery Site, Missouri River Overlook, and several additional locations along the refuge's tour road.

Natural resource interpretation provided at the kiosk and sign locations covers migratory birds and other wildlife, wildlife habitat, wildlife identification, wildlife conservation, threatened and endangered species, Missouri River channelization history, and recent habitat restoration efforts. Two major cultural themes are also interpreted throughout the refuge: the westward expansion of the United States (Lewis and Clark Expedition), and the mid-19th century Missouri River navigation and riverboat history (Steamboat Bertrand).

Boyer Chute NWR provides a self-guided, paved automobile tour road in the West Chute Unit, providing access to six parking areas and bank fishing opportunities along the chute including one accessible fishing pier. Bicycling is permitted on the tour road surface. Informational and interpretive kiosks are located at the entrance and at the main parking lot for the West Chute and Boyer Island Units. The kiosks are used to welcome and orient visitors as well as provide interpretation about the biological resources of the refuges and recent habitat restoration efforts including the Boyer Chute. One major cultural theme is interpreted—the westward expansion of the United States. Kiosk interpretive panels tell the story of Lewis and Clark's first meeting with Indian tribes in August of 1804, three miles west at the nearby "Council Bluff."

Refuge Administration

Both refuges are currently managed and staffed out of DeSoto NWR. The existing organizational chart identifies 21 positions, of which 16 are filled (see table 3-9). The 2001 DeSoto CCP requested an additional nine positions over the 19 positions that existed at the time to accomplish the objectives of the plan. Administration is split between the DeSoto NWR headquarters building, which houses most of the staff, and the Visitor Center, which houses the visitor services, law enforcement, and museum curatorial staff.

Table 3-9: Staffing on the Refuges

Position Category	No. of Employees
Manager	1
Wildlife Refuge Specialist	3
Administrative Officer	1
Museum Curation	2
Park Ranger	3
Law Enforcement	1
Maintenance	4
Student Trainee	1
TOTAL	16

The management of DeSoto NWR has been fairly stable since its creation in 1959. However, the management of Boyer Chute NWR has varied greatly over the 25-year lifespan of the refuge. The refuge was created as a unit of the Rocky Mountain Region of the Service (Region 6), but was managed by the Midwest Region (Region 3) until July of 2001. During the early 2000s the refuge was managed out of Region 6. Then in October of 2006, management was passed back to Region 3 of the Service and has remained there ever since. The refuges' close proximity and shared ecology, habitats, wildlife management, and publics make shared management more efficient.

The operations and maintenance budget for the refuges have fluctuated over the past 5 years (see table 3-10). The late 2000s saw a generally increasing trend, and then in the early 2010s budgets have been stable for Boyer Chute NWR and gradually decreasing for DeSoto NWR—the notable exception being 2012, which had a number of costs associated with 2011's catastrophic flooding.

Table 3-10: Refuge Operations and Maintenance Budgets

Fiscal Year	DeSoto NWR	Boyer Chute NWR
FY 2008	\$1,674,282	\$281,022
FY 2009	\$2,226,370	\$287,723
FY 2010	\$1,926,075	\$322,298
FY 2011	\$1,804,362	\$222,736
FY 2012	\$2,309,686	\$223,392
FY 2013	\$1,720,926 (estimated)	Funding moved to DeSoto NWR

Law Enforcement

Law enforcement on the refuges focuses on both protection and prevention. Protection seeks to safeguard the visiting public, staff, facilities, and natural and cultural resources from criminal action, accidents, negligence, and acts of nature such as storms. Incident prevention occurs primarily through the patrols and activities of law enforcement staff. Law enforcement includes verbal warnings, written notices, and warrant arrests; incidents reported include poaching, dumping, drug and alcohol use, vandalism, and auto accidents.

DeSoto and Boyer Chute Refuges share one Service law enforcement officer. As needed, the officer also assists other refuges in the Midwest Region. In addition, the refuges rely on assistance from the Iowa and Nebraska state conservation officers in the area and the Sheriff's Offices in Blair and Missouri Valley.

Refuge Support

To accomplish the conservation mission of the Refuge System, support from volunteers and partners is essential. External support is key to the success of many refuge programs.

Friends Group

The refuges share a single Friends Group: the Friends of Boyer Chute and DeSoto National Wildlife Refuge, a non-profit citizen group formed in 2003. At the time of writing, the Friends Group has approximately 55 members with about a dozen very active individuals. The goals of the Friends Group include providing awareness of the refuges and environmental education to residents of the surrounding communities, providing volunteers and support to refuge staff with environmental, educational, and wildlife-oriented projects, and raising funds for special refuge projects. At DeSoto NWR the Friends Group also manages and operates the Visitor Center's Eagle Emporium Bookstore.

Volunteer Program

Volunteerism on the refuges was relatively stable in the early 2000s but has declined in recent years due to the regularity of flood events, flood-related closures, and a reduction in the number of refuge events held throughout the year. Many volunteers work with the refuge as a part of the Friends Group or local birding groups. Refuge volunteers also assist with general maintenance, environmental education, and seed collecting activities. Table 3-11 tracks volunteerism on the refuges starting in 2000.

Table 3-11: Volunteerism at the Refuges

Fiscal Year	DeSoto NWR		Boyer Chute NWR	
	No. of Individuals	Hours Donated	No. of Individuals	Hours Donated
2000	84	4,168	14	292
2001	88	3,926	5	212
2002	137	5,962	20	4,010
2003	85	5,809	22	1,594
2004	106	5,952	60	2,151
2005	312	6,532	155	1,576
2006	562	5,202	46	1,043
2007	373	3,962	44	847
2008	343	4,222	33	781
2009	293	3,851	21	611
2010	369	4,933	22	563
2011	191	2,633	0	0
2012	262	2,262	50	180

Partnerships

Refuges staff frequently interact with many federal, state, county, and local governments in addition to a number of non-governmental organizations. In fact, it is through these partnerships that Boyer Chute NWR was created; collaborative efforts led to the initial land acquisition and numerous habitat restorations on the refuge.

In addition, there are a number of ongoing partnership activities throughout the Greater Omaha–Council Bluffs Metro Area. Examples include refuge participation in programs at the Omaha Zoo and Durham Museum, career days in metro area public schools, support of refuge activities by Bass Pro Shops®, interaction with the NGPC's Omaha Visitor Center, and regular interaction with metro news and radio outlets.

The refuges meet annually with the Corps to discuss shallow water habitat restoration projects. Both refuges are in the path of the Lewis and Clark National Historic Trail and have camps from the expedition on or adjacent to refuge lands. An artistic monument has been constructed on Boyer Chute NWR as a part of the interpretation of this history. The refuges are also partners in a range of Missouri River Recovery Program initiatives and working groups. The refuges are involved in the Loess Hills Alliance through their private lands program, which has undertaken a number of restoration projects within the Loess Hills. Other examples of refuge partnerships include coordinating the refuge's law enforcement program with the Washington County Sheriff's Department, updating Nebraska legislators on Service programs and emerging issues, and the diversity of research projects coordinated with the University of Nebraska's Omaha and Lincoln campuses.

A number of the refuge key partners are listed below and in appendix I.

- Papio-Missouri River Natural Resources District (PMNRD)
- U.S. Army Corp of Engineers (USACE)
- Natural Resources Conservation Service (NRCS)
- National Park Service – Midwest Regional Office (NPS)
- Nebraska Game and Parks Commission (NGPC)
- Iowa Department of Natural Resources (Iowa DNR)
- Lower Missouri River Ecosystem Team
- Missouri River Natural Resources Committee (MRNRC)
- Ducks Unlimited (DU)
- Back to the River, Inc. (B2R)
- The Nebraska Land Trust
- National Audubon Society – Omaha Chapter
- The Nature Conservancy
- Washington County Highway Department
- Washington County Planning Department
- Pottawattamie County Conservation Board

- The Upper Mississippi/Great Lakes Joint Venture (UM/GL JV)
- University of Nebraska – Omaha (UNO)
- University of Nebraska – Lincoln (UNL)
- Fontenelle Nature Association
- Fort Calhoun Volunteer Fire Department
- Blair Community Schools
- Local landowners

Private Lands Program (Partners for Fish and Wildlife)

The Partners for Fish and Wildlife Program is a voluntary program that has been offered nationwide by the Service since 1987 to provide landowners with technical and financial assistance in restoring habitat and managing private property to benefit wildlife. Projects include wetland, upland, streambank, and aquatic habitat restoration. The program also strengthens relationships with federal, state, local, and private conservation partners.

DeSoto NWR currently maintains a coordinator position for the Private Lands/Partners for Fish and Wildlife Program it operates through DeSoto and Boyer Chute Refuges. Refuges staff assist with habitat restoration and enhancement projects in 28 counties along the Missouri River, 18 on the Iowa side (Lyon, Sioux, Plymouth, Woodbury, Monona, Crawford, Carroll, Harrison, Shelby, Audubon, Pottawattamie, Cass, Mills, Montgomery, Adams, Fremont, Page, and Taylor) and 10 on the Nebraska side (Burt, Washington, Dodge, Saunders, Douglas, Sarpy, Cass, Otoe, Nemaha, and Richardson). The refuges work with neighboring landowners and partners in the watershed to address water quality, drainage, and other hydrological issues. The refuges watersheds (see figure 3-17) are priority areas for targeting Partners for Fish and Wildlife projects. Along with wetland restoration projects, prairie restoration in the seven counties along the Missouri River containing the Loess Hills has been a priority of the upland habitat conservation program in recent years. As much as \$30,000 of Partners for Fish and Wildlife funds are allocated annually to restoring and enhancing wildlife habitat in the counties where the refuges work. Many of the habitat projects have been accomplished through coordination with Farm Bill programs operated by the USDA's Farm Service Agency and Natural Resource Conservation Service.

Historic and Cultural Resources

Native American History and Early Settlement

Human activity has taken place in western Iowa and eastern Nebraska, including the Missouri River Valley, for the past 12,000 years. 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 spear points used to kill and butcher these animals. Paleoindian spear points that have been found include Clovis, Plainview, Folsom, Hell Gap, Agate Basin, Alberta, Scottsbluff, Eden, Frederick, Lusk, and Brown's Valley.

As the climate changed and became closer to what we experience today, the big game animals became extinct, and humans adapted; they became less mobile and used a much broader

range of plant and animals resources. These adaptive peoples, called “Archaic” by archaeologists, were foragers that, while still somewhat mobile, returned year after year to favorite hunting and gathering spots. They left behind a wide range of stone tools including smaller spear points and plant grinding implements.

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 western Iowa and eastern Nebraska. These peoples, called “Plains Woodland” by archaeologists, settled down in year round residences in small villages and utilized local resources. Because of their more stationary lifestyle they also started to develop designated burial sites in the form of earthen mounds.

As populations increased in these villages around 1,000 years ago, residents started to experiment with gardening and eventually added horticulture to their hunting and gathering activities. Transitioning into what archaeologists call “Central Plains Village,” these woodland peoples intensively planted and harvested corn, beans, and squash (introduced from the South) to supplement bison hunting and plant gathering activities. They built larger and more substantial lodges with a variety of storage and trash pits within the lodge floors. The St. Helena and Nebraska Phases of this period were centered along the Missouri River.

It is these Central Plains Villagers that European explorers encountered in the 1700s. Consequently, these are the earliest Native American groups for which there is ethnographic evidence of group identification and documentation of the tribes’ names. The area of the refuges was occupied by Siouan-speaking tribes, including the Omaha, Ponca, Oto, Missouri, Ioway, and Kansa. When Lewis and Clark passed through this area in August 1804 they met with the leaders of the Oto and Missouri just west of the refuge boundaries within the present day Fort Atkinson State Historical Park at the “Council Bluff” site. By 1820 the federal government established Fort Atkinson in the same area, the first fort west of the Missouri River. The fort was short-lived, however, and was abandoned in 1827. Since then the area has seen the rise of rural European-origin farmers taking advantage of the rich Missouri River bottom soils. A number of early farmsteads, including standing structures, are contained within the refuges’ authorized boundaries.

Although no evidence of Native American peoples has been found within the authorized refuge boundaries for either refuge, sites of the more recent Central Plains Village people have been found nearby. In fact, sixteen federally recognized tribes claim historic ties to the three counties that contain the refuges (appendix I). These tribes were invited to participate in the CCP process for the refuges.

The scarcity of evidence for pre-European human activity on the refuges is most likely due to active erosion and deposition of alluvial sediments from the Missouri River and its tributaries. As a result, while the potential for human activity is great, the tangible record of human occupation is sparse and not likely to improve. Even if ancient archaeological sites have survived years of sediment shifts, they are deeply buried and beyond the reach of ordinary Service activities. Such sites may turn up, however, during dredging activities along the Missouri River and its tributaries.

Harrison and Pottawattamie Counties in Iowa and Washington County in Nebraska contain numerous properties listed on the National Register of Historic Places (59 as of December, 2012). One is the Steamboat Bertrand Museum Collection and Discovery Site on DeSoto NWR; another is Fort Atkinson on the western border of Boyer Chute NWR. The remainder are

primarily homes, churches, schools, and other historic buildings in towns throughout the counties. Aside from the Historic Register sites, it is believed by some historians that additional steamboats may have been lost in the area of DeSoto/Bertrand Bend. In addition, the August 3, 1804 campsite of the Lewis and Clark expedition is believed to be located on DeSoto NWR, and two additional campsites from July 29 and 30, 1804 are thought to be located within or very close to the authorized boundary for Boyer Chute NWR (although not on Service-owned property). To date, no material artifacts have been recovered on the refuges from any Lewis and Clark campsites. DeSoto NWR contains 13 reported cultural resources sites. All of these sites are a part of the Western culture historic period, including two homestead sites. Just under 200 acres of DeSoto NWR have been subjected to archeological survey. This includes a survey conducted by Wichita State University in 1978 (the Blakeslee and King survey) at the location of the refuge's Visitor Center. At Boyer Chute NWR, the most recent archaeological survey was conducted in 2009 prior to the installation of the maintenance shop's geothermal wells. No evidence of archaeological resources was found at that time.

Steamboat Bertrand History

Over 400 steamboats were lost on the Missouri River during the early history of the United States, including the Steamboat Bertrand. DeSoto Visitor Center is home to a one-of-a-kind collection of civil war era artifacts that were excavated from the buried hull of the Steamboat Bertrand. On April 1, 1865, the Steamboat Bertrand was traveling up the Missouri River headed to the Montana goldfields when it hit a submerged log just below "DeSoto Landing" and sank with all of its cargo. Originally owned by J. J. Roe and Company, the 161-foot ship and its load of foodstuffs, clothing, and agricultural and mining supplies were on a two-month voyage from St. Louis, Missouri to Fort Benton in the Montana Territory. Rumor held that a wealth of mercury, whiskey, and gold were in the hull's contents, but these items were not found during the excavation, and it is now believed that the most valuable cargo was salvaged by the insurance company shortly after the steamboat sank (Petsche 1974).

A failed attempt to find the Steamboat Bertrand occurred in 1896. Finally, in 1968 the buried wreckage was discovered on DeSoto NWR beneath 28 feet of silt and clay by two modern salvors, Jesse Pursell and Sam Corbino, using a flux gate magnetometer. The iron-rich howitzer ammunition, iron plows, steel bar stock, and kegs of nails caused aberrations in the magnetic readings so a grid of holes were drilled and cargo materials were encountered in the core samples. In accordance with the Antiquities Act of 1906, the complete cargo (10,000 cubic feet) excavated during 1968 and 1969 were turned over to the Service for exhibition and preservation. The work was overseen by National Park Service archaeologists at the Midwest Archaeological Center in Lincoln, Nebraska. The hull of the ship was left in place once the cargo was removed (Petsche 1974), and the Steamboat Bertrand Discovery Site is state listed (25WN14) and has also been listed on the National Register of Historic Places (#69000138) since March 24, 1969. The well-preserved, time-capsuled artifacts include an array of tools, clothing, food, and equipment. Since 1981, the Steamboat Bertrand Museum Collection has been on display in the DeSoto Visitor Center. This 26,000 square foot facility contains numerous exhibits, a conservation lab, collection research area, and library.

In October of 1991, the Service signed an agreement with the Advisory Council on Historic Preservation, the Iowa State Historic Preservation Officer (SHPO), and the Nebraska SHPO that articulates conditions for the documentation, curatorship, and preservation of the Steamboat Bertrand Museum Collection. This agreement ensures compliance with Section 106 of the National Historic Preservation Act (NHPA).

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 about interactions between individuals as well as between early peoples and 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 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 Service 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.

Section 14 of the Archaeological Resources Protection Act of 1979 (ARPA) 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 on federal land—not just sites meeting the criteria for the National Register, 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 regarding cultural resources are 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 Service-administered lands, by monitoring archaeological investigations by contractors and permittees, and by reporting ARPA violations.

Chapter 4: Management Direction and Implementation

In this chapter:

[Introduction](#)

[Habitat \(1\)](#)

[Wildlife \(2\)](#)

[People \(3\)](#)

Introduction

This chapter presents the goals, objectives, and strategies that will guide management and administration of the refuges over the next 15 years. This management direction represents the plan for the refuges and mirrors Alternative D in the Environmental Assessment and Draft Comprehensive Conservation Plan that was prepared as a part of the planning process.

The refuges have three goals:

- *Goal 1: Habitat* - Provide quality native grasslands, floodplain forests, wetlands, sandbar, and riverine habitats through land conservation, restoration, and management.
- *Goal 2: Wildlife* - Protect, maintain, and enhance a diversity of resident, migratory, and endangered species native to the Missouri River floodplain.
- *Goal 3: People* - Refuge visitors will understand and appreciate management of the refuges and the Refuge System through participation in diverse wildlife-dependent recreation, environmental education, and outreach opportunities and will understand the progression of change in the Missouri River Valley as reflected through the Steamboat Bertrand Museum Collection and its history.

Goals, objectives, and strategies comprise the proposed future management direction. Goals are descriptive broad statements of desired future conditions that convey a purpose. Goals are followed by objectives, which are specific statements describing management intent. Objectives provide detail and are supported by rationale statements that describe background, history, assumptions, and technical details to help clarify how the objectives were formulated. Finally, beneath each objective there is a list of potential strategies—specific actions, tools, and techniques designed to fulfill the objective. The strategies may be refined or amended as specific tasks are completed or new research and information come to light.

Habitat (1)

Habitat Goal

Provide quality native grasslands, floodplain forests, wetlands, sandbar, and riverine habitats through land conservation, restoration, and management. (See figures 4-1, 4-2, and 4-3.)

Objective 1.1: DeSoto Lake

Within 10 years of CCP approval, manage DeSoto Lake to mimic historic (preregulation) annual hydrological fluctuations and improve riverine fish passage while carefully avoiding impacts to

refuge neighbors; work to improve water quality and to remove DeSoto Lake from the Iowa list of impaired and threatened waters (section 303(d) of the Clean Water Act).

Rationale

In order to manage refuge habitats at benchmark conditions it is important to reestablish fluctuating water levels that support floodplain habitat and the wildlife that depend on these habitats.

DeSoto Lake was listed as a Category Five state impaired water by the Iowa Department of Natural Resources (DNR) under section 303(d) of the Clean Water Act for excessive turbidity in 2004 and 2006, and then for both turbidity and algae in 2008 and their most recent 2010 survey—citing aesthetically objectionable conditions in Secchi and Chl-a tropic surveys conducted between 2002 and 2008. Although the water quality issues in DeSoto Lake are considered a low priority by the state, the refuge can work to address and improve these conditions through on-refuge management actions and off-refuge partnerships. Much of the water that feeds DeSoto Lake enters from three agricultural ditches that drain the lake's twenty square mile watershed, or from surface flow during rain events. Soil and water conservation efforts in the lake's watershed can improve its water quality.

Figure 4-1: Projected Future Land Cover Quantities

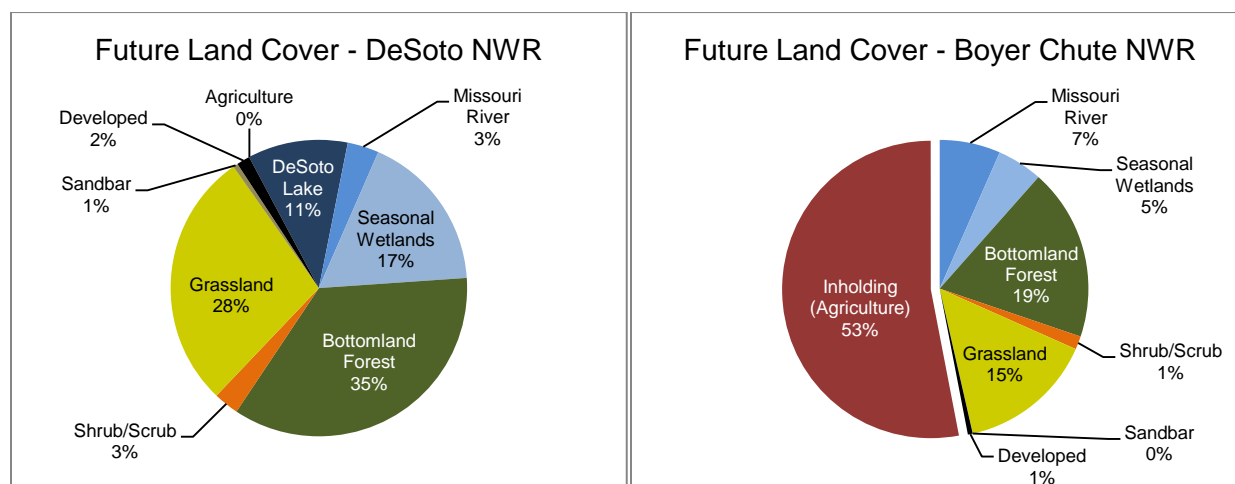


Figure 4-2: Future Land Cover, DeSoto NWR

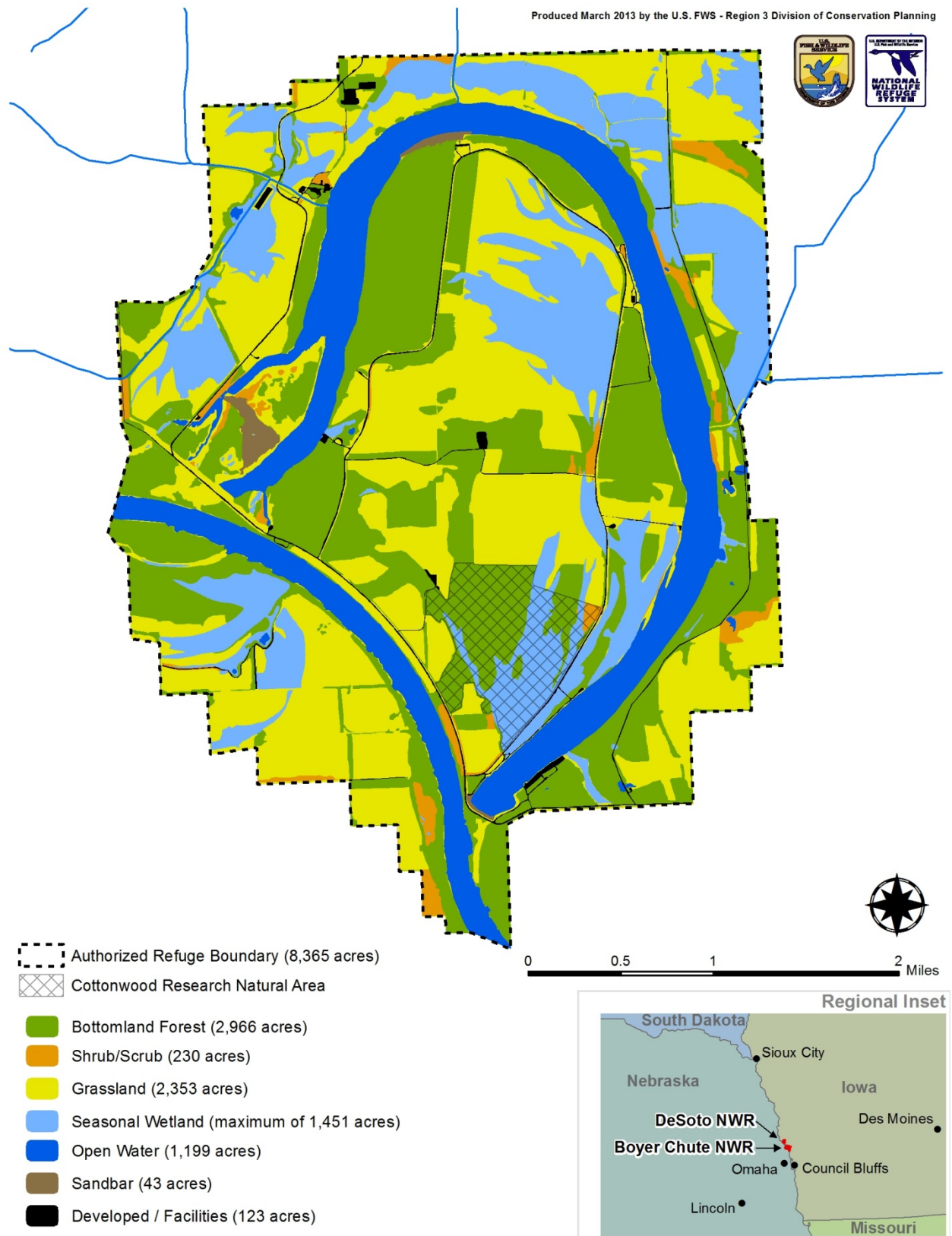
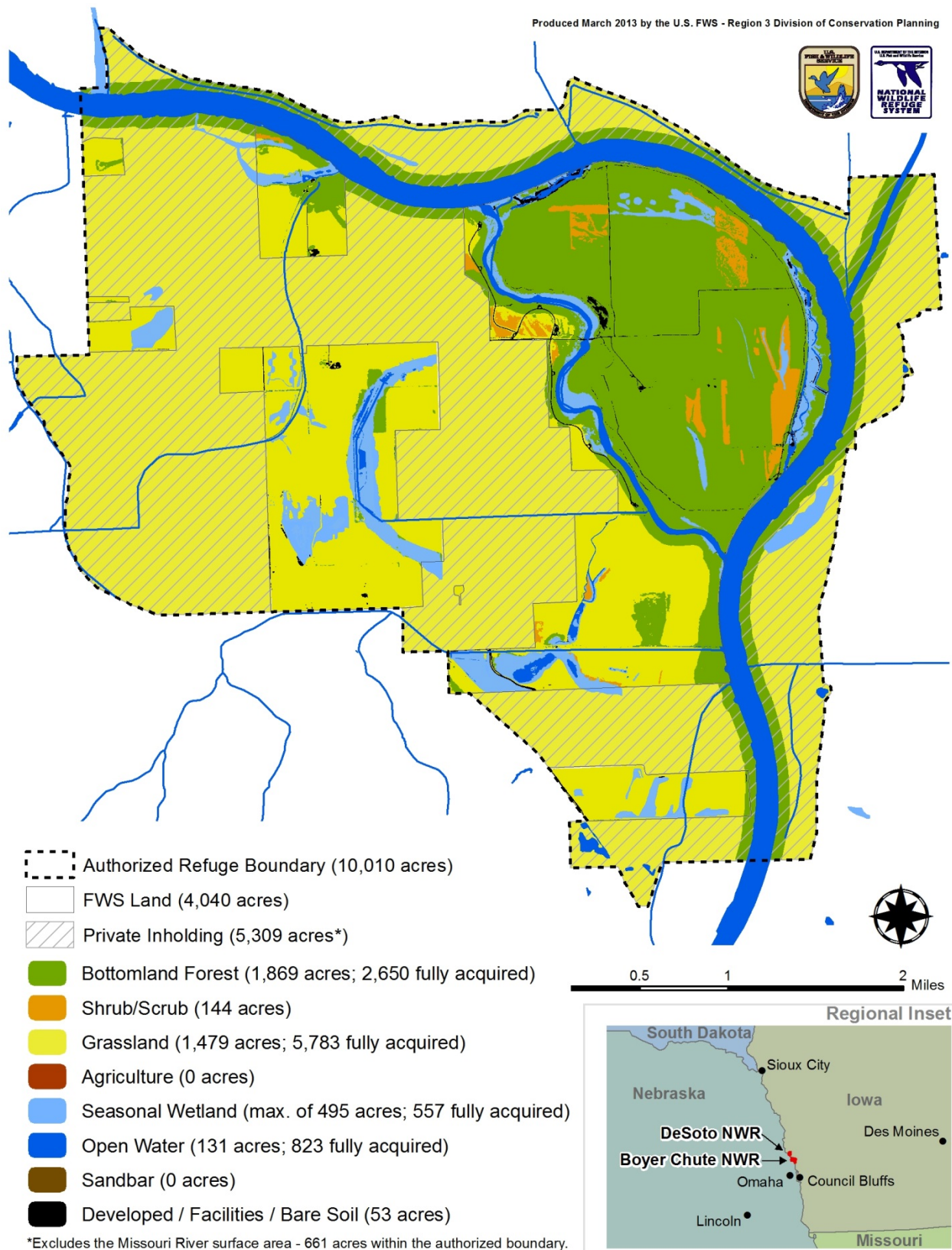


Figure 4-3: Future Land Cover (Assuming Full Acquisition), Boyer Chute NWR



Strategies

1. Use historic data to identify the average hydrograph for the stretch of the Missouri River containing DeSoto and Boyer Chute Refuges.
2. Remain active in efforts to study the hydrology of the area, including the hydrogeomorphic analysis being undertaken by the Service and its partners on the Lower Missouri River.
3. Replace inlet and outlet structures at DeSoto Lake with new structures that improve fish passage and water management capabilities within 10 years of CCP approval.
4. Use water control structures as needed to adjust seasonal water levels in DeSoto Lake.
5. Use wetlands to prefilter water entering DeSoto Lake from surrounding agricultural lands and associated drainage ditches.
6. Update DeSoto Lake water quality monitoring protocols in an inventory and monitoring step-down management plan to be completed within three years of CCP approval.
7. Continue to use the Partners for Fish and Wildlife program to work with landowners in the DeSoto Lake drainage basin (see chapter 3 for additional information).

Objective 1.2: Seasonal Wetlands

DeSoto National Wildlife Refuge (NWR, refuge): Annually manage for seasonal wetlands that range from approximately 100 acres (dry conditions during nonmigratory periods) to 1,500 acres (full capacity in wet conditions during migrations); annually rotate management for mudflats, annual vegetation, and perennial vegetation.

Boyer Chute NWR: Given current acquisition status, annually manage for seasonal wetlands that range from 30 acres (dry conditions during nonmigratory periods) to 500 acres (full capacity in wet conditions during migrations). Assuming full acquisition of authorized boundary, annually manage for seasonal wetlands that range from approximately 30 acres (dry conditions during nonmigratory periods) to 1,200 acres (full capacity in wet conditions during migrations).

Rationale

Enhancing and maintaining the integrity of existing wetland habitat and restoring degraded wetlands to benchmark conditions is important for numerous reasons. The following list cites some of the key reasons:

1. It is National Wildlife Refuge System (NWRS, Refuge System) policy as mandated by the National Wildlife Refuge Improvement Act of 1997 to “ensure that the biological integrity, diversity, and environmental health of the System are maintained . . .,” which provides guidance to restore and maintain “biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic (benchmark) conditions . . .” on refuge lands where appropriate.
2. According to the Iowa DNR’s 2010 “Wetland Action Plan for Iowa,” Iowa has lost 90–95 percent of its original 4–6 million acres of wetlands (Evelsizer and Johnson 2010). The State of Nebraska has lost approximately one million acres (about 35 percent) of the state’s original wetland acreage in the last 200 years (Dahl 1990).

3. A mosaic of wetland habitat types on the landscape would support an abundant and diverse array of wildlife species.
4. Wetlands provide a multitude of ecosystem services that benefit both humans and wildlife—from flood control to improving water quality.

The short- and long-term objectives described in this CCP strive to maximize acres of refuge wetlands by protecting existing wetland habitat and restoring wetland areas that have been altered or degraded. There are areas of both refuges that have the environmental factors (soils, hydrology, relief, etc.) to support wetland habitat. Minor modifications in surface drainage and the addition of supplemental water will allow the refuges to create new seasonal wetland habitat during critical migration periods.

Although a number of factors, including climate change, have the potential to affect fundamental ecosystem conditions and balances, historic records still form a benchmark by which management can gauge the level of habitat alteration and disturbance and use this information to guide restoration.

In addition, it is important to acknowledge the natural range of variation within each habitat type, both spatially and temporally, that is brought about by disturbance and local environmental factors. Selecting a range of target conditions and habitat acreages is a more accurate and less risky way to identify desired conditions than with exact quantities; however, numerical ranges can obscure the precision of existing data. Therefore, exact numbers are identified for the habitat objectives with the understanding that the numbers are approximations based on the best available information. Furthermore, annual fluctuations in water levels make it nearly impossible to pinpoint exact desired acreages for wetland habitat types, particularly open water and emergent marsh. Nonetheless, an average of current and preexisting conditions obtained from a variety of sources, including an analysis of aerial imagery, the National Wetlands Inventory; U.S. Department of Agriculture, Natural Resources Conservation Service soils data; and presettlement vegetation estimates make it possible to establish target acreages—fully acknowledging the limitations of these data sources and resulting numbers.

In addition to rain and river water from periodic flood events, water will be pumped into wetlands from refuge agricultural ditches, DeSoto Lake, and groundwater sources. Surface waters directed into wetlands have the benefit of filtering and processing agricultural runoff from adjacent lands. Nutrients in agricultural runoff can help to increase the primary and secondary productivity in wetlands, augmenting food resources for wildlife.

The local benefits of diverse wetland habitats to bird species and other wildlife are well documented. Open water, emergent marsh, and sedge meadow habitats on the refuges are essential stopover sites during spring and fall migrations, supporting an average of 3 million waterfowl use days; a mix of divers, dabblers, and geese; and numerous other migratory bird species. There are notable concentrations of Northern Pintail, Mallards, Blue-winged Teal, Green-winged Teal, Ring-necked Ducks, White-fronted Geese, and Canada Geese in the spring and fall.

Strategies

1. Complete a habitat step-down management plan within five years of CCP approval.

2. Identify and restore wetland habitats and hydrology by using historical vegetation descriptions, soils data, and other data sources.
3. Manage wetlands to provide for a variety of habitats (mudflat, annual and perennial vegetation) needed to support species that depend on wetlands for their life cycle.

Objective 1.3: Grasslands

DeSoto NWR: Over the life of the CCP manage for approximately 2,350 acres of mesic and wet grasslands.

Boyer Chute NWR: Over the life of the CCP, manage for approximately 1,500 acres of mesic and wet grasslands, given current acquisition status. Over the life of the CCP, manage for approximately 5,800 acres of mesic and wet grasslands, assuming full acquisition of authorized boundary.

Rationale

As mandated by the National Wildlife Refuge Improvement Act of 1997, it is Service policy to “ensure that the biological integrity, diversity, and environmental health of the System are maintained . . .” Service policy provides guidance to restore habitat to historical benchmark conditions on refuge lands where appropriate and possible. Much of the refuges’ uplands were once prairie but were converted to agricultural fields over the last 100 years. Newly acquired refuge lands (within the Boyer Chute NWR authorized boundary) containing farm fields should be converted to prairie with native, local ecotype seed as a step toward restoring the lands to conditions associable with the presettlement period. Prairie is considered one of the most endangered ecosystems in the country. According to the Iowa Wildlife Action Plan, of the 30 million acres of prairie that once covered Iowa only 0.1 percent remains (Zohrer 2006). The Nebraska Wildlife Action Plan states that approximately 2 percent of the original tallgrass prairie remains in Nebraska—mostly in parcels less than 80 acres in size (Schneider et al. 2005). The majority of this loss can be attributed to conversion to agriculture. As a result, many of the grassland birds and other wildlife associated with this habitat are also declining. By restoring prairies, the refuges would provide critical habitat for declining grassland birds and other wildlife and plant species.

Strategies

1. Identify and map the wet and mesic grassland habitat with the highest potential for restoration within the boundaries of the refuges.
2. Research historical vegetation records to assist in refining benchmark conditions.
3. Expand vegetation monitoring to include periodic field-based species richness surveys and GIS-based land cover analysis.
4. Further define refuge habitat management in a step-down management plan within five years of CCP approval.
5. Restore natural ecological processes and functions such as fire and local hydrology to support these grassland habitats.

Objective 1.4: Wooded Habitats (Bottomland Forest, Cottonwood Parkland, and Shrub/Scrub)

DeSoto NWR: Over the life of the CCP, continue to manage for approximately 3,200 acres of native bottomland forest, cottonwood parkland, and shrub/scrub, managing these habitats for structural and species diversity. Maintain large mature stands of bottomland forest with a diverse, dense understory component to provide nesting habitat for Yellow-billed Cuckoos, Chestnut-sided Warblers, Wood Thrush, and woodpecker species.

Boyer Chute NWR: Over the life of the CCP, allow the Center Island Unit and riparian buffers (approximately 100 meters) along the Missouri River and Boyer Chute to succeed to bottomland forest (estimated 1,850 wooded acres within existing landholdings, and 2,650 wooded acres with full acquisition).

Rationale

Bottomland forests provide an important riparian habitat buffer for many watercourses on the refuges. This buffer helps improve water quality, protect refuge soils, and provide habitat for a diversity of native wildlife. In addition, a number of bottomland forest-dependent migratory songbirds are declining as a result of habitat loss and fragmentation. Conservation and management of suitable bottomland forest habitat is a principal strategy for maintaining healthy, self-sustaining populations of these birds.

Strategies

1. Promote natural regeneration of cottonwood bottomland forest on the refuges.
2. Where necessary, plant endemic Missouri River floodplain species that will enhance the bottomland forest communities, will re-establish missing historic plant community species, and are appropriate for contemporary Missouri River floodplain conditions.
3. Conduct a land cover/vegetation assessment across both refuges that distinguishes the habitat types covered by the CCP objectives at least once every 10 years.

Objective 1.5: Agriculture

DeSoto NWR: After CCP approval, eliminate the cooperative farming program and limit the use of farming techniques (not to exceed 200 acres annually) to scattered plots for habitat management needs.

Boyer Chute NWR: No cooperative farming program exists or is planned for Boyer Chute NWR.

Rationale

The use of farming techniques has long been recognized as a valuable habitat management tool on refuges. It can be used to set back succession, prepare seedbeds, control exotic, noxious, and invasive weeds, and meet other management objectives while providing supplemental food for biannual migrations. However, there are also concerns about genetically modified organisms and pesticide use associated with farming. In the past, agriculture was a larger part of the refuges' habitat management program, and the cooperative farming program provided an opportunity to minimize refuge equipment and personnel costs, support the local

economy, and promote relationships with refuge neighbors. The refuge now proposes to use agricultural practices to achieve long-range habitat goals and to address exotic, invasive, or noxious plants. Since these areas will be sprayed or disked anyway to control these species, this objective allows us to plant a cover crop to provide erosion control and offer a food source for migration.

Strategies (DeSoto NWR)

1. Upon CCP approval, eliminate cooperative and financial incentive farming, and reduce the use of farming techniques for habitat management to levels specified in the objective (generally not to exceed 200 acres per year).
2. Use farming techniques as habitat management needs and staff levels warrant over the life of the CCP.
3. Use annual planning activities to determine the extent farming techniques for habitat management will be used on the refuge each year. Areas planted will be limited to areas that require control of exotic, invasive, and/or noxious plants.
4. No genetically modified organism (GMO) crops or neonicotinoids will be used on the refuge.
5. Adhere to all regional and national guidance/policy regarding farming and pesticide use on refuges.
6. Planted crops will generally be limited to small grains that can offer both erosion control and food value for wildlife.
7. No crops will be planted or harvested for commercial market or sale.
8. All crops will be left in the field as a supplemental food source for wildlife.

Objective 1.6: Land Acquisition

DeSoto NWR: The authorized refuge boundary is fully acquired at 8,365 acres. Over the life of the CCP, continue to evaluate acquisition opportunities for important habitats adjacent to the refuge, the sum not to exceed 10 percent of the existing refuge acreage.

Boyer Chute NWR: Over the life of the CCP, continue to use priorities established in the 1997 expansion document (FWS 1997) to guide acquisition of the remaining inholdings (5,309 acres excluding the Missouri River surface area) within the authorized 10,010-acre refuge boundary.

Rationale

Land acquisition (fee title) is an important tool for permanently protecting wildlife habitat. The Refuge System identifies land protection priorities, and then designates formal boundaries within which acquisitions can be made at fair market value from willing landowners. By extending permanent protection to important natural resources of the Nation, the Refuge System is sustaining wildlife and habitats, “for the benefit of present and future generations of Americans” as directed by the mission of the Refuge System. Protection emphasis at Boyer Chute NWR is focused first on land that retains natural cover types, and then extends to those areas that have the greatest potential for the restoration of priority habitats such as wetlands, bottomland forests, and grasslands. Protection of habitat also extends benefits to other

important aquatic resources, wildlife, and habitat—while providing valuable open space and recreation opportunities to the public.

Strategies (Boyer Chute NWR)

1. Actively work with partners to secure lands via grant opportunities, donations, bequeaths, and purchases.
2. Provide accurate and up-to-date land acquisition information to landowners within the refuge acquisition boundary.
3. Where land acquisition is not practical within the refuge acquisition boundary, work to obtain conservation easements.

Objective 1.7: Invasive Plant Species

Both refuges: Monitor extent of invasive plant species annually, and maintain refuge habitats with less than 15 percent adversely impacted by invasive plant species.

Rationale

Invasive plant species are often introduced from other areas, typically Europe or Asia, and they rarely have adequate native biological controls in the United States. The plants are often early successional species adapted to disturbance that move in quickly. They are difficult to control and interfere with natural ecological processes. If the invasive plant species are not controlled they can out-compete and displacing native flora, reducing the habitat's biological integrity and benefit to native wildlife.

Strategies

1. Document the location and size of invasive populations on the refuges using GIS.
2. When available, use biological controls as a preferred strategy.
3. Where appropriate, use prescribed fire to control invasive plant species.
4. Use chemical and mechanical means to control infestations in cases where biological control techniques are not available, feasible, or practical.
5. Monitor invasive species infestations and the effectiveness of control measures taken.
6. Support and work with the Service's Partners for Fish and Wildlife program and refuge partners and neighbors to provide education and services (identification, mapping, and control programs) related to invasive species within a 15-mile radius of the refuges.

Wildlife (2)

Wildlife Goal

Protect, maintain, and enhance a diversity of resident, migratory, and endangered species native to the Missouri River floodplain.

Objective 2.1: Waterfowl

Both refuges: Over the life of the CCP, provide for the seasonal stopover needs of migratory waterfowl with a target of three million waterfowl use days per migration period, ensuring a thorough waterfowl monitoring program.

Rationale

First and foremost, DeSoto NWR's primary establishment purpose is to provide an inviolate sanctuary for migratory waterfowl. In addition, conserving a diversity of fish, wildlife, and plants and their habitats, including threatened and endangered species is one of the fundamental goals of the Refuge System.

It is necessary to monitor outcomes to evaluate whether or not management actions are having the predicted outcomes. A representative sample of sites and conditions is used to ensure that, on average, the effects of a particular treatment match expectations. Information gained through monitoring that is clearly linked to refuge management actions helps the refuges learn and adapt, increasing the overall effectiveness in meeting conservation objectives.

Strategies:

1. Over the life of the CCP, continue weekly waterfowl counts during the fall (September to January) and spring (March to May) migrations, and continue conducting the Mid-Winter Waterfowl Survey in collaboration with state partners.
2. Include all waterfowl species in surveys and monitoring efforts; focal species will include Canada Geese and dabbling ducks (including Northern Pintails, Mallards, and Blue-winged Teal).
3. Further refine monitoring efforts for the refuges in an inventory and monitoring step-down management plan within three years of CCP approval.
4. Annually manage refuge wetland habitats to provide enough food to support seasonal migration of waterfowl in excess of three million waterfowl use days.
5. Continue to provide refugia and areas of minimal disturbance for birds during critical migration periods, including wetland areas and DeSoto Lake.
6. Investigate the potential benefits of closing the west arm of DeSoto Lake for the migration one month earlier (September 14 instead of October 14).

Objective 2.2: Shorebirds

Both refuges: Increase shorebird use on both refuges by improving habitat management and refining monitoring efforts as described in the associated strategies.

Rationale

Conserving a diversity of fish, wildlife, and plants and their habitats, including threatened and endangered species is one of the fundamental goals of the Refuge System. Furthermore, one of the purposes of the refuge is to provide habitat for migratory birds. Migratory shorebird conservation is a priority for the refuges, and refuge management strives to support the goals identified in the U.S. Shorebird Conservation Plan (Brown et al. 2001). By providing quality

habitat, the refuges contribute to shorebird numbers at the local level, which helps maintain shorebird populations at the continental level.

To evaluate whether or not management actions are having the predicted outcomes, it is necessary to monitor outcomes. A representative sample of sites and conditions is used to ensure that, on average, the effects of a particular treatment match expectations. Information gained through monitoring that is clearly linked to refuge management actions helps the refuges learn and adapt, increasing the overall effectiveness in meeting conservation objectives.

Strategies

1. Establish baseline shorebird use on the refuges, set migratory stopover targets for the refuges, and complete an inventory and monitoring step-down management plan further defining shorebird monitoring and management within three years of CCP approval.
2. Conduct seasonal monitoring of migratory shorebirds on the refuges in three-year cycles (begin within three years of CCP approval). Annual monitoring recommended by the Service's Midwest Division of Migratory Birds for the refuges includes three spring surveys (April 1–10, May 10–20, and May 20–30) and three fall surveys (July 15–30, August 15–30, and September 15–25).
3. All shorebird species will be included in surveys and monitoring; however, focal species will include Greater Yellowlegs, Lesser Yellowlegs, Pectoral Sandpiper, Short-billed Dowitcher (less common), and Hudsonian Godwit.
4. Provide 200 acres of shorebird habitat (i.e., mudflats) annually.
5. Within the life of the CCP, develop a research project to assess the potential benefits of providing sandbar habitat and the feasibility of restoring and maintaining sandbar habitat on the refuges.
6. Continue to collaborate with the U.S. Army Corps of Engineers (Corps) to develop shallow water and sandbar projects that provide shorebird habitat in support of the 2000 "Missouri River Biological Opinion," as amended.

Objective 2.3: Secretive Marshbirds

Both refuges: Increase secretive marshbird use on both refuges by improving habitat management and refining monitoring efforts as described in the associated strategies.

Rationale

Conserving a diversity of fish, wildlife, and plants and their habitats, including threatened and endangered species is one of the fundamental goals of the Refuge System. Furthermore, one of the purposes of the refuge is to provide habitat for migratory birds. Secretive marshbird conservation is a priority for the refuges, because marshbird populations are declining across North America according to the Breeding Bird Survey (Sauer et al. 2008). As a result, several species have acquired a federal, state, or local conservation status. Furthermore, secretive marshbirds are difficult to detect and adequately monitor because of their tendency to occupy dense vegetation and vocalize infrequently. Monitoring will allow the refuge staff to track population trends locally and improve our understanding of how the populations respond to habitat changes and associated management actions. Information gained through monitoring

that is clearly linked to refuge management actions helps the refuges learn and adapt, increasing the overall effectiveness in meeting conservation objectives.

Strategies

1. Establish baseline secretive marshbird use on the refuges and complete an inventory and monitoring step-down management plan further defining secretive marshbird monitoring and management within three years of CCP approval.
2. Ensure that future habitat management step-down management plan considers fall migratory habitat for secretive marshbirds.
3. Use secretive marshbird monitoring data to establish population targets for the refuges.
4. Conduct seasonal monitoring of breeding secretive marshbirds on the refuges in three-year cycles within three years of CCP approval. Annual monitoring recommended by the Service's Midwest Division of Migratory Birds for the refuges includes two annual surveys (May 15–31 and June 1–15).
5. All secretive marshbird species will be included in surveys and monitoring; however, focal species will include Sora, Virginia Rail, Black Rail (very rare), and King Rail (very rare).
6. Provide an additional 100 acres of wet meadow habitat in support of secretive marshbird species.

Objective 2.4: Grassland Birds

Both refuges: Improve habitat management and refine monitoring efforts for grassland birds as described in the associated strategies.

Rationale

Conserving a diversity of fish, wildlife, and plants and their habitats, including threatened and endangered species is one of the fundamental goals of the Refuge System. Furthermore, one of the purposes of the refuge is to provide habitat for migratory birds. Grassland birds are uniquely adapted to a specific suite of habitat features (grass heights and densities) that were historically created by disturbance mechanisms such as large-scale herbivory and prairie fires. The loss of these disturbance mechanisms and the overwhelming conversion of prairie habitat to agriculture have led to steeper, more consistent, and more widespread population declines over the past 25 years than any other avian guild in North America. Grassland bird species are increasingly dependent on land managers for the habitats they require. A diversity of grassland habitats were endemic to the Missouri River floodplain, and a large portion of both refuges is dedicated to providing these habitat types.

Monitoring is a key aspect of grassland bird management. To evaluate whether or not management actions on habitat conditions are having the predicted outcomes, it is necessary to monitor outcomes in the bird populations. A representative sample of sites and conditions is used to ensure that, on average, the effects of a particular treatment match expectations. Information gained through monitoring that is clearly linked to refuge management actions helps the refuges learn and adapt, increasing the overall effectiveness in meeting conservation objectives.

Strategies

1. Establish baseline grassland bird use on the refuges and complete an inventory and monitoring step-down management plan further defining grassland bird monitoring and management within three years of CCP approval.
2. Use grassland bird monitoring data to establish population targets for the refuges.
3. Begin conducting seasonal monitoring of breeding grassland birds on the refuges in three-year cycles within three years of CCP approval. Annual monitoring recommended by the Service's Midwest Division of Migratory Birds for the refuges consists of one survey (June 1–15).
4. All secretive marshbird species will be included in survey and monitoring efforts; however, focal species will include Eastern Kingbird and Western Meadowlark during dry years and Sedge Wren and Henslow's Sparrow (rare) during wet years.
5. Provide a combined grassland habitat acreage of approximately 3,350 on the refuges.
6. Provide for the migratory habitat needs of grassland birds by creating diverse successional habitat through periodic disturbance (fire, herbivory, mowing, and agriculture).
7. Use diverse, local-ecotype seed sources for grassland plantings.

Objective 2.5: Fish and Aquatic Species

Both refuges: Over the life of the CCP, support the viability and health of riverine fish and aquatic threatened and endangered species populations through collaborative monitoring and habitat management programs as described in the associated strategies.

Rationale

Conserving a diversity of fish, wildlife, and plants and their habitats, including threatened and endangered species is one of the fundamental goals of the Refuge System. While the majority of waters within the authorized refuges' boundaries are managed by Service, the Corps maintains jurisdiction over the Missouri River. The vast majority of federally and state listed fish, aquatic invertebrates, and other aquatic species occur within the Missouri River and its associated riverine habitats. The refuges can provide benefits to these species by working collaboratively with the its partners including the Corps and by supporting the restoration of river-associated habitats.

Strategies

1. Completing an inventory and monitoring step-down management plan further defining fish and aquatic species monitoring and management within three years of CCP approval.
2. Improve connectivity of DeSoto Lake and the Missouri River so that lake can better support endemic riverine fishes.
3. Continue to assist and partner with other agencies to monitor trends of aquatic threatened and endangered species and other native riverine species.

4. Continue collaborating with the Corps to develop shallow water habitat projects in support of the 2000 “Missouri River Biological Opinion,” as amended.
5. Assess DeSoto Lake for breeding and over-wintering habitat on a five-year cycle.
6. All fish species will be included in survey and monitoring efforts; however, focal species will include pallid sturgeon, paddlefish, shovelnose sturgeon, and lake sturgeon.

Objective 2.6: Game Species

Both refuges: Over the life of the CCP, maintain a target post-hunt deer population of 17 deer per square mile on both refuges; continue deer monitoring surveys conducted once every 2–5 years; and increase management and monitoring of quail populations.

Rationale

Hunting is one of the six compatible, wildlife-dependent recreational uses. Careful monitoring and management of game species can help prevent negative impacts to associated habitats and wildlife, including overgrazing, disease, and starvation. Overgrazing by deer can lead to changes in plant community composition and structure, which can result in negative impacts to other plant and animal species. In addition to impacts on biological resources, game species populations can have impacts on neighboring properties, area businesses, and the local economy. Game management decisions are based on a firm understanding of the size and trends of local populations, which is dependent on regular monitoring. It is important to understand the dynamics of local emigration and immigration, which impacts the population size and density, making game species populations variable from year-to-year.

Strategies

1. Continue deer monitoring surveys conducted once every 2–5 years, over the life of the CCP.
2. DeSoto NWR’s acreage (non-water surface) of approximately 7,166 acres (11.19 sq. mi.) should support 190 deer, and Boyer Chute NWR’s acreage of 4,040 land acres (6.31 sq. mi.) should support 107 deer.
3. Within five years begin monitoring quail populations on the refuges in partnership with state agencies.
4. Further refine game species monitoring by completing an inventory and monitoring step-down management plan within three years of CCP approval.
5. Manage for grassland bird migratory habitat with diverse successional stages and a high proportion of annuals to benefit refuge quail populations.

Objective 2.7: Federally Threatened and Endangered Species

Over the life of the CCP, continue to monitor federally listed species trends and manage for refuge conditions that benefit federally threatened and endangered species endemic to refuges, including the Piping Plover, Interior Least Tern, and pallid sturgeon.

Rationale

It is a priority for the refuges to monitor and protect rare, threatened, and endangered species because they are trust resources of the Service and it is a goal of the Refuge system. It is also required by the Endangered Species Act of 1973, “that all Federal departments and agencies shall seek to conserve endangered and threatened species . . .” All living things are part of a complex, often delicately balanced network within an ecosystem . It is difficult to predict how the extinction of organisms will affect other members of its ecosystem, but the removal of a single species can set off a chain reaction affecting many others (FWS 2005). It is important that the refuges contribute, where possible, to the agency mission of protecting species from extinction.

Currently there are no federally listed endangered species inhabiting DeSoto and Boyer Chute Refuges, but the refuges support several state listed species and many Midwest Region Resources of Conservation Concern (RCC) species. Bald Eagles were once listed as a federally threatened species. They were delisted on August 9, 2007, moved to a protected status, and remain an RCC species in the Midwest Region. Bald Eagles are commonly observed in the area during spring and fall migration, and DeSoto NWR currently supports one nesting pair. Because of its recent delisting and its protected status in Region 3, Bald Eagles should be monitored and considered during management activities. Over time, and as additional research takes place, species may be added or removed from state and federal lists. Thus, it is necessary for the refuge to maintain an adaptive management approach regarding individual species protection and monitoring.

Strategies

1. Maintain close coordination with the Service’s Division of Ecological Services and with partners to monitor the status of federally threatened and endangered species on the refuges.
2. Continue to partner with the state and federal agencies to restore habitats recommended by the 2000 “Missouri River Biological Opinion,” as amended, that benefit threatened and endangered species along the Missouri River corridor.
3. Investigate the feasibility and potential to create or improve sandbar habitat for terns and plovers on the refuges.
4. Include considerations for federally listed species in the development of the inventory and monitoring step-down management plan.
5. Monitor Bald Eagle nesting activities and adjust management to minimize disturbance in these areas during key periods of the year.

People (3)

People Goal

Refuge visitors will understand and appreciate management of the refuges and the Refuge System through participation in diverse wildlife-dependent recreation, environmental education, and outreach opportunities and will understand the progression of change in the Missouri River Valley as reflected through the Steamboat Bertrand Museum Collection and its history. (See figures 4-4 and 4-5.)

Figure 4-4: Future Visitor Services, DeSoto NWR

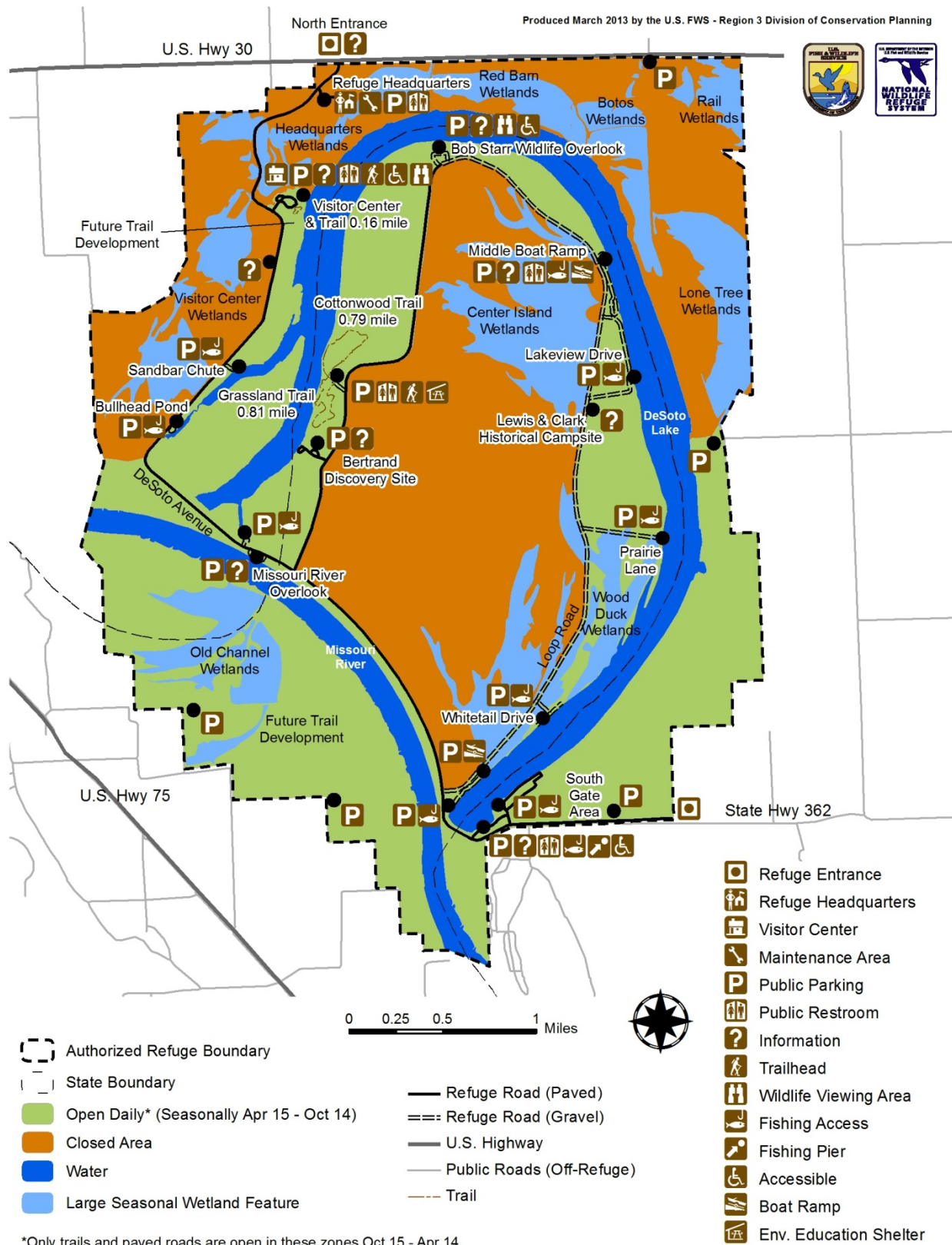
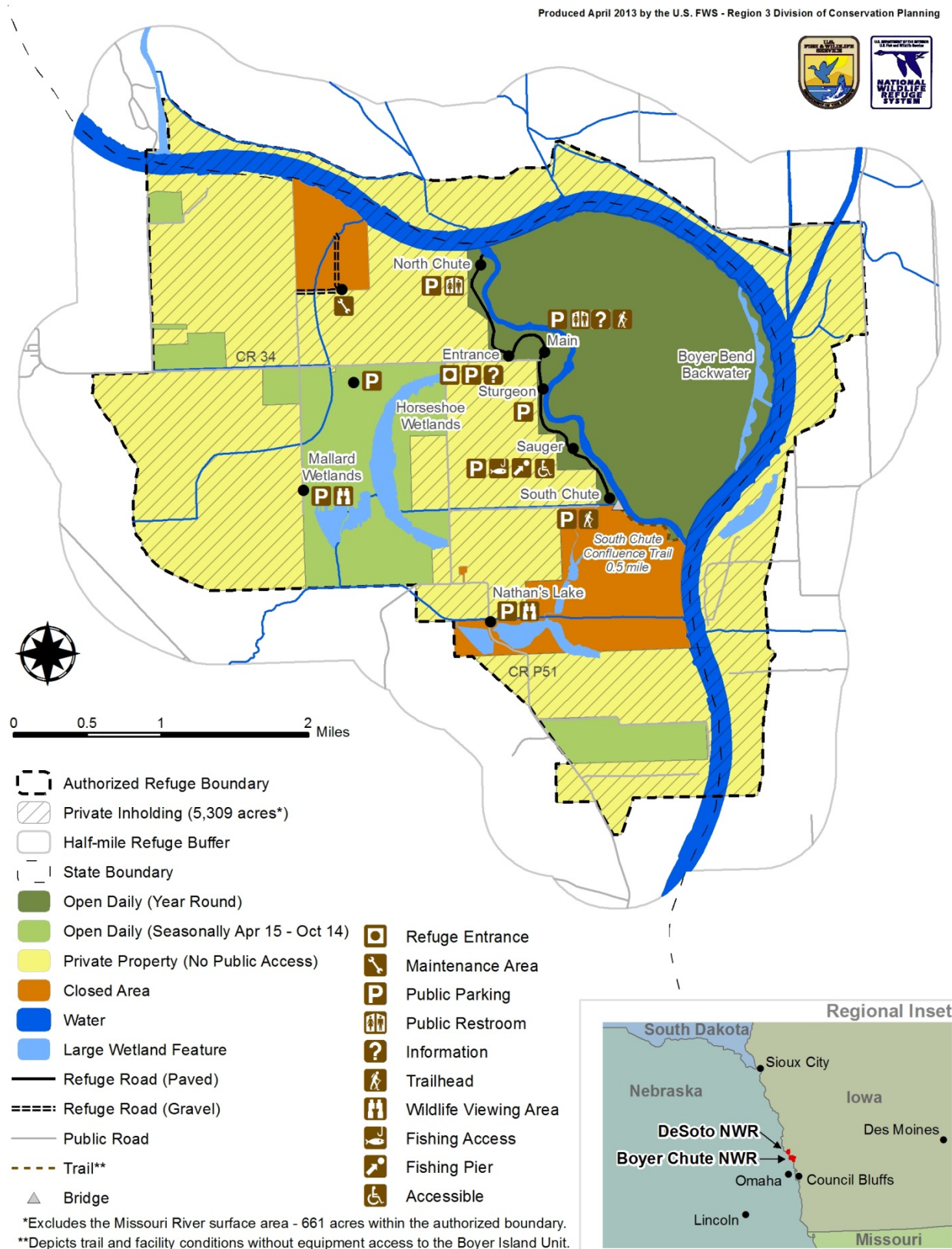


Figure 4-5: Future Visitor Services, Boyer Chute NWR



Objective 3.1: Hunting

Both refuges: As compared to current conditions, increase upland (Wild Turkey and Ring-necked Pheasant) hunting opportunities, big game (deer archery) hunting opportunities, and consider increased waterfowl hunting opportunities on the refuges through the development of a hunting step-down management plan that will be completed within one year of CCP approval.

Rationale

Hunting is one of the six priority wildlife-dependent recreational uses identified in the National Wildlife Refuge System Improvement Act of 1997. Service policy directs us to provide hunting opportunities when compatible with refuge management. Increasing hunting opportunities was also identified as a need in the 2011 visitor survey conducted at DeSoto NWR (Sexton et al. 2011). Managed hunting programs help promote an understanding and appreciation of natural resources and their management. Properly planned and managed hunts on the refuges provide a traditional recreational activity with negligible adverse impacts to the biological integrity or habitat sustainability of refuge resources. Due to the loss of large predators, hunting programs can be used to reduce game wildlife populations to local carrying capacities. Refuge staff can provide hunting opportunities in a regulated manner, direct these activities to specific audiences, and adaptively evaluate the hunting programs based on demand and program success.

Strategies

1. Further define refuge management of the hunt program through the development of a hunting step-down management plan (to be completed within one year of CCP approval) so that new hunting opportunities can be incorporated into the visitor services step-down management plan (to be completed within three years of CCP approval).
2. Use the visitor services step-down management plan to revise hunt program zoning and scheduling—ensuring a design that minimizes disturbance of bird migrations.
3. Prepare DeSoto NWR's West Side Unit and additional Boyer Chute NWR units for managed hunts.
4. Prepare and submit all materials required to open or expand hunting on the refuges.
5. Partner with Iowa DNR and Nebraska Game and Parks Commission, National Wild Turkey Federation, Pheasants Forever, local sportsmen's clubs, and others to conduct managed hunts.
6. As additional land is acquired within the acquisition boundary at Boyer Chute NWR, reevaluate the areas that are available and safe for hunting with the long-term goal of opening additional areas to hunting.
7. Ensure that concerns over seasonal deer stand use on DeSoto NWR are addressed in the hunting step-down management plan.

Objective 3.2: Fishing

Both refuges: Over the life of the CCP, increase fishing opportunities over current conditions by opening new areas, promoting the fishing program, and through infrastructure improvements described in the associated strategies.

Rationale

Fishing is one of the six priority wildlife-dependent recreational uses identified in the National Wildlife Refuge System Improvement Act of 1997, and Service policy directs refuges to provide fishing opportunities when compatible. It is a goal of the Refuge System to provide the most appropriate and compatible, highest quality, and most sustainable wildlife-dependent recreation opportunities for the public. Fishing provides a traditional recreational activity on the refuges with no definable adverse impact to the biological integrity or habitat sustainability of the refuges' resources. Furthermore, fishing programs help promote an understanding and appreciation of natural resources and their management on lands and waters in the Refuge System. Fishing is also a way to engage visitors in activities related to water resources and water-associated habitats. The refuges enjoy a high degree of satisfaction with their fishing programs and plan to maintain this trend. The visitor survey conducted in 2010–2011 on DeSoto NWR indicated that 71 percent of anglers were either somewhat satisfied or very satisfied with the fishing opportunities on the refuge, and only 6 percent were unsatisfied (23 percent responded as indifferent) (Sexton et al. 2011).

Strategies

1. Increase fishing opportunities on both refuges, after CCP approval, by allowing bank fishing on the open waters of all refuge units that are open to the public (see figures 4-4 and 4-4).
2. Maintain two permanent boat launches on DeSoto Lake within 10 years of CCP approval. This includes the existing Middle Boat Ramp, and a new boat ramp and parking lot on the south end of DeSoto Lake (see figure 4-4).
3. Increase accessible fishing options on DeSoto Lake.
4. Continue to facilitate interagency partnerships that monitor and make management recommendations for the refuges' recreational fishing opportunities.
5. Investigate the potential benefits of closing the west arm of DeSoto Lake for the migration one month earlier (September 14 instead of October 14).

Objective 3.3: Wildlife Observation and Photography

Both refuges: Over the life of the CCP, increase wildlife observation and photography opportunities on both refuges over current conditions by opening new areas of the refuges allowing leashed dogs and improving infrastructure as described in the associated strategies.

Rationale

Wildlife observation and photography are priority wildlife-dependent recreation activities listed in the National Wildlife Refuge System Improvement Act of 1997. They are important and valuable activities that promote understanding and appreciation of natural resources and their management. If properly managed, these uses provide invaluable opportunities for interaction between people and the natural environment with little or no adverse effects to wildlife or habitat. By maintaining and developing trails, boardwalks, observation decks, and other infrastructure it is possible to enhance mobility and access to locations that offer premium wildlife viewing opportunities. The various modes of travel permitted on the refuge also help facilitate year round access to these opportunities and provide enjoyment of scenic views and a

diversity of wildlife not available on adjacent private lands. Allowing leashed dogs on open areas of the refuge will improve the wildlife viewing experience for some visitors. Disturbance created by leashed dogs on average is no greater than other pedestrian activities traditionally permitted on the refuge.

Strategies

1. Open additional areas to the public during the nonmigratory season at DeSoto NWR, including the East Dike South and on the West Side Units; and at Boyer Chute NWR including the Boyer Island, Horseshoe, Yellowlegs, Rail, Northwest, and Wildflower Units (see figure 3-2 for a map of management units).
2. Add a new trail near the DeSoto NWR Visitor Center, and a trail on the West Side Unit.
3. Offer wildlife observation opportunities at Nathan's Lake and improve parking and viewing capabilities on the Horseshoe Lake Unit of Boyer Chute NWR.
4. Develop a visitor services step-down management plan within three years of CCP approval.
5. Monitor and respond to needs for signage, orientation, information, and facilities.
6. Provide basic signage, orientation, information, and facilities in newly opened or acquired areas.
7. Continue to offer wildlife observation and photography opportunities for portable blinds in open areas.
8. Allow leashed dogs on open areas of the refuges.
9. Continue to allow biking on the refuges on all roads that are open to the public.
10. Monitor the bridge to the Boyer Island Unit, plan for its removal within the life of the CCP, and consider replacement options that will avoid the current maintenance needs, safety risks, and chute habitat disturbance.
11. Maintain free access to Boyer Chute NWR, and the existing fee structure for DeSoto NWR.

Objective 3.4: Environmental Education

Both refuges: Over the life of the CCP, maintain current environmental education programs in area schools (7,500 student visits per year) with a special emphasis on increasing interaction with inner city schools.

Rationale

Environmental education is a priority wildlife-dependent recreational use identified in the National Wildlife Refuge System Improvement Act of 1997. Well-designed environmental education programs can be effective management tools and provide the opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service. They can help develop public awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively towards the conservation of our Nation's natural resources. They can also influence visitor behavior when visiting units of the Refuge System. Environmental education efforts for students span a broad diversity of science and natural resource topics, help connect

the Nation's youth with the natural world, and engage children in the outdoors. The educational partnership with the Blair Public School District (Nebraska) is nationally recognized, bringing thousands of onsite student visits annually. Future growth in formal educational student visits will be targeted at Omaha–Council Bluffs inner city schools located approximately 30 miles south of the refuges.

Current environmental education programs and activities include:

- Staff-conducted formal environmental educational school programs
- Self-guided school educational, with pre-visit and post-visit materials
- Friends Group educational bookstore in the DeSoto NWR Visitor Center

Strategies

1. Continue coordinating existing environmental education program partnership with local schools in Blair, Edison, and Fort Calhoun Schools (Nebraska), and West Harrison Schools (Iowa).
2. Work with local educators, refuge environmental education staff, and others to increase inner city education efforts by identifying new inner city education audiences and topics for environmental education programs.
3. Continue to encourage self-directed learning on the refuge in addition to providing programs, activities, talks, publications, audio-visual media, signs, and exhibits.
4. Continue to serve as a local resource for environmental education related to area wildlife, habitats, water resources, and cultural history by providing curricula, workshops, outdoor classrooms, and teaching materials.
5. Because DeSoto NWR's Steamboat Bertrand Museum Collection offers a one-of-a-kind cultural history education resource, the refuges will continue to offer formal cultural history programs and resources highlighting cultural history aspects of environmental education.
6. Continue to work with local educators to develop environmental education curricula and conduct workshops.
7. Develop operational measures of success for the environmental education program.

Objective 3.5: Interpretation

Both refuges: Over the life of the CCP, improve interpretive facilities and services as described in the associated strategies to increase visitor appreciation and understanding of the refuge purposes and FWS mission.

Rationale

Interpretation is a priority wildlife-dependent recreational use identified in the National Wildlife Refuge System Improvement Act of 1997. Well-designed interpretation programs can provide the opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service. They can help develop public awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively towards the conservation of our Nation's

natural resources. They can also influence visitor behavior when visiting units of the Refuge System.

Current interpretation programs and activities include:

- Junior Refuge Manager program
- Winter backyard bird feeding programs
- Wildlife observation walks and talks
- Wilson Island campfire talks
- Refuge-specific interpretive brochures and publications
- Wildlife and refuge orientation videos shown in the DeSoto NWR Visitor Center
- Wildlife observation stations with viewing scopes
- Family fishing clinics
- Interpretive wayside and kiosk panels
- Visitor Center exhibits
- Refuge website and Facebook pages

Strategies

1. Within the life of the CCP, as needed create new exhibit panels at DeSoto NWR's main entrance, wetland viewing platforms, trails, Missouri River Overlook, Steamboat Bertrand Discovery Site, boat launch sites, and at new areas opened to the public at both refuges.
2. Increase information at viewing platforms within three years, introducing a wider range of interpretive media over the life of the CCP; and update interpretive products to better reflect biological topics.
3. Within three years of CCP approval, develop a visitor services plan that identifies target audiences, establishes interpretive themes, and identifies the best tools and techniques to strategically apply interpretive programs and products.

Objective 3.6: Welcoming and Orientation

Both refuges: Within 5 years of plan approval, improve welcoming, orienting, and associated information and infrastructure as described in the associated strategies.

Rationale

Successfully welcoming and orienting refuge visitors is an important part of the development of a quality wildlife-dependent recreation program as identified in the National Wildlife Refuge System Improvement Act of 1997 and defined in the Service Manual (605 FW 1). The ease with which the public can navigate to visitor use areas on the refuges, understand guidelines for appropriate conduct and safety, meet basic needs (i.e., parking, restrooms, orientation, etc.), and fully engage in wildlife-related activities directly translates to a quality recreational experience, a positive impression of the Service, and an identification with the mission and goals of the Service.

On DeSoto NWR, the quantity of visitor services and resulting visitation have been sustained at high levels since the establishment of the refuge in 1958—and were further enhanced by the construction of the Visitor Center and Steamboat Bertrand Museum Collection display in 1981. DeSoto NWR is a destination for visitors, attracting a mix of individuals with wildlife-dependent recreation interests as well as interest in the refuge’s historical and cultural history. Adequate way-finding, orientation, signage, and other refuge information continues to be essential to directing people to the refuge and providing a positive visitor experience across the broad spectrum of public uses.

Information, orientation, and signage needs are even greater at Boyer Chute NWR, which does not maintain a daily staff presence. Proper signage and other welcoming and orienting materials can reduce the need for direct interaction with refuge staff and allows a greater amount of self-guided use.

Strategies

1. Complete a visitor services step-down management plan within three years of CCP approval to further evaluate and define refuge welcoming and orientation needs.
2. Establish a sign replacement plan, which will be revised/updated every three years during the life of the CCP.
3. Update existing kiosk and wayside information and orientation exhibits according to the sign plan priorities at both refuges.
4. Create new exhibit panels, within the life of the CCP, at DeSoto NWR main entrance, wetland viewing platforms, trails, Missouri River Overlook, Steamboat Bertrand Discovery Site, boat launch sites, and at new areas opened to the public at both refuges.
5. Work with the regional Departments of Transportation, within 10 years of CCP approval, to establish way-finding signage on U.S. 30 in Missouri Valley, Nebraska and Blair, Iowa; and on I-29 and I-80 in Council Bluffs, Iowa and Omaha, Nebraska.
6. Inspect refuge signs annually, updating and rehabilitating where necessary.
7. Maintain and update visitor service information provided by social media, brochures, and refuge websites over the life of the CCP.

Objective 3.7: Outreach

Over the life of the CCP, maintain current levels of media engagement and the current annual number of onsite small events (10) and offsite events (nine) with review and revision as necessary at five-year intervals.

Rationale

The Service’s “National Outreach Strategy” (FWS 1997a) defines outreach as a two-way communication between the Service and the public to establish mutual understanding, promote involvement, and influence attitudes and actions, with the goal of improving joint stewardship of our natural resources.

It is critical to the mission of the Refuge System and to DeSoto and Boyer Chute Refuges that neighbors, citizens, organizations, and agencies in the surrounding area know about the refuges and support them as valuable, contributing assets to area communities. Continued support is essential for the success of the refuges and their long-term viability. Developing relationships with other conservation agencies and organizations is of mutual benefit in meeting broader natural resource goals and objectives. Also, building support for land and water conservation among refuge neighbors is essential to the protection of natural resources over the long-term. It is important that the refuges continue efforts to build and maintain open lines of communication, informing partners and the public about the successes, opportunities, and challenges of conservation and wildlife-dependent recreation.

Current activities include:**Onsite**

National Public Lands Day
Spring Earth Day Cleanup
Boyer Butterfly Count
Family Fishing Clinics (5)
Spring Migration Weekend
National Wildlife Refuge Week
Fall Migration Weekend
Art-In-The Wild
Bertrand Days
Teachers Workshop
Junior Refuge Manager (6)

Offsite

Nebraska Fishing Clinic
Family Nature Nights (4)
Party for the Planet
Gifford Farm Park
Durham Teachers Workshop
Omaha Public Schools Career Day
Nebraska Science Festival
Wilson Island Campfire Talks (12)

Strategies

1. Evaluate visitor feedback and participation in annual onsite and offsite refuge events and programs for continuity, relevance, and changes.
2. Complete a visitor services step-down management plan within three years of CCP approval to further evaluate and define refuge events and outreach efforts.
3. Continue to interact with public media outlets to promote and report refuge programs activities, accomplishments, and management.
4. Continue to develop periodic news articles and radio/TV programs on refuge-related topics.
5. Maintain active communication with community leaders, schools, agencies, and partner organizations.
6. Continue to develop good relations with landowners in, and immediately adjacent to refuge authorized boundaries.
7. Work cooperatively with local universities, colleges, and other organizations and agencies to promote research on the refuges.
8. Continue to use the refuge website and social media to communicate with off-site audiences.

Objective 3.8: Gathering

Both refuges: After CCP approval, allow mushroom gathering in all areas and seasons that are open to the public.

Rationale

Access for gathering is not a wildlife-dependent recreational use of the Refuge System. Refuge resources can support this activity, which can also provide enjoyment of scenic views and a diversity of wildlife not usually available on adjacent private lands. Access for gathering is a high priority for many refuge visitors. In addition, consistency in the management of public use across both refuges will ease visitor understanding and management considerations related to this use.

Strategies

1. Monitor impacts to new areas open to mushroom gathering.
2. Provide updated visitor use information related to mushroom gathering through the refuge website, brochures, and other media.

Objective 3.9: Steamboat Bertrand Museum Collection and Discovery Site

Continue stewardship and display of the Steamboat Bertrand Museum Collection over the life of the CCP and improve interpretation of the Steamboat Bertrand Discovery Site for visitors by developing a new site interpretation proposal within 5 years of CCP approval.

Rationale

DeSoto NWR's Steamboat Bertrand Museum Collection and Discovery Site connect visitors to an important story in our national heritage, and constitute an invaluable and irreplaceable national treasure. Relaying the entire story of the Steamboat Bertrand—its construction, use, loss, rediscovery, excavation, preservation, and eventual display—highlights the importance of safeguarding historic sites and protecting these antiquities from degradation, looting, and other adverse impacts. It also tells the story of how the Missouri River once migrated freely across the floodplain, continually altering habitats along its course. Stewardship of the collection is derived from numerous laws, including the National Historic Preservation Act of 1966 as amended (16 U.S.C.470 et seq.) and the Archeological Resources Protection Act of 1979 as amended (16 U.S.C. 47011-mm).

Strategies

1. Develop and implement new interpretation around the Steamboat Bertrand Museum Collection and Discovery Site in coordination with the Nebraska State Historic Preservation Officer and Service Regional Historic Preservation Officer to ensure compliance with Section 106 of the National Historic Preservation Act of 1966, ARPA, and NAGPRA.

2. Ensure that the design and planning of the Steamboat Bertrand Museum Collection storage and interpretation includes updated considerations for disaster mitigation and evacuation procedures.
3. Ensure archaeological and cultural resources at the Steamboat Bertrand Discovery Site are better identified, interpreted, and accessible to the public.
4. Remove the existing overlook at the Steamboat Bertrand Discovery Site, and build a new interpretive kiosk within two years of CCP approval.
5. Ensure the Steamboat Bertrand Discovery Site story is connected to the resources displayed and interpreted at the Visitor Center.
6. Complete and maintain a comprehensive inventory of the Steamboat Bertrand Museum Collection.

Objective 3.10: Refuge Support

Both refuges: Over the life of the CCP, maintain an average of at least 3,500 annual volunteer hours and existing levels of support for the refuges from the Friends Group, law enforcement partnerships with local police departments and state game officers, partner agencies, and non-government organizations.

Rationale

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

The volunteer program over the past ten years for both refuges (combined) has averaged over 300 individuals each year that have helped with refuge awareness, wildlife surveys, DeSoto NWRs Eagle Emporium bookstore, general maintenance, environmental education, seed collecting, and fundraising activities.

As an extension of refuge volunteerism, a refuge Friends Group is a grassroots organization formed by citizens who have a shared desire and vision to support their local refuge. They join with Service personnel in a partnership that seeks to accomplish mutually defined goals. Maintaining a Friends Group helps build a constituency of support for the refuges, provides people with opportunities to assist in the accomplishment of the FWS mission, and enhances refuge performance through the creativity, innovations, labor, and expertise contributed by its members.

Strategies:

1. Fill existing (five) vacancies in the staffing chart for the refuges with the associated priority order (highest to lowest): wildlife biologist, maintenance, administrative assistant, maintenance, and park ranger.

2. Actively recruit new volunteers in areas within, and adjacent to, the refuges authorized boundaries, and throughout the Omaha–Council Bluffs Metropolitan Area.
3. Partner with the Friends Group to provide six onsite and offsite events as opportunities to recruit new volunteers and promote the Friends Group.
4. Work with volunteer organizations and area service groups to increase volunteerism at the refuges.
5. Support the refuge Friends Group in refuge education and resource management.
6. Work cooperatively with local universities, colleges, and other agencies to promote research on the refuges.

Appendix A: Finding of No Significant Impact (FONSI)

Finding of No Significant Impact

Environmental Assessment and Comprehensive Conservation Plan for DeSoto and Boyer Chute National Wildlife Refuges, Iowa and Nebraska

An Environmental Assessment (EA) has been prepared to identify management objectives to meet the conservation goals of DeSoto and Boyer Chute National Wildlife Refuges (NWRs). The EA examined the environmental consequences that each management alternative could have on the quality of the physical, biological, and human environment, as required by the National Environmental Policy Act of 1969 (NEPA). The EA evaluated four alternatives for the future management of DeSoto and Boyer Chute NWRs.

The alternative selected for implementation on the refuges is *Alternative D*. This preferred alternative takes an active approach to habitat and wildlife management and monitoring, focusing on an expansion of seasonal wetland habitat to emulate pre-regulation flood cycles of the Missouri River. The cooperative farming program will be phased out, grassland acreages will decrease in favor of wetland and wooded habitats, and the inlet and outlet structures on DeSoto Lake will be improved to increase lake management capabilities. Species monitoring will increase for aggregated targets. This alternative also provides a moderate increase in visitor services available to the public—including new opportunities across all six priority wildlife-dependent recreation activities. Public access and visitor opportunities increase across both refuges while minimizing new visitor services infrastructure development on the floodplain.

For reasons presented above and below, and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative D as the management alternative for DeSoto and Boyer Chute NWRs is not a major Federal action which would significantly affect the quality of the human environment, within the meaning of Section 102 (2)(c) of the National Environmental Policy Act of 1969.

Additional Reasons:

- Future management actions will have a neutral or positive impact on the local economy.
- This action will not have an adverse impact on threatened or endangered species.

Supporting References:

- Environmental Assessment
- Comprehensive Conservation Plan

ACTING Regional Director

Date

Appendix B: Species Lists

In this appendix:

[Introduction](#)

[Species List Legend](#)

[Birds](#)

[Mammals](#)

[Reptiles and Amphibians](#)

[Fishes](#)

[Butterflies](#)

Introduction

A great deal of research, numerous surveys, and countless observations on the refuges were used over time to develop the bird list for the refuges included in this appendix.

The species lists for mammals, reptiles, amphibians, and fish were updated specifically for this Comprehensive Conservation Plan (CCP) under contract with the U.S. Geologic Survey (USGS). The lists began with all species in each taxa for the states of Iowa and Nebraska, incorporating preexisting species lists for the refuges and lists of state or federal species of concern. These exhaustive species lists were then reduced using range information for each taxa derived from NatureServe (2011) and the sources below. A number of species that have not yet been documented on the refuges, but they are included in the species lists because of their potential to occur in the future.

- Mammals: American Society of Mammalogists (2012) and Iowa Gap Analysis Mammal List (Kane et al. 2003).
- Herptiles: Iowa Gap Analysis Herp List (Kane et al. 2003), Amphibians & Reptiles of Nebraska (Lemen et al. 2003), Reptiles and Amphibians of Eastern and Central North America (Conant and Collins 1998), and Annotated Checklist of the Amphibians and Reptiles of Nebraska (Lynch 1985).
- Fish: Iowa Aquatic Gap Fish Atlas (Loan-Wilsey et al. 2005), and The Lower Missouri River Rare and Endangered Fishes Distribution, Relative Abundance, and Community Association (Grady 1996).

A more detailed database of species for the refuges highlighting the species of greatest conservation concern, and a metadata file explaining the methodology used to compile the database, is included in the administrative record for this CCP. This database of “Resources of Concern” was used to identify potential focal species for the refuges and will be used to develop future step-down management plans for the refuges.

Species Lists Legend

Refuge Occurrence

R	Confirmed on the refuge
C	Confirmed in Washington County, Nebraska
E	Expected range
–	Potential range

Global Status

G1	Extremely rare and critically imperiled; five or fewer documented occurrences, or very few remaining individuals globally
G2	Very rare and imperiled; six to 20 documented occurrences, or few remaining individuals globally
G3	Either very rare and local throughout its range or found locally in a restricted range; 21 to 80 documented occurrences
G4	Common and apparently secure globally, although it may be rare in parts of its range, especially at the periphery; 81 to 300 occurrences
G5	Very common and demonstrably secure, although it may be rare in parts of its range, especially at the periphery; over 300 occurrences
GNR	Global not ranked
---	No data
?	Element not yet ranked, or rank is undecided

National Status

E	Endangered
T	Threatened
C	Candidate
S	Special Concern
X	Exotic
N	Non-indigenous

State Status

S1	Extremely rare and critically imperiled; five or fewer documented occurrences, or very few remaining individuals within the state
S2	Very rare and imperiled; six to 20 documented occurrences, or few remaining individuals within the state
S3	Rare and uncommon in the state; 21 to 80 documented occurrences
S4	Common and apparently secure; 81 to 300 occurrences
S5	Very common and demonstrably secure; over 300 occurrences
SNR	State not ranked
SNA	State not applicable (species is not a suitable conservation target)
SE	Considered exotic to the state
SX	Believed extirpated; little likelihood of rediscovery
SH	Historical occurrence; not documented within the past 20 years; may be rediscovered
SU	Currently unrankable due to lack of information or substantially conflicting information about status or trends
---	No data
?	Rank is undecided

Birds

Common Name	Family Name	Scientific Name	Refuge Occurrence	Global Status	National Status	Nebraska Status	Iowa Status	FWS Region 3 ¹	FWS Region 6 ¹	BCR 22 ¹ (Eastern Tallgrass Prairie)	Nebraska Breeding Species ²	Great Plains Endemic ²
Cooper's Hawk	Accipitridae	<i>Accipiter cooperii</i>	R	G5							•	
Northern Goshawk	Accipitridae	<i>Accipiter gentilis</i>	R	G5								
Sharp-shinned Hawk	Accipitridae	<i>Accipiter striatus</i>	R	G5							•	
Golden Eagle	Accipitridae	<i>Aquila chrysaetos</i>	R	G5					•		•	
Red-tailed Hawk	Accipitridae	<i>Buteo jamaicensis</i>	R	G5							•	
Rough-legged Hawk	Accipitridae	<i>Buteo lagopus</i>	R	G5							•	
Red-shouldered Hawk	Accipitridae	<i>Buteo lineatus</i>	R	G5			E					
Broad-winged Hawk	Accipitridae	<i>Buteo platypterus</i>	R	G5								
Swainson's Hawk	Accipitridae	<i>Buteo swainsoni</i>	R	G5	C			•			•	
Northern Harrier	Accipitridae	<i>Circus cyaneus</i>	R	G5			E				•	
Bald Eagle	Accipitridae	<i>Haliaeetus leucocephalus</i>	R	G4			S	•	•	•	•	
Osprey	Accipitridae	<i>Pandion haliaetus</i>	R	G5								
Horned Lark	Alaudidae	<i>Eremophila alpestris</i>	R	G5							•	
Belted Kingfisher	Alcedinidae	<i>Ceryle alcyon</i>	R	G5							•	
Wood Duck	Anatidae	<i>Aix sponsa</i>	R	G5							•	
Northern Pintail	Anatidae	<i>Anas acuta</i>	R	G5							•	
American Wigeon	Anatidae	<i>Anas americana</i>	R	G5							•	
Northern Shoveler	Anatidae	<i>Anas clypeata</i>	R	G5							•	
Green-winged Teal	Anatidae	<i>Anas crecca</i>	R	G5							•	
Blue-winged Teal	Anatidae	<i>Anas discors</i>	R	G5							•	
Mallard	Anatidae	<i>Anas platyrhynchos</i>	R	G5							•	
American Black Duck	Anatidae	<i>Anas rubripes</i>	R	G5								
Gadwall	Anatidae	<i>Anas strepera</i>	R	G5							•	
Greater White-fronted Goose	Anatidae	<i>Anser albifrons</i>	R	G5								
Lesser Scaup	Anatidae	<i>Aythya affinis</i>	R	G5							•	
Redhead	Anatidae	<i>Aythya americana</i>	R	G5							•	
Ring-necked Duck	Anatidae	<i>Aythya collaris</i>	R	G5							•	
Greater Scaup	Anatidae	<i>Aythya marila</i>	R	G5								
Canvasback	Anatidae	<i>Aythya valisineria</i>	R	G5							•	
Canada Goose	Anatidae	<i>Branta canadensis</i>	R	G5							•	
Cackling Goose	Anatidae	<i>Branta hutchinsii</i>	R	G5							•	
Bufflehead	Anatidae	<i>Bucephala albeola</i>	R	G5								
Common Goldeneye	Anatidae	<i>Bucephala clangula</i>	R	G5								

Snow Goose	Anatidae	<i>Chen caerulescens</i>	R	G5									
Ross's Goose	Anatidae	<i>Chen rossii</i>	R	G4									
Trumpeter Swan	Anatidae	<i>Cygnus buccinator</i>	R	G4								•	
Hooded Merganser	Anatidae	<i>Lophodytes cucullatus</i>	R	G5								•	
Common Merganser	Anatidae	<i>Mergus merganser</i>	R	G5								•	
Red-breasted Merganser	Anatidae	<i>Mergus serrator</i>	R	G5									
Ruddy Duck	Anatidae	<i>Oxyura jamaicensis</i>	R	G5								•	
Chimney Swift	Apodidae	<i>Chaetura pelagica</i>	R	G5								•	
Great Egret	Ardeidae	<i>Ardea alba</i>	R	G5								•	
Great Blue Heron	Ardeidae	<i>Ardea herodias</i>	R	G5								•	
American Bittern	Ardeidae	<i>Botaurus lentiginosus</i>	R	G4				•				•	
Cattle Egret	Ardeidae	<i>Bubulcus ibis</i>	R	G5								•	
Green Heron	Ardeidae	<i>Butorides virescens</i>	R	G5								•	
Little Blue Heron	Ardeidae	<i>Egretta caerulea</i>	R	G5									
Snowy Egret	Ardeidae	<i>Egretta thula</i>	R	G5								•	
Least Bittern	Ardeidae	<i>Ixobrychus exilis</i>	R	G5				•	•	•	•		
Black-crowned Night-Heron	Ardeidae	<i>Nycticorax nycticorax</i>	R	G5						•	•		
Cedar Waxwing	Bombycillidae	<i>Bombycilla cedrorum</i>	R	G5								•	
Smith's Longspur	Calcariidae	<i>Calcarius pictus</i>	R	G5				•	•	•			
Eastern Whip-poor-will	Caprimulgidae	<i>Caprimulgus vociferus</i>	R	G5				•		•	•		
Common Nighthawk	Caprimulgidae	<i>Chordeiles minor</i>	R	G5								•	
Northern Cardinal	Cardinalidae	<i>Cardinalis cardinalis</i>	R	G5								•	
Blue Grosbeak	Cardinalidae	<i>Guiraca caerulea</i>	R	G5								•	
Indigo Bunting	Cardinalidae	<i>Passerina cyanea</i>	R	G5								•	
Rose-breasted Grosbeak	Cardinalidae	<i>Pheucticus ludovicianus</i>	R	G5								•	
Scarlet Tanager	Cardinalidae	<i>Piranga olivacea</i>	R	G5								•	
Dickcissel	Cardinalidae	<i>Spiza americana</i>	R	G5				•		•	•	•	
Turkey Vulture	Cathartidae	<i>Cathartes aura</i>	R	G5									
Brown Creeper	Certhiidae	<i>Certhia americana</i>	R	G5								•	
Piping Plover	Charadriidae	<i>Charadrius melodus</i>	R	G3		E	E					•	
Semipalmated Plover	Charadriidae	<i>Charadrius semipalmatus</i>	R	G5									
Killdeer	Charadriidae	<i>Charadrius vociferus</i>	R	G5								•	
American Golden Plover	Charadriidae	<i>Pluvialis dominica</i>	R	G5									
Black-bellied Plover	Charadriidae	<i>Pluvialis squatarola</i>	R	G5									
Rock Pigeon	Columbidae	<i>Columba livia</i>	R	G5								•	
Eurasian Collared Dove	Columbidae	<i>Streptopelia decaocto</i>	R	G5									
Mourning Dove	Columbidae	<i>Zenaida macroura</i>	R	G5								•	
American Crow	Corvidae	<i>Corvus brachyrhynchos</i>	R	G5								•	
Blue Jay	Corvidae	<i>Cyanocitta cristata</i>	R	G5								•	
Yellow-billed Cuckoo	Cuculidae	<i>Coccyzus americanus</i>	R	G5								•	
Black-billed Cuckoo	Cuculidae	<i>Coccyzus erythrophthalmus</i>	R	G5				•	•	•	•		
Henslow's Sparrow	Emberizidae	<i>Ammodramus henslowii</i>	R	G4			T	•	•	•	•		
Le Conte's Sparrow	Emberizidae	<i>Ammodramus leconteii</i>	R	G4					•	•		•	
Nelson's Sharp-tailed Sparrow	Emberizidae	<i>Ammodramus nelsoni</i>	R	G5				•	•		•		
Grasshopper Sparrow	Emberizidae	<i>Ammodramus savannarum</i>	R	G5					•	•	•		
Lapland Longspur	Emberizidae	<i>Calcarius lapponicus</i>	R	G5									
Chestnut-collared Longspur	Emberizidae	<i>Calcarius ornatus</i>	R	G5				•	•		•	•	
Lark Sparrow	Emberizidae	<i>Chondestes grammacus</i>	R	G5								•	

Black Tern	Laridae	<i>Chlidonias niger</i>	R	G4			S	•		•	•	
Herring Gull	Laridae	<i>Larus argentatus</i>	R	G5								
Ring-billed Gull	Laridae	<i>Larus delawarensis</i>	R	G5								
Bonaparte's Gull	Laridae	<i>Larus philadelphia</i>	R	G5								
Franklin's Gull	Laridae	<i>Larus pipixcan</i>	R	G4 G5								•
Least Tern	Laridae	<i>Sterna antillarum</i>	R	G4	E	E	E				•	
Caspian Tern	Laridae	<i>Sterna caspia</i>	R	G5								
Forster's Tern	Laridae	<i>Sterna forsteri</i>	R	G5			S				•	
Common Tern	Laridae	<i>Sterna hirundo</i>	R	G5				•		•		
Gray Catbird	Mimidae	<i>Dumetella carolinensis</i>	R	G5							•	
Northern Mockingbird	Mimidae	<i>Mimus polyglottos</i>	R	G5							•	
Brown Thrasher	Mimidae	<i>Toxostoma rufum</i>	R	G5							•	
American Pipit	Motacillidae	<i>Anthus rubescens</i>	R	G5								
Northern Bobwhite	Odontophoridae	<i>Colinus virginianus</i>	R	G5							•	
Tufted Titmouse	Paridae	<i>Baeolophus bicolor</i>	R	G5							•	
Black-capped Chickadee	Paridae	<i>Poecile atricapilla</i>	R	G5							•	
Black-throated Green Warbler	Parulidae	<i>Dendroica caerulescens</i>	R	G5								
Yellow Rumped Warbler	Parulidae	<i>Dendroica coronata</i>	R	G5							•	
Palm Warbler	Parulidae	<i>Dendroica palmarum</i>	R	G5								
Chestnut-sided Warbler	Parulidae	<i>Dendroica pensylvanica</i>	R	G5								
Yellow Warbler	Parulidae	<i>Dendroica petechia</i>	R	G5							•	
Blackpoll Warbler	Parulidae	<i>Dendroica striata</i>	R	G5								
Common Yellowthroat	Parulidae	<i>Geothlypis trichas</i>	R	G5							•	
Yellow-breasted Chat	Parulidae	<i>Icteria virens</i>	R	G5							•	
Black and White Warbler	Parulidae	<i>Mniotilta varia</i>	R	G5							•	
Mourning Warbler	Parulidae	<i>Oporornis philadelphia</i>	R	G5								
Louisiana Waterthrush	Parulidae	<i>Parkesia motacilla</i>	R	G5								
Northern Parula	Parulidae	<i>Parula americana</i>	R	G5								
Ovenbird	Parulidae	<i>Seiurus aurocapillus</i>	R	G5							•	
Northern Water Thrush	Parulidae	<i>Seiurus noveboracensis</i>	R	G5								
Bay-breasted Warbler	Parulidae	<i>Setophaga castanea</i>	R	G5								
Blackburnian Warbler	Parulidae	<i>Setophaga fusca</i>	R	G5								
Magnolia Warbler	Parulidae	<i>Setophaga magnolia</i>	R	G5								
American Redstart	Parulidae	<i>Setophaga ruticilla</i>	R	G5							•	
Orange-crowned Warbler	Parulidae	<i>Vermivora celata</i>	R	G5								
Tennessee Warbler	Parulidae	<i>Vermivora peregrina</i>	R	G5								
Nashville Warbler	Parulidae	<i>Vermivora ruficapilla</i>	R	G5								
Wilson's Warbler	Parulidae	<i>Wilsonia pusilla</i>	R	G5								
House Sparrow	Passeridae	<i>Passer domesticus</i>	R	G5							•	
American White Pelican	Pelecanidae	<i>Pelecanus erythrorhynchos</i>	R	G3								
Double-crested Cormorant	Phalacrocoracidae	<i>Phalacrocorax auritus</i>	R	G5							•	
Wild Turkey	Phasianidae	<i>Meleagris gallopavo</i>	R	G5							•	
Ring-necked Pheasant	Phasianidae	<i>Phasianus colchicus</i>	R	G5							•	
Greater Prairie Chicken	Phasianidae	<i>Tympanuchus cupido</i>	R	G4							•	
Northern Flicker	Picidae	<i>Colaptes auratus</i>	R	G5						•	•	
Pileated Woodpecker	Picidae	<i>Dryocopus pileatus</i>	R	G5								
Red-bellied Woodpecker	Picidae	<i>Melanerpes carolinus</i>	R	G5							•	
Red-headed Woodpecker	Picidae	<i>Melanerpes erythrocephalus</i>	R	G5				•	•	•	•	

¹ U.S. Fish and Wildlife Service, *Birds of Conservation Concern* (2002, 2008a, 2011d)
² Johnsgard, *Nebraska Bird Review* (1979, 1998, 2009)

Mammals

Common Name	Family	Scientific Name	Refuge Occurrence	Global Status	National Status	Nebraska Status	Iowa Status
Coyote	Canidae	<i>Canis latrans</i>	R	G5		S5	S5
Gray fox	Canidae	<i>Urocyon cinereoargenteus</i>	E	G5		S4	S4
Red fox	Canidae	<i>Vulpes vulpes</i>	R	G5		S5	S4
Beaver	Castoridae	<i>Castor canadensis</i>	R	G5		S5	S5
White-tailed deer	Cervidae	<i>Odocoileus virginianus</i>	R	G5		S5	S5
Mule deer	Cervidae	<i>Odocoileus hemionus</i>	–	G5		S5	---
Prairie vole	Cricetidae	<i>Microtus ochrogaster</i>	R	G5		S5	S3
Meadow vole	Cricetidae	<i>Microtus pennsylvanicus</i>	R	G5		S5	S5
Woodland Vole	Cricetidae	<i>Microtus pinetorum</i>	–	G5		S1	S3
Common muskrat	Cricetidae	<i>Ondatra zibethicus</i>	R	G5		S5	S5
Northern grasshopper mouse	Cricetidae	<i>Onychomys leucogaster</i>	R	G5		S5	S3
White-footed deermouse	Cricetidae	<i>Peromyscus leucopus</i>	R	G5		S5	S5
North American deermouse	Cricetidae	<i>Peromyscus maniculatus</i>	R	G5		S5	S5
Western harvest mouse	Cricetidae	<i>Reithrodontomys megalotis</i>	R	G5		S4	S4
Hispid cotton rat	Cricetidae	<i>Sigmodon hispidus</i>	–	G5		S3	SU
Southern bog lemming	Cricetidae	<i>Synaptomys cooperi</i>	–	G5		S4	S3
Virginia opossum	Didelphidae	<i>Didelphis marsupialis</i>	R	G5		S5	S5
Meadow jumping mouse	Dipodidae	<i>Zapus hudsonius</i>	R	G5		S5	S4
Nine-banded armadillo	Dasypodidae	<i>Dasypus novemcinctus</i>	–	G5		---	---
Porcupine	Erethizontidae	<i>Erethizon dorsatum</i>	–	G5		S4	SX
Feral Cat	Felidae	<i>Felis catus</i>	R	GNA	X	SNA	SNA
Bobcat	Felidae	<i>Lynx rufus</i>	R	G5		S5	S3
Plains pocket gopher	Geomyidae	<i>Geomys bursarius</i>	R	G5		S5	S5
Hispid pocket mouse	Heteromyidae	<i>Chaetodipus hispidus</i>	–	G5		S5	---
Plains pocket mouse	Heteromyidae	<i>Perognathus flavescens</i>	E	G5		S5	S2
Black-tailed jackrabbit	Leporidae	<i>Lepus californicus</i>	–	G5		S5	---
White-tailed jackrabbit	Leporidae	<i>Lepus townsendii</i>	R	G5		S4	S3
Eastern cottontail	Leporidae	<i>Sylvilagus floridanus</i>	R	G5		S5	S5
House mouse	Muridae	<i>Mus musculus</i>	R	G5		SNA	SNA
Norway rat	Muridae	<i>Rattus norvegicus</i>	R	G5		SNA	SNA
River otter	Mustelidae	<i>Lontra canadensis</i>	–	G5		S2	S3
Striped skunk	Mustelidae	<i>Mephitis mephitis</i>	R	G5		S5	S5
Long-tailed weasel	Mustelidae	<i>Mustela frenata</i>	R	G5		S5	S4
Least weasel	Mustelidae	<i>Mustela rixosa</i>	–	G5		S5	S3
Mink	Mustelidae	<i>Mustela vison</i>	R	G5		S5	S4
Eastern spotted skunk	Mustelidae	<i>Spilogale putorius</i>	R	G5		S1	S1
Badger	Mustelidae	<i>Taxidea taxus</i>	R	G5		S5	S4
Nutria	Myocastoridae	<i>Myocastor coypus</i>	–	G5	X	SNA	SNA

Raccoon	Procyonidae	<i>Procyon lotor</i>	R	G5		S5	S5
Franklin ground squirrel	Sciuridae	<i>Citellus franklinii</i>	R	G5		S5	S3
Southern flying squirrel	Sciuridae	<i>Glaucomys volans</i>	–	G5		S1	S4
Woodchuck	Sciuridae	<i>Marmota monax</i>	R	G5		S4	S5
Eastern gray squirrel	Sciuridae	<i>Sciurus carolinensis</i>	R	G5		S3	S5
Eastern fox squirrel	Sciuridae	<i>Sciurus niger</i>	R	G5		S5	S5
Richardson's ground squirrel	Sciuridae	<i>Spermophilus richardsonii</i>	–	G5		---	S3
Thirteen-lined ground squirrel	Sciuridae	<i>Spermophilus tridecemlineatus</i>	R	G5		S5	S5
Eastern chipmunk	Sciuridae	<i>Tamias striatus</i>	–	G5		S1	S5
Northern short-tailed shrew	Soricidae	<i>Blarina brevicauda</i>	R	G5		S3	S5
Least shrew	Soricidae	<i>Cryptotis parva</i>	–	G5		S4	S2
Cinereus shrew	Soricidae	<i>Sorex cinereus</i>	–	G5		---	SNR
Hayden's shrew	Soricidae	<i>Sorex haydeni</i>	–	G4		S4	---
Eastern mole	Talpidae	<i>Scalopus aquaticus</i>	R	G5		S5	S5
Big brown bat	Vespertilionidae	<i>Eptesicus fuscus</i>	E	G5		S5	S4
Silver-haired bat	Vespertilionidae	<i>Lasionycteris noctivagans</i>	E	G5		S5	S4
Eastern red bat	Vespertilionidae	<i>Lasiurus borealis</i>	E	G5		S5	S4
Hoary bat	Vespertilionidae	<i>Lasiurus cinereus</i>	E	G5		S5	S4
Western small-footed myotis	Vespertilionidae	<i>Myotis ciliolabrum</i>	–	G5		S4	---
Little brown myotis	Vespertilionidae	<i>Myotis lucifugus</i>	R	G5		S4	S4
Northern myotis	Vespertilionidae	<i>Myotis septentrionalis</i>	–	G4		S4	S4
Indiana bat	Vespertilionidae	<i>Myotis sodalis</i>	–	G2	E	---	S1
Evening bat	Vespertilionidae	<i>Nycticeius humeralis</i>	–	G5		S4	S3
Eastern pipistrelle	Vespertilionidae	<i>Perimyotis subflavus</i>	–	G5		S1	S4

Reptiles and Amphibians

Common Name	Order	Family	Scientific Name	Refuge Occurrence	Global Status	National Status	Nebraska Status	Iowa Status
Common American toad	Anura	Bufonidae	<i>Bufo americanus</i>	R	G5		S1	S5
Great plains toad	Anura	Bufonidae	<i>Bufo cognatus</i>	R	G5		S5	S4
Fowler's toad	Anura	Bufonidae	<i>Bufo fowleri</i>	–	G5		---	S3
Woodhouse's toad	Anura	Bufonidae	<i>Bufo woodhouseii</i>	R	G5		S5	S3
Blanchard's cricket frog	Anura	Hylidae	<i>Acris blanchardi</i>	R	G5		S5	S3?
Northern cricket frog	Anura	Hylidae	<i>Acris crepitans</i>	R	G5		---	---
Cope's gray treefrog	Anura	Hylidae	<i>Hyla chrysoscelis</i>	R	G5		S5	S4
Gray treefrog	Anura	Hylidae	<i>Hyla versicolor</i>	C	G5		---	S4
Spring peeper	Anura	Hylidae	<i>Pseudacris crucifer</i>	–	G5		---	S4
Chorus frog	Anura	Hylidae	<i>Pseudacris maculata</i>	R	G5		S5	S4
Western chorus frog	Anura	Hylidae	<i>Pseudacris triseriata triseriata</i>	R	G5		---	---
Plains narrow-mouthed toad	Anura	Microhylidae	<i>Gastrophryne olivacea</i>	–	G5		S3S4	---
Crawfish frog	Anura	Ranidae	<i>Rana areolata</i>	–	G4		---	S1
Plains leopard frog	Anura	Ranidae	<i>Rana blairi</i>	R	G5		S5	S5
American bullfrog	Anura	Ranidae	<i>Rana catesbeiana</i>	R	G5		S5	S5
Green frog	Anura	Ranidae	<i>Rana clamitans</i>	R	G5		---	S4
Pickrel frog	Anura	Ranidae	<i>Rana palustris</i>	–	G5		---	S4
Northern leopard frog	Anura	Ranidae	<i>Rana pipiens</i>	R	G5		S5	S5
Southern leopard frog	Anura	Ranidae	<i>Rana sphenoccephala</i>	R	G5		---	S4
Plains spadefoot toad	Anura	Scaphiopodidae	<i>Scaphiopus bombifrons</i>	R	G5		S5	S4
Smallmouth salamander	Caudata	Ambystomatidae	<i>Ambystoma texanum</i>	E	G5		S1	S3
Eastern tiger salamander	Caudata	Ambystomatidae	<i>Ambystoma tigrinum</i>	C	G5		S5	S5
Mudpuppy	Caudata	Proteidae	<i>Necturus maculosus</i>	–	G5		---	S2
Common snapping turtle	Testudines	Chelydridae	<i>Chelydra serpentina</i>	R	G5		S5	S5
Northern painted turtle	Testudines	Emydidae	<i>Chrysemys picta</i>	R	G5		S5	S5
Blanding's turtle	Testudines	Emydidae	<i>Emydoidea blandingii</i>	–	G4		S5	S3
Map turtle	Testudines	Emydidae	<i>Graptemys geographica</i>	–	G5		---	S4
False map turtle	Testudines	Emydidae	<i>Graptemys pseudogeographica</i>	R	G5		S4	S4
Missouri river cooter	Testudines	Emydidae	<i>Pseudemys concinna metteri</i>	–	G5		---	---
Ornate box turtle	Testudines	Emydidae	<i>Terrapene ornata</i>	R	G5		S5	S2
Slider	Testudines	Emydidae	<i>Trachemys scripta</i>	–	G5		---	S3
Yellow mud turtle	Testudines	Kinosternidae	<i>Kinosternon flavescens</i>	–	G5		S3	S1
Common musk turtle	Testudines	Kinosternidae	<i>Sternotherus odoratus</i>	–	G5		---	S2
Smooth softshell	Testudines	Trionychidae	<i>Apalone mutica</i>	R	G5		S5	S4
Spiny softshell	Testudines	Trionychidae	<i>Apalone spinifera</i>	R	G5		S5	SNR
Western wormsneak	Squamata	Colubridae	<i>Carphophis vermis</i>	E	G5		S5	S3
Racer	Squamata	Colubridae	<i>Coluber constrictor</i>	R	G5		S5	S5
Ring-neck snake	Squamata	Colubridae	<i>Diadophis punctatus</i>	R	G5		S5	S5

Western hog-nose snake	Squamata	Colubridae	<i>Heterodon nasicus</i>	E	G5		S5	S1
Eastern hog-nose snake	Squamata	Colubridae	<i>Heterodon platirhinos</i>	R	G5		S4	S4
Yellow-bellied kingsnake	Squamata	Colubridae	<i>Lampropeltis calligaster</i>	E	G5		S2	S3
Common kingsnake	Squamata	Colubridae	<i>Lampropeltis getulus</i>	E	G5		S1	S1
Milksnake	Squamata	Colubridae	<i>Lampropeltis triangulum</i>	C	G5		S5	S4
Diamond-backed watersnake	Squamata	Colubridae	<i>Nerodia rhombifer</i>	–	G5		---	S4
Northern watersnake	Squamata	Colubridae	<i>Nerodia sipedon</i>	E	G5		S5	S5
Smooth greensnake	Squamata	Colubridae	<i>Opheodrys vernalis</i>	E	G5		S1	S3
Western ratsnake	Squamata	Colubridae	<i>Pantherophis obsoleta</i>	E	G5		S4	S4
Western foxsnake	Squamata	Colubridae	<i>Pantherophis vulpinus</i>	R	G5		S5	S4
Bullsnake / gophersnake	Squamata	Colubridae	<i>Pituophis catenifer</i>	R	G5		S5	S4
Graham's crayfish snake	Squamata	Colubridae	<i>Regina grahamii</i>	E	G5		S2	S4
Brownsnake	Squamata	Colubridae	<i>Storeria dekayi</i>	R	G5		S3	S5
Red-bellied snake	Squamata	Colubridae	<i>Storeria occipitomaculata</i>	C	G5		S2	S3
Western ribbonsnake	Squamata	Colubridae	<i>Thamnophis proximus</i>	R	G5		S2	S5
Plains gartersnake	Squamata	Colubridae	<i>Thamnophis radix</i>	R	G5		S5	S4
Common gartersnake	Squamata	Colubridae	<i>Thamnophis sirtalis</i>	R	G5		S5	S5
Lined snake	Squamata	Colubridae	<i>Tropidoclonion lineatum</i>	E	G5		S5	S4
Copperhead	Squamata	Viperidae	<i>Agkistrodon contortrix</i>	–	G5		S2	S1
Timber rattlesnake	Squamata	Viperidae	<i>Crotalus horridus</i>	E	G4		S1	S3
Prairie rattlesnake	Squamata	Viperidae	<i>Crotalus viridis</i>	E	G5		S4	S1
Massasauga rattlesnake	Squamata	Viperidae	<i>Sistrurus catenatus</i>	E	G3G4	C	S1	S1
Five-lined skink	Squamata - Lacertilia	Scincidae	<i>Plestiodon fasciatus</i>	E	G5		S1	S4
Prairie skink	Squamata - Lacertilia	Scincidae	<i>Plestiodon septentrionalis</i>	R	G5		S5	S3
Six-lined racerunner	Squamata - Lacertilia	Teiidae	<i>Aspidoscelis sexlineata</i>	E	G5		S5	S3

Fishes

Common Name	Family	Scientific Name	Refuge Occurrence	Global Status	National Status	Nebraska Status	Iowa Status
Pallid sturgeon	Acipenseridae	<i>Scaphirhynchus albus</i>	R	G2	E	S1	S1
Shovelnose sturgeon	Acipenseridae	<i>Scaphirhynchus platyrhynchus</i>	R	G4		S4	S4
Bowfin	Amiidae	<i>Amia calva</i>	–	G5		SH	S3
American eel	Anguillidae	<i>Anguilla rostrata</i>	R	G4		SNR	S3
River carpsucker	Catostomidae	<i>Carpionodes carpio</i>	R	G5		S5	S5
Quillback	Catostomidae	<i>Carpionodes cyprinus</i>	R	G5		S4	S5
Highfin carpsucker	Catostomidae	<i>Carpionodes velifer</i>	–	G4G5		SX	S4
White sucker	Catostomidae	<i>Catostomus commersoni</i>	R	G5		S4	S5
Blue sucker	Catostomidae	<i>Cycleptus elongatus</i>	R	G3G4	S	S1	S3
Smallmouth buffalo	Catostomidae	<i>Ictiobus bubalus</i>	R	G5		S3	S5
Bigmouth buffalo	Catostomidae	<i>Ictiobus cyprinellus</i>	R	G5		S4	S5
Black buffalo	Catostomidae	<i>Ictiobus niger</i>	R	G5		S2	S3
River redhorse	Catostomidae	<i>Moxostoma carinatum</i>	R	G4		---	S3
Golden redhorse	Catostomidae	<i>Moxostoma erythrurum</i>	–	G5		---	SNR
Shorthead redhorse	Catostomidae	<i>Moxostoma macrolepidotum</i>	–	G5		S5	S5
Green sunfish	Centrarchidae	<i>Lepomis cyanellus</i>	R	G5		S5	S5
Orange-spotted sunfish	Centrarchidae	<i>Lepomis humilis</i>	R	G5		S5	S5
Bluegill	Centrarchidae	<i>Lepomis macrochirus</i>	R	G5		S5	S5
Long-ear sunfish	Centrarchidae	<i>Lepomis megalotis</i>	–	G5		---	SX
Largemouth bass	Centrarchidae	<i>Micropterus salmoides</i>	R	G5		S5	S5
White crappie	Centrarchidae	<i>Pomoxis annularis</i>	R	G5		S5	S5
Black crappie	Centrarchidae	<i>Pomoxis nigromaculatus</i>	R	G5		S5	S5
Alabama shad	Clupeidae	<i>Alosa alabamiae</i>	–	G3		---	SH
Skipjack herring	Clupeidae	<i>Alosa chrysochloris</i>	R	G5		SNR	S3
Gizzard shad	Clupeidae	<i>Dorosoma cepedianum</i>	R	G5		S5	S5
Central stone-roller	Cyprinidae	<i>Campostoma anomalum</i>	–	G5		S5	S5
Goldfish	Cyprinidae	<i>Carassius auratus</i>	R	G5	X	SNA	SNA
Grass carp	Cyprinidae	<i>Ctenopharyngodon idella</i>	R	G5	X	SX	SX
Brook stickleback	Cyprinidae	<i>Culaea inconstans</i>	R	G5		S3	S4
Common carp	Cyprinidae	<i>Cyprinus carpio</i>	R	G5	X	SNA	SNA
Western silvery minnow	Cyprinidae	<i>Hybognathus argyritis</i>	R	G4	S	S5	S1
Brassy minnow	Cyprinidae	<i>Hybognathus hankinsoni</i>	R	G5		S4	S5
Central silvery minnow	Cyprinidae	<i>Hybognathus nuchalis</i>	–	G5		---	S3?
Plains minnow	Cyprinidae	<i>Hybognathus placitus</i>	R	G4	S	S4	S4
Speckled chub	Cyprinidae	<i>Hybopsis aestivalis</i>	–	G3G4		---	---
Flathead chub	Cyprinidae	<i>Hybopsis gracilis</i>	R	G5	S	S5	S3
Silver chub	Cyprinidae	<i>Hybopsis storeriana</i>	R	G5		S4	SNR
Silver carp	Cyprinidae	<i>Hypophthalmichthys molitrix</i>	–	G5	X	---	---

Bighead carp	Cyprinidae	<i>Hypophthalmichthys nobilis</i>	R	G5	X	SX	SX
Sturgeon chub	Cyprinidae	<i>Macrhybopsis gelida</i>	R	G3	C	S1	SH
Shoal chub	Cyprinidae	<i>Macrhybopsis hyostoma</i>	R	G5		S4	SNR
Sicklefin chub	Cyprinidae	<i>Macrhybopsis meeki</i>	R	G3	C	S1	S1?
Golden shiner	Cyprinidae	<i>Notemigonus crysoleucas</i>	R	G5		S5	S4
Emerald shiner	Cyprinidae	<i>Notropis atherinoides</i>	R	G5		S4	S5
River shiner	Cyprinidae	<i>Notropis blennioides</i>	R	G5		S4	SNR
Ghost shiner	Cyprinidae	<i>Notropis bairdii</i>	–	G5		---	S3
Striped shiner	Cyprinidae	<i>Notropis chryscephalus</i>	–	G5		---	---
Bigmouth shiner	Cyprinidae	<i>Notropis dorsalis</i>	R	G5		S4	S5
Spottail shiner	Cyprinidae	<i>Notropis hudsonius</i>	R	G5		SNA	SNR
Red shiner	Cyprinidae	<i>Notropis lutrensis</i>	R	G5		S5	S5
Rosyface shiner	Cyprinidae	<i>Notropis rubellus</i>	–	G5		---	---
Silverband shiner	Cyprinidae	<i>Notropis shumardi</i>	–	G5		SU	SX
Spotfin shiner	Cyprinidae	<i>Notropis spilopterus</i>	–	G5		S2S3	S5
Sand shiner	Cyprinidae	<i>Notropis stramineus</i>	R	G5		S5	S5
Redfin shiner	Cyprinidae	<i>Notropis umbratilis</i>	–	G5		---	S4
Mimic shiner	Cyprinidae	<i>Notropis volucellus</i>	–	G5		---	S4
Channel shiner	Cyprinidae	<i>Notropis wickliffi</i>	–	G5		---	SNR
Suckermouth minnow	Cyprinidae	<i>Phenacobius mirabilis</i>	–	G5		S4	S4
Blunt-nose minnow	Cyprinidae	<i>Pimephales notatus</i>	R	G5		S3	S5
Fathead minnow	Cyprinidae	<i>Pimephales promelas</i>	–	G5		S5	S5
Creek chub	Cyprinidae	<i>Semotilus atromaculatus</i>	R	G5		S5	S5
Northern pike	Esocidae	<i>Esox lucius</i>	R	G5		S4	S5
Plains killifish	Fundulidae	<i>Fundulus kansae</i>	–	GNR		S4	---
Burbot	Gadidae	<i>Lota lota</i>	R	G5		SH	S3
Goldeye	Hiodontidae	<i>Hiodon alosoides</i>	R	G5		S5	SNR
Mooneye	Hiodontidae	<i>Hiodon tergisus</i>	–	G5		SNR	SNR
Blue catfish	Ictaluridae	<i>Ictalurus furcatus</i>	R	G5		S3	S4
Black bullhead	Ictaluridae	<i>Ictalurus melas</i>	R	G5		S5	S5
Yellow bullhead	Ictaluridae	<i>Ictalurus natalis</i>	R	G5		S4	S4
Channel catfish	Ictaluridae	<i>Ictalurus punctatus</i>	R	G5		S5	S5
Stonecat	Ictaluridae	<i>Noturus flavus</i>	R	G5		S5	S5
Tadpole madtom	Ictaluridae	<i>Noturus gyrinus</i>	R	G5		S3	S3
Freckled madtom	Ictaluridae	<i>Noturus nocturnus</i>	–	G5		-	S2
Flathead catfish	Ictaluridae	<i>Pylodictis olivaris</i>	–	G5		S4	S4
Long-nose gar	Lepisosteidae	<i>Lepisosteus osseus</i>	R	G5		S4	S3
Short-nose gar	Lepisosteidae	<i>Lepisosteus platostomus</i>	R	G5		S5	S4
White perch	Moronidae	<i>Morone americana</i>	R	G5		SNA	---
White bass	Moronidae	<i>Morone chrysops</i>	R	G5		S4	S4
Hybrid striped bass	Moronidae	<i>Morone chrysops</i> x <i>M. saxatilis</i>	R	GNR	N	SNR	SNR
Striped bass	Moronidae	<i>Morone saxatilis</i>	–	G5	N	SNA	---
Rainbow smelt	Osmeridae	<i>Osmerus mordax</i>	–	G5	N	SE	---
Johnny darter	Percidae	<i>Etheostoma nigrum</i>	R	G5		S3	S5
Orange-throat darter	Percidae	<i>Etheostoma spectabile</i>	–	G5		S3	S2
Yellow perch	Percidae	<i>Perca flavescens</i>	R	G5		S5	S5
Logperch	Percidae	<i>Percina caprodes</i>	–	G5		---	S3
Trout perch	Percidae	<i>Percopsis omiscomaycus</i>	R	G5		S1	S3
Sauger	Percidae	<i>Stizostedion canadense</i>	R	G5		S5	S4

Walleye	Percidae	<i>Stizostedion vitreum</i>	R	G5		S5	S5
Chestnut lamprey	Petromyzontidae	<i>Ichthyomyzon castaneus</i>	–	G4		S1	S2
Mosquitofish	Poeciliidae	<i>Gambusia affinis</i>	–	G5	X	SNA	SNA
Paddlefish	Polyodontidae	<i>Polyodon spathula</i>	R	G4	S	S2	S3
Freshwater drum	Sciaenidae	<i>Aplodinotus grunniens</i>	R	G5		S5	S5

Butterflies

Common Name	Family	Scientific Name	Refuge Occurrence	Global Status	National Status	Nebraska Status	Iowa Status
Delaware skipper	Hesperiidae	<i>Anatrytone logan</i>	–	G5		S3	S5
Sachem	Hesperiidae	<i>Atalopedes campestris</i>	–	G5		S5	SNA
Silver-spotted skipper	Hesperiidae	<i>Epargyreus clarus</i>	R	G5		S4	S4
Pawnee skipper	Hesperiidae	<i>Hesperia leonardus pawnee</i>	R	G4		SNR	---
Ottoo skipper	Hesperiidae	<i>Hesperia ottoe</i>	R	G3G4		S2	S2
Fiery skipper	Hesperiidae	<i>Hylephila phyleus</i>	R	G5		S3	SNA
Common sootying	Hesperiidae	<i>Pholisora catullus</i>	R	G5		S5	S5
Peck's skipper	Hesperiidae	<i>Polites peckius</i>	R	G5		S5	S5
Tawny-edged skipper	Hesperiidae	<i>Polites themistocles</i>	R	G5		S5	S5
White checkered skipper	Hesperiidae	<i>Pyrgus albescens</i>	–	G5		---	---
Common checkered skipper	Hesperiidae	<i>Pyrgus communis</i>	R	G5		SNR	SNR
Northern cloudywing	Hesperiidae	<i>Thorybes pylades</i>	R	G5		S4	S4
Juniper hairstreak	Lycaenidae	<i>Callophrys gryneus</i>	–	G5		S3	S3
Spring azure	Lycaenidae	<i>Celastrina ladon</i>	R	G4G5		S5	S5
Eastern tailed blue	Lycaenidae	<i>Everes comyntas</i>	R	G5		S5	S5
Harvester	Lycaenidae	<i>Feniseca tarquinius</i>	R	G4		S2	S2
Reakirt's blue	Lycaenidae	<i>Hemiargus isola</i>	R	G5		SNR	SNR
Gray copper	Lycaenidae	<i>Lycaena dione</i>	R	G5		S3	S4
Purplish copper	Lycaenidae	<i>Lycaena helloides</i>	R	G5		S3	S3
Bronze copper	Lycaenidae	<i>Lycaena hyllus</i>	R	G4G5		S4	S5
Little copper	Lycaenidae	<i>Lycaena phlaeas</i>	–	G5		SNR	S4
Gray hairstreak	Lycaenidae	<i>Strymon melinus</i>	R	G5		S5	S4
Goatweed leafwing	Nymphalidae	<i>Anaea andria</i>	R	G4G5		SNA	---
Hackberry emperor	Nymphalidae	<i>Asterocampa celtis</i>	R	G5		S3	S5
Tawny emperor	Nymphalidae	<i>Asterocampa clyton</i>	R	G5		S3	S4
Common wood-nymph	Nymphalidae	<i>Cercyonis pegala</i>	R	G5		S5	S5
Gorgone checkerspot	Nymphalidae	<i>Chlosyne gorgone</i>	R	G5		S4	S4
Silvery checkerspot	Nymphalidae	<i>Chlosyne nycteis</i>	R	G5		S3	S4
Queen	Nymphalidae	<i>Danaus gilippus</i>	R	G5		---	---
Monarch	Nymphalidae	<i>Danaus plexippus</i>	R	G5		S5	S5
Northern pearly eye	Nymphalidae	<i>Enodia anthedon</i>	R	G4		S3	S3
Variegated fritillary	Nymphalidae	<i>Euptoieta claudia</i>	R	G5		S5	SNA
Common buckeye	Nymphalidae	<i>Junonia coenia</i>	R	G5		S4	SNA
American snout	Nymphalidae	<i>Libytheana carinenta</i>	R	G5		---	SNR
Viceroy	Nymphalidae	<i>Limenitis archippus</i>	R	G5		S4	S4
Red spotted purple	Nymphalidae	<i>Limenitis arthemis astyanax</i>	R	G5		SNR	---
Little wood-satyr	Nymphalidae	<i>Megisto cymela</i>	R	G5		S4	S4
Mourning cloak	Nymphalidae	<i>Nymphalis antiopa</i>	R	G5		S5	S4

Milbert's tortoiseshell	Nymphalidae	<i>Nymphalis milberti</i>	R	G5		S3	SNR
Pearl crescent	Nymphalidae	<i>Phyciodes tharos</i>	R	G5		S5	S5
Eastern comma	Nymphalidae	<i>Polygonia comma</i>	R	G5		S4	S5
Question mark	Nymphalidae	<i>Polygonia interrogationis</i>	R	G5		S5	S5
Great spangled fritillary	Nymphalidae	<i>Speyeria cybele</i>	–	G5		S3	S4
Regal fritillary	Nymphalidae	<i>Speyeria idalia</i>	R	G3		S3	S2
Red admiral	Nymphalidae	<i>Vanessa atalanta</i>	R	G5		S5	S5
Painted lady	Nymphalidae	<i>Vanessa cardui</i>	R	G5		S5	SNR
American lady	Nymphalidae	<i>Vanessa virginiensis</i>	–	G5		S4	S5
Pipevine swallowtail	Papilionidae	<i>Battus philenor</i>	R	G5		---	S3
Giant swallowtail	Papilionidae	<i>Papilio cresphontes</i>	R	G5		S4	S4
Tiger swallowtail	Papilionidae	<i>Papilio glaucus</i>	R	G5		S5	S5
Black swallowtail	Papilionidae	<i>Papilio polyxenes</i>	R	G5		S5	S5
Spicebush swallowtail	Papilionidae	<i>Papilio troilus</i>	R	G4?		---	---
Orange sulphur	Pieridae	<i>Colias eurytheme</i>	R	G5		S5	S5
Clouded sulphur	Pieridae	<i>Colias philodice</i>	R	G5		S5	S5
Little yellow	Pieridae	<i>Eurema lisa</i>	R	G5		S4	SNR
Sleepy orange	Pieridae	<i>Eurema nicippe</i>	R	G5		S2	---
Cloudless sulphur	Pieridae	<i>Phoebis sennae</i>	R	G5		S4	SNR
Cabbage white	Pieridae	<i>Pieris rapae</i>	R	G5		SNA	SNA
Checkered white	Pieridae	<i>Pontia protodice</i>	R	G4		S4	S4
Dogface sulphur	Pieridae	<i>Zerene cesonia</i>	R	G5		S3	SNR

Appendix C: Abbreviations and Glossary

Abbreviations

The following is a list of the most frequently used abbreviations in this document. More detail for some of the abbreviations is included in the Glossary.

NOTE: “Abbreviations” is used generically to refer to abbreviations (shortened version of a term or series of words), acronyms (word formed from letters or parts of a series of words), and initialisms (initial letters pronounced separately).

BCA:	Bird Conservation Areas
BCC:	Birds of Conservation Concern
BCR:	Bird Conservation Region
CD:	Compatibility Determination
CCP:	Comprehensive Conservation Plan
CFR:	Code of Federal Regulations
CRP:	U.S. Department of Agriculture's Conservation Reserve Program
DNR:	Department of Natural Resources (often preceded by state abbreviation)
DOI:	U.S. Department of the Interior
DU:	Ducks Unlimited
EA:	Environmental Assessment
EAS:	Environmental Action Statement
EE:	Environmental Education
EIS:	Environmental Impact Statement
EO:	Executive Order
EPA:	U.S. Environmental Protection Agency
ESA:	Endangered Species Act
FONSI:	Finding of No Significant Impact
FR:	Federal Register
FTE:	Full-time Equivalent
FWS:	U.S. Fish and Wildlife Service (also USFWS and Service)
FY:	Fiscal Year
GAP:	Gap Analysis Program
GIS:	Geographic Information System
HAPET:	U.S. Fish and Wildlife Service's Habitat and Population Evaluation Team
IBA:	Audubon Society's Important Bird Area
IPCC:	Intergovernmental Panel on Climate Change
LCC:	Landscape Conservation Cooperative
LCD:	Landscape Conservation Design
MOA:	Memorandum of Agreement
MOU:	Memorandum of Understanding
NABCI:	North American Bird Conservation Initiative
NAI:	Natural Areas Inventory
NEPA:	National Environmental Policy Act of 1969
NRHP:	National Register of Historic Places
NWR:	National Wildlife Refuge (also refuge)
NWRS:	National Wildlife Refuge System (also Refuge System)
PFT:	Permanent Full-time
PPJV:	Prairie Pothole Joint Venture

PPR:	Prairie Pothole Region
R3:	Region 3 (Midwest) of the U.S. Fish and Wildlife Service (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin)
ROD:	Record of Decision
SGCN:	Species of Greatest Conservation Need
SHC:	Strategic Habitat Conservation
TFT:	Temporary Full-time
UMR/GLR JV:	Upper Mississippi River & Great Lakes Region Joint Venture
USC:	United States Code
USDA:	U.S. Department of Agriculture
USGS:	U.S. Geologic Survey
WMA:	Wildlife Management Area
WMD:	Wetland Management District (also district)
WPA:	Waterfowl Production Area
WRP:	U.S. Department of Agriculture's Wetland Reserve Program
WSA:	Wilderness Study Areas

Glossary

Adaptation: Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.

Adaptive Management: The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels (FWS, 602 FW 1.6(A)).

Alternatives: Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the National Wildlife Refuge System mission, and resolving issues (FWS, 602 FW 1.6(B)).

Appropriate Use: A proposed or existing use on a refuge that meets at least one of the following four conditions (FWS, 603 FW 1.6):

- The use is a wildlife-dependent recreational use as identified in the Fish and Wildlife Improvement Act of 1978.
- The use contributes to fulfilling the refuge purpose(s), the National Wildlife Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the National Wildlife Refuge System Improvement Act of 1997 was signed into law.
- The use involves the take of fish and wildlife under state regulations.
- The use has been found to be appropriate as specified in section 1.11.

Approved Acquisition Boundary: A project boundary that the Director of the U.S. Fish and Wildlife Service approves upon completion of the planning and environmental compliance process. An approved acquisition boundary only designates those lands that the Service has authority to acquire and/or manage through various agreements. Approval of an acquisition boundary does not grant the Service jurisdiction or control over lands within the boundary, and it does not make lands within the refuge boundary part of the National Wildlife Refuge System. Lands do not become part of the Refuge System until they are purchased or are placed under an agreement that provides for management as part of the Refuge System.

Biological Control: The use of organisms or viruses to control weeds or other pests.

Biological Diversity: The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur (FWS, 602 FW 1.6(C)).

Biological Integrity: Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities (FWS, 602 FW 1.6(D)).

Candidate Species: Plants and animals for which the U.S. Fish and Wildlife 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 proposed listing regulation is precluded by other higher priority listing activities.

Carbon Sequestration: The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen, and store the carbon. Fossil fuels were at one time biomass and continue to store the carbon until burned.

Climate Change: Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from (1) natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; (2) natural processes within the climate system (e.g., changes in ocean circulation); (3) human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification, etc.).

Code of Federal Regulations (CFR): The codification of the general and permanent rules published in the *Federal Register* by the departments and agencies of the federal government. It is divided into 50 titles that represent broad areas subject to federal regulation. The 50 subject matter titles contain one or more individual volumes, which are updated once each calendar year, on a staggered basis.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge (FWS, 603 FW 2.6(B)).

Compatibility Determination (CD): A written determination signed and dated by the refuge manager and the U.S. Fish and Wildlife Service regional chief signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. The director of the Service makes this delegation through the regional director (FWS, 603 FW 2.6(A)).

Comprehensive Conservation Plan (CCP): A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the National Wildlife Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (FWS, 602 FW 1.6(E)).

Consumptive Use: Use of a refuge resource that removes the resource from the refuge (e.g., killing an animal to eat, catching and keeping fish, harvesting berries or plants, or removal of mineral or other specimens).

Council on Environmental Quality (CEQ): An executive office of the president whose members are appointed by the president. CEQ recommends national policies to promote the improvement of the quality of the environment.

Cultural Resource Inventory: A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register of Historic Places follows the criteria found in 36 CFR 60.4.

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.

Easement: A privilege or right that is held by one person or other entity in land owned by another.

Ecological Integrity: The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions (FWS, 602 FW 1.6(G)).

Ecosystem: A biological community together with its environment, functioning as a unit. For administrative purposes, 53 ecosystems covering the United States and its possessions have been designated. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary (FWS, 602 FW 1.6(H)).

Effects (Impacts): Effects include:

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

- Cumulative effects, which result from past, present, and reasonably foreseeable future actions that, collectively, become significant over time.

Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial (40 CFR 1508.8).

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*.

Endangered Species Act (ESA): Through federal action and by encouraging the establishment of state programs, the Endangered Species Act of 1973 provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The act authorizes the determination and listing of species as endangered and threatened; prohibits unauthorized taking, possession, sale, and transport of endangered species; provides authority to acquire land for the conservation of listed species, using land and water conservation funds; authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for endangered and threatened wildlife and plants; authorizes the assessment of civil and criminal penalties for violating the act or regulations; and authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the act or any regulation issued thereunder.

Section 7 of the Endangered Species Act of 1973 requires federal agencies to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

Environmental Action Statement (EAS): The decision document for an environmental assessment for the U.S. Fish and Wildlife Service. The EAS will consist of a one-page document indicating the proposal, the Service decision, references to supporting documents (if any), and a signature block. The purposes of the EAS are to establish a process for internal review of National Environmental Policy Act-related decision documents and to provide an appropriate administrative record of NEPA-related decisions at all management levels of the Service (FWS, 550 FW 3.3 (C)).

Environmental Analysis: The process associated with preparing documents such as environmental assessments and environmental impact statements and the decision whether to prepare an environmental impact statement. It is an analysis of alternative actions and their predictable short-term and long-term effects, which include physical, biological, economic, and social factors and their interactions.

Environmental Assessment (EA): A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.

Environmental Consequences: The scientific and analytic basis for the comparison of alternatives. The environmental impacts of the alternatives including the proposed action, any

adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources that would be involved in the proposal should it be implemented (40 CFR 1502.16).

Environmental Health: Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment (FWS, 602 FW 1.6(I)).

Environmental Impact Statement (EIS): A detailed written statement, required by section 102(2)(C) of the National Environmental Policy Act of 1969, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Environmental Justice: The fair treatment and meaningful involvement of all people in the development, implementation, and enforcement of environmental laws regardless of race, color, national origin, or income.

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

Finding of No Significant Impact (FONSI): A document prepared in compliance with the National Environmental Policy Act of 1969 and supported by an environmental assessment that briefly presents why a federal action will have no significant effects on the human environment and for which an Environmental Impact Statement will not be prepared (40 CFR 1508.13).

Global Warming: Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities.

Goal: A descriptive, open-ended, and often broad statement of desired future conditions that conveys purposes but does not define measurable units (FWS, 602 FW 1.6(J)).

Greenhouse Gas (GHG): Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O₃), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Habitat: The physical and biological resources required by an organism for its survival and reproduction; these requirements are species-specific. Food and cover are major components of habitat and must extend beyond the requirements of the individual to include a sufficient area capable of supporting a viable population.

Incompatible: Any use (recreational or nonrecreational) of a refuge that, in the sound professional judgment of the Director of the U.S. Fish and Wildlife Service, will materially

interfere with or detract from the fulfillment of the mission of the National Wildlife Refuge System or the purposes of the refuge. Incompatible uses are not allowed to occur on Service areas.

Indicator: In effects analysis, a way for measuring effects from management alternatives on a particular resource or issue.

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.

Invasive Species: Invasive species are organisms that are introduced into a non-native ecosystem and that cause, or are likely to cause, harm to the economy, environment, or human health.

Inventory: Accepted biological methods to determine the presence, relative abundance, and/or distribution of species (FWS, 701 FW 2.6(A)).

Issue: Any unsettled matter that requires a management decision—that is, a U.S. Fish and Wildlife Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (FWS, 602 FW 1.6(K)).

Landscape Conservation Cooperative (LCC): A national network of public-private partnerships that provide shared science to ensure the sustainability of America's land, water, wildlife, and cultural resources.

Landscape Conservation Design (LCD): A partnership-driven activity that results in an assessment of current and anticipated future resource patterns and processes, and a spatially explicit depiction of a desired future condition. These products guide partners' identification of broad management, restoration, and protection strategies that could be implemented on the ground to address identified resource concerns, attain desired future conditions, sustain ecosystem function, and achieve the missions, mandates, and goals of partner agencies, organizations, and tribes.

Major Federal Action: Includes action with effects that may be major and that are potentially subject to federal control and responsibility. "Major" reinforces but does not have a meaning independent of significantly. "Actions" include new and continuing activities. Federal actions include adoption of official policy, formal plans, programs, and approval of specific projects (40 CFR 1508.18).

Memorandum of Understanding or Agreement (MOU or MOA): A legal document outlining the terms and details of an agreement between parties (often U.S. Fish and Wildlife Service and a state natural resource agency), including each party's requirements and responsibilities. It sets forth the basic principles and guidelines under which the parties will work together to accomplish their goals. A memorandum of understanding or agreement are generally recognized as binding, even if no legal claim could be based on the rights and obligations laid down in them.

Migratory Birds: Birds that follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

Monitoring: Accepted biological methods to determine the status and/or demographics of species over time (FWS, 701 FW 2.6(B)).

National Environmental Policy Act of 1969 (NEPA): This act, promulgated in 1969, requires all federal agencies to disclose the environmental effects of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements and must prepare appropriate NEPA documents to facilitate better environmental decision making (40 CFR 1500). The law also established the Council on Environmental Quality to implement the law and to monitor compliance with the law.

National Wilderness Preservation System: A network of federally owned areas designated by Congress as wilderness and managed by one of four federal agencies: the U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, or the U.S. Forest Service. Includes over 600 areas and more than 105 million acres. The National Wildlife Refuge System includes over 20 million acres of wilderness in more than 60 refuges (FWS, 610 FW 1.9).

National Wildlife Refuge (NWR, refuge): A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include Coordination Areas. A complete listing of all units of the Refuge System is located in the current Report of Lands Under Control of the U.S. Fish and Wildlife Service (FWS, 602 FW 1.6(L)).

National Wildlife Refuge System (NWRS, 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.

National Wildlife Refuge System Improvement Act of 1997 (improvement act): Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System. 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; establishes the responsibilities of the Secretary of the 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.

Native Species: A species, subspecies, or distinct population that occurs within its natural range or natural zone of potential dispersal (i.e., the geographic area the species occupies naturally or would occupy in the absence of direct or indirect human activity or an environmental catastrophe).

No Action Alternative: In the context of a Comprehensive Conservation Plan, this refers to the current management direction. With this alternative, no change from the current CCP would be implemented.

Non-consumptive Uses: Recreational activities (e.g., hiking, photography, and wildlife observation) that do not involve the taking or catching of fish, wildlife, or other natural resources.

Non-native Species: A species, subspecies, or distinct population that has been introduced by humans (intentionally or unintentionally) outside its natural range or natural zone of potential dispersal.

Objective: 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. Objectives are to be attainable, time-specific, and measurable (FWS, 602 FW 1.6(N)).

Ozone (O3): Ozone, the triatomic form of oxygen (O₃), is a gaseous atmospheric constituent. In the troposphere, it is created both naturally and by photochemical reactions involving gases resulting from human activities (photochemical smog). In high concentrations, tropospheric ozone can be harmful to a wide range of living organisms. Tropospheric ozone acts as a greenhouse gas. In the stratosphere, ozone is created by the interaction between solar ultraviolet radiation and molecular oxygen (O₂). Stratospheric ozone plays a decisive role in the stratospheric radiative balance. Depletion of stratospheric ozone, due to chemical reactions that may be enhanced by climate change, results in an increased ground-level flux of ultraviolet (UV) B radiation.

Planning Area: The area upon which the planning effort will focus. A planning area may include lands outside existing planning unit boundaries currently studied for inclusion in the National Wildlife Refuge System and/or partnership planning efforts. It also may include watersheds or ecosystems outside of our jurisdiction that affect the planning unit. At a minimum, the planning area includes all lands within the authorized boundary of the refuge (FWS, 602 FW 1.6(O)).

Planning Team: A planning team is interdisciplinary in membership and function. A team generally consist of a planning team leader, refuge manager, staff biologists, a state natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, recreation specialist). Other federal and tribal natural resource agencies may also be asked to provide team members, as appropriate. The planning team prepares the Comprehensive Conservation Plan and appropriate National Environmental Policy Act of 1969 documentation (FWS, 602 FW 1.6(P)).

Prescribed Burning: Controlled application of fire to the landscape that allows the fire to be confined to a predetermined area while producing the intensity of heat and rate of spread required to achieve planned management objectives.

Preferred Alternative: A proposed action in the National Environmental Policy Act of 1969 document for the Comprehensive Conservation Plan identifying the alternative that the U.S. Fish and Wildlife Service believes best achieves planning unit purposes, vision, and goals; helps fulfill the National Wildlife Refuge System mission; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; addresses the significant issues and mandates; and is consistent with principles of sound fish and wildlife management.

Priority Public Uses: Six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority and are found to be compatible with the refuge purposes. This includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

Proposed Action: In the context of a Comprehensive Conservation Plan, this is the same as the Preferred Alternative.

Public Involvement: A process that offers affected and interested individuals and organizations opportunities to become informed about, and to express their opinions on, U.S. Fish and Wildlife Service actions and policies. In the process, these public views are studied thoroughly and are thoughtfully considered in shaping decisions for refuge management.

Purposes of the Refuge: The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (FWS, 602 FW 1.6(S)).

Record of Decision (ROD): A concise public record of a decision prepared by the federal agency, pursuant to National Environmental Policy Act of 1969, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

Resident Species: A nonmigratory species inhabiting a given locality throughout the year. Examples include white-tailed deer, muskrat, raccoon, mink, and fox.

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.

Shorebird: Long-legged birds, also known as waders, belonging to the order Charadriiformes that use shallow wetlands and mud flats for foraging and nesting.

Significant Issue: A significant issue is typically: within Service jurisdiction, suggests different actions or alternatives, and will influence the decision (FWS, 602 FW 3.4 (3)(b)).

Species: A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Sound Professional Judgment: A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the National Wildlife Refuge System Administration Act of 1966 and other applicable laws.

Stakeholder: A person or group who has an interest in activities within the Planning Area.

Step-down Management Plan: A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting Comprehensive Conservation Plan goals and objectives (FWS, 602 FW 1.6(U)).

Strategic Habitat Conservation (SHC): A structured, science-driven approach for making efficient, transparent decisions about where and how to expend Service resources for species, or groups of species, that are limited by the amount or quality of habitat. It is an adaptive management framework integrating planning, design, delivery, and evaluation.

Strategy: A specific action, tool or technique, or combination of actions, tools, and techniques used to meet unit objectives (FWS, 602 FW 1.6(V)).

Surrogate Species: Species that are used to represent other species or aspects of the environment.

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*.

Vision Statement: A concise statement of what the planning unit should be or hope to do, based primarily upon the National Wildlife Refuge System mission, specific refuge purposes, and other mandates. The vision statement for the refuge should be tied to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (FWS, 602 FW 1.6(Z)).

Waterfowl: A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Waterfowl Production Area (WPA): Prairie wetlands with associated uplands managed to provide nesting areas for waterfowl and owned in fee title by the U.S. Fish and Wildlife Service. These lands are purchased from willing sellers with funds from federal Duck Stamp sales. They are open to public hunting, fishing, and trapping according to state and federal regulations.

Watershed: The entire land area that collects and drains water into a river/stream or river/stream system.

Wetland: A wetland is land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this classification a wetland must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

Wetland Management District (WMD, district): An area covering several counties that acquires (with federal Duck Stamp funds), restores, and manages prairie wetland habitat critical to waterfowl and other wetland birds.

Wildlife-Dependent Recreational Use: A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. These are the six priority public uses of the National Wildlife Refuge System as established in the National Wildlife Refuge System Administration Act of 1966, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. These

other uses will also be considered in the preparation of refuge Comprehensive Conservation Plans; however, the six priority public uses always will take precedence (FWS, 602 FW 1.6(Y)).

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

Water Birds: 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 D: Legal and Policy Guidance

Administrative Procedures Act of 1946

Outlines administrative procedures to be followed by federal agencies with respect to identification of information to be made public; publication of material in the *Federal Register*; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.

American Indian Religious Freedom Act of 1978

Establishes as policy of the United States the protection and preservation for American Indians of their inherent right to freedom to believe, express, and practice their traditional religions. The act directs federal agencies to evaluate their policies and procedures, in consultation with native traditional religious leaders, in order to determine changes required to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act of 1990, as amended by the ADA Amendments Act of 2008

Prohibits discrimination of individuals based on disability. It requires that public transportation services be accessible to individuals with disabilities and prohibits discrimination in employment of qualified individuals with disabilities. It requires the Equal Employment Opportunity Commission to issue regulations relating to discrimination of disabled individuals, and requires the National Council on Disability to conduct a study of areas designated as wilderness to determine the effect of the designation on the ability of individuals to enjoy such areas. The ADA Amendments Act of 2008 restored the intent and protections of the original act.

Antiquities Act of 1906

Authorizes the president to designate as National Monuments objects or areas of historic or scientific interest on lands owned or controlled by the United States. The act requires that a permit be obtained for examination of ruins, excavation of archaeological sites, and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army; and provides penalties for violations.

Archaeological Resources Protection Act of 1979

Largely supplanted the resource protection provisions of the Antiquities Act for archaeological items. This act established detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from federal or Indian lands. It also established civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from federal or Indian land in violation of any provision of federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any state or local law. This act also required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the Nation.

Archeological and Historic Preservation Act of 1960, as amended

This act carries out the policy established by the Historic Sites, Buildings and Antiquities Act of 1935 (known as the Historic Sites Act). It directs federal agencies to notify the Secretary of the Interior whenever they find a federal or federally assisted, licensed, or permitted project may cause loss or destruction of significant scientific, prehistoric, or archaeological data. The act authorizes use of appropriated, donated, and/or transferred funds for the recovery, protection, and preservation of such data.

Archeological and Historic Preservation Act of 1974

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

Architectural Barriers Act of 1969

Ensures that certain buildings financed or leased by federal agencies are constructed (or renovated) so that they will be accessible to the physically handicapped.

Bald and Golden Eagle Protection Act of 1940, as amended

Prohibits the possession, sale, or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes or for the religious purposes of Indians.

Bankhead-Jones Farm Tenant Act of 1937

Directs the Secretary of Agriculture to develop a program of land conservation and utilization in order to correct maladjustments in land use and thus assist in such things as control of soil erosion, reforestation, preservation of natural resources, and protection of fish and wildlife. Some early refuges and hatcheries were established under authority of this act.

Clean Air Act of 1970

Regulates air emissions from area, stationary, and mobile sources. The act and its amendments charge federal land managers with direct responsibility to protect the "air quality and related values" of land under their control. These values include fish, wildlife, and their habitats.

Emergency Wetlands Resources Act of 1986

Authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. Requires the Secretary of the Interior to establish a National Wetlands Priority Conservation Plan, requires the states to include wetlands in their comprehensive outdoor recreation plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It established entrance fees at national wildlife refuges. It also extended the Wetlands Loan Act authorization through 1988 and required the Secretary to report to Congress on wetlands loss. In addition, it directed the Secretary, through the U.S. Fish and Wildlife Service, to continue the National Wetlands Inventory; to complete mapping of the contiguous United States; and to produce at ten-year intervals reports to update and improve in the September 1982 "Status and Trends of Wetlands and Deepwater Habitat in the Conterminous United States, 1950s to 1970s." This act also increased the price of Duck Stamps.

Endangered Species Act of 1973, as amended

Directs federal agencies to take actions that would further the purposes of the act and to ensure that actions they carry out, authorize, or fund do not jeopardize endangered species or their critical habitat. The act also provides authority for land acquisition. Conservation of threatened and endangered species has become a major objective of both land acquisition and refuge management programs.

Endangered Species Conservation Act of 1969

This act expanded the provisions of the Endangered Species Preservation Act of 1966 to include the listing of species in danger world-wide and added mollusks and crustaceans to the animals that could be listed.

Endangered Species Preservation Act of 1966

This act was the predecessor to the Endangered Species Act of 1973 and directed the Secretary of the Interior to produce a list of native U.S. vertebrate species in danger of extinction for the limited protection of those animals.

Environmental Education Act of 1990

Established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the U.S. Fish and Wildlife Service.

Executive Order 11593: Protection and Enhancement of the Cultural Environment (1971)

States that if the U.S. Fish and Wildlife Service proposes any development activities that may affect the archaeological or historic sites, the Service will consult with federal and state Historic Preservation Officers to comply with section 106 of the National Historic Preservation Act of 1966, as amended.

Executive Order 11644: Use of Off-road Vehicles on the Public Lands (1972)

Established policies and procedures to ensure that the use of off-road vehicles on public lands will be controlled and directed to protect the resources of those lands, to promote the safety of all users of those lands, and minimize conflicts among the various uses of those lands. EO 11889 (1977) amends section 2 of EO 11644 and directs agencies to close areas negatively impacted by off-road vehicles.

Executive Order 11988: Floodplain Management (1977)

Prevents federal agencies from contributing to the “adverse impacts associated with occupancy and modification of floodplains” and the “direct or indirect support of floodplain development.” In the course of fulfilling their respective authorities, federal agencies “shall take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains.

Executive Order 11990: Protection of Wetlands (1977)

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)

Seeks to foster intergovernmental partnerships by requiring federal agencies to use the state process to determine and address concerns of state and local elected officials with proposed federal assistance and development programs.

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994)

Mandates that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. This order also creates an Interagency Working Group on Environmental Justice to provide guidance to federal agencies in overcoming these issues.

Executive Order 12906: Coordinating Geographical Data Acquisition and Access: The National Spatial Data Infrastructure (1994), as amended by Executive Order 13286: Amendment of Executive Orders, and Other Actions, in Connection With the Transfer of Certain Functions to the Secretary of Homeland Security (2003)

Recommended that the executive branch develop, in cooperation with state, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data. Of particular importance to Comprehensive Conservation Plans is the National Vegetation Classification System (NVCS), which is the adopted standard for vegetation mapping. Using NVCS facilitates the compilation of regional and national summaries, which, in turn, can provide an ecosystem context for individual refuges.

Executive Order 12962: Recreational Fisheries (1995)

Directs federal agencies to improve the quantity, function, sustainable productivity, and distribution of United States aquatic resources for increased recreational fishing opportunities in cooperation with states and tribes.

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

Defines a conservation mission for the National Wildlife Refuge System, six compatible wildlife-dependent recreational activities, and four guiding principles for management of the Refuge System. Directs the Secretary of the Interior to undertake several actions in support of management and public use and to ensure the maintenance of the biological integrity and environmental health of the Refuge System. It also provides for the identification of existing wildlife-dependent uses that will continue to occur as lands are added to the Refuge 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.

Executive Order 13061: Federal Support of Community Efforts Along American Heritage Rivers (1997)

Established the American Heritage Rivers initiative for the purpose of natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The act directs federal agencies to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage.

Executive Order 13084: Consultation and Coordination With Indian Tribal Governments (2000)

Provides a mechanism for establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.

Executive Order 13112: Invasive Species (1999)

Directs federal agencies to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and habitat conditions, conduct research to prevent introductions, to control invasive species, and to promote public education on invasive species and the means to address them. This EO replaces and rescinds EO 11987: Exotic Organisms (1977).

Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds (2001)

Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation (2007)

Directs federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

Farmland Protection Policy Act of 1981, as amended

Minimizes the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.

Federal Advisory Committee Act of 1972, as amended

Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.

Federal-Aid Highways Act of 1968

Establishes requirements for approval of federal highways through wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other federal agencies before approving any program or project requiring the use of land under their jurisdiction.

Federal Aid in Sport Fish Restoration Act (Dingell-Johnson Act) of 1950

Authorizes the Secretary of the Interior to provide financial assistance for state fish restoration and management plans and projects. It is financed by excise taxes paid by manufacturers of rods, reels, and other fishing tackle.

Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act) of 1937

Taxes the purchase of ammunition and firearms and earmarks the proceeds to be distributed to the states for wildlife restoration.

Federal Cave Resources Protection Act of 1988

Established requirements for the management and protection of caves and their resources on federal lands, including allowing the land managing agencies to withhold the location of caves from the public and requiring permits for any removal or collecting activities in caves on federal lands.

Federal Lands Recreation Enhancement Act (REA) of 2004

Allows the government to charge a fee for recreational use of public lands managed by the U.S. Fish and Wildlife Service and other agencies. The recreation fee program is a program by which fees paid by visitors to certain federal recreation sites are retained by the collecting site and used to improve the quality of the visitor experiences at those sites.

Federal Noxious Weed Act of 1975, as amended

The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other federal, state, and local agencies; farmers associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The act requires each federal land-managing agency, including the U.S. Fish and Wildlife Service, to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the states, including integrated management systems to control undesirable plants.

Federal Records Act of 1950

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

Federal Water Pollution Control Act of 1948, as frequently amended particularly by the Clean Water Act of 1977

This act and its amendments have as their objectives the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters and, therefore, regulates the discharge of pollutants into waters of the United States. The act protects fish and wildlife, establishes operation permits for all major sources of water pollution, limits the discharge of pollutants or toxins into water, and makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit is obtained under the Clean Water Act. Section 404 charges the U.S. Army Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands. The "Clean Water Act" became the common name with amendments in 1977.

Federal Water Project Recreation Act of 1965, as amended

Declares the intent of Congress that recreation and fish and wildlife enhancement be given full consideration as purposes of federal water development projects. The act also authorizes the use of federal water project funds for land acquisition in order to establish refuges for migratory waterfowl when recommended by the Secretary of the Interior, and authorizes the Secretary to provide facilities for outdoor recreation and fish and wildlife at all reservoirs under his control, except those within national wildlife refuges.

Fish and Wildlife Act of 1956, as frequently amended

Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also with a direction to administer the act with regard to the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. The 1998 amendments to the act modified the powers of the Secretary of the Interior in regard to volunteer service, community partnerships, and education programs.

Fish and Wildlife Conservation Act of 1980, as amended

Requires the Service to monitor non-gamebird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act of 1973.

Fish and Wildlife Coordination Act of 1934

Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the U.S. Fish and Wildlife Service and the state fish and wildlife agencies where the "waters of a stream or other body of

water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified” by any agency under federal permit or license. This act also authorized use of surplus federal property for wildlife conservation purposes and authorized the Secretary of the Interior to provide public fishing areas and accept donations of lands and funds.

Fish and Wildlife Improvement Act of 1978

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 of 1966, and the Fish and Wildlife Act of 1956. It authorizes the Secretary of the 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.

Food Security Act of 1985 (Farm Bill), as amended

Known as the Farm Bill, this act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farm program subsidies. The act also established the Wetlands Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.

Freedom of Information Act of 1966

Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions; official, published and unpublished policy statements; final orders deciding case adjudication; and other documents. Special exemptions have been reserved for nine categories of privileged material. The act requires the party seeking the information to pay reasonable search and duplication costs.

Geothermal Steam Act of 1970, as amended

Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15(c) of the act prohibits issuing geothermal leases on virtually all U.S. Fish and Wildlife Service-administered lands.

Historic Sites, Buildings and Antiquities Act of 1935

Popularly known as the Historic Sites Act, as amended in 1965, declared it a national policy to preserve historic sites and objects of national significance, including those located on refuges. It provided procedures for designation, acquisition, administration, and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this act.

Lacey Act of 1900, as amended

Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species. The act prohibits interstate and international transport and commerce of fish, wildlife, or plants taken in violation of domestic or foreign laws. It regulates the introduction to the United States of foreign species into new locations.

Land and Water Conservation Fund Act of 1965

Provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for

outdoor recreation projects and for land acquisition by various federal agencies including the Fish and Wildlife Service.

Migratory Bird Conservation Act of 1929

Establishes a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. Authorizes the Secretary of the Interior to cooperate with local authorities in wildlife conservation and to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges. The act provides for cooperation with states in enforcement. It establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Commission for migratory birds. This act includes acquisition authority for purchase or rental of a partial interest in land or waters and requires the Secretary of the Interior to consult with the appropriate units of local government and with the governor of the state concerned, or the appropriate state agency, before recommending an area for purchase or rental. This provision was subsequently amended in 1983, 1984, and 1986 to require that either the governor or the state agency approve each proposed acquisition. The role of the Commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.

Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) of 1934

Known as the Duck Stamp Act, this act requires every waterfowl hunter 16 years of age or older to carry a stamp, and earmarks proceeds of 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

Implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, the act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export, or import any migratory bird, part, nest, egg, or product.

Mineral Leasing Act for Acquired Lands of 1947, as amended

Authorizes and governs mineral leasing on acquired public lands.

Minerals Leasing Act of 1920, as amended

Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas, and other hydrocarbons, sulphur, phosphate, potassium, and sodium. Section 185 of this act contains provisions relating to granting rights-of-way over federal lands for pipelines.

Mining Act of 1872, as amended

Authorizes and governs prospecting and mining for the so-called “hardrock” minerals (such as gold and silver) on public lands.

National and Community Service Act of 1990

Authorizes several programs to engage citizens of the United States in full and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law established the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on federal or tribal lands.

National Environmental Policy Act of 1969 (NEPA), as amended

This act and the implementing regulations developed by the Council on Environmental Quality (40 CFR 1500–1508) require federal agencies to integrate the National Environmental Policy Act of 1969 (NEPA) process with other planning at the earliest possible time to provide a systematic interdisciplinary approach to decision making; to identify and analyze the environmental effects of their actions; to describe appropriate alternatives to the proposed actions; and to involve the affected state and federal agencies, tribal governments, and public in the planning and decision making process. This act 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

Repeatedly amended, the act provides for preservation of significant historical features (buildings, objects, and sites) through a grant-in-aid program to the states. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468–468d). The act established an Advisory Council on Historic Preservation, which was made a permanent independent agency in 1976 (90 Stat. 1319). That act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. 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.

National Trails System Act of 1968

Established the National Trails System to protect the recreational, scenic, and historic values of some important trails. National Recreation Trails may be established by the Secretaries of the Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s) and other land managing agencies, if any. National scenic and national historic trails may only be designated by an act of Congress. Several national trails cross units of the National Wildlife Refuge System.

National Wildlife Refuge System Administration Act of 1966 (amended by the National Wildlife Refuge System Improvement Act of 1997)

This act consolidates the authorities relating to the various categories of lands for the conservation of fish and wildlife administered by the Secretary of the Interior through the U.S. Fish and Wildlife Service by designating all such areas part of a single National Wildlife Refuge System. Areas include wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas. The law also prohibits knowingly disturbing any area within the system or the take of Refuge System wildlife without a permit. The act addresses the growing need for recreational opportunities by providing a decision framework for allowing appropriate and compatible uses of the Refuge System.

National Wildlife Refuge System Centennial Act of 2000

Establishes a commission to promote awareness by the public to develop a long-term plan to meet priority needs of the National Wildlife Refuge System, require an annual report on the needs, and improve public use programs and facilities.

National Wildlife Refuge System Improvement Act of 1997

This act, which amends the National Wildlife Refuge System Administration Act of 1966, serves as the "organic act" for the National Wildlife Refuge System. The act states first and foremost that the mission of the National Wildlife Refuge System is focused singularly on wildlife conservation. It establishes a unifying mission for the Refuge System, reinforces the importance of refuge purposes to guide management direction, articulates a process for determining compatible uses of refuges, identifies six priority wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation), and adds a requirement for preparing comprehensive conservation plans through a public planning process. The act requires the Secretary of the Interior to maintain the biological integrity, diversity, and environmental health of the Refuge System.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998

Amends the Fish and Wildlife Act of 1956 to encourage the use of volunteers to help in the management of refuges within the National Wildlife Refuge System; facilitates partnerships between the Refuge System and nonfederal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

National Wildlife Refuge Volunteer Improvement Act of 2010

Maintains the current funding authorization level for the U.S. Fish and Wildlife Service's volunteer and community partnerships programs that are vital to national wildlife refuges but makes a number of important amendments. The law amends the National Wildlife Refuge Volunteer and Community Partnership Enhancement Act of 1998 to direct the Service to carry out a National Volunteer Coordination Program within the National Wildlife Refuge System. It also requires the Director of the Service to publish a national strategy for the coordination and utilization of volunteers within the Refuge System and provide at least one regional volunteer coordinator for each Service region to implement the strategy.

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990

Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession. This act imposes serious delays on a project when human remains or other cultural items are encountered in the absence of a plan.

Neotropical Migratory Bird Conservation Act of 2000

Establishes a matching grants program to fund projects that promote the conservation of neotropical migratory birds in the United States, Latin America, and the Caribbean.

North American Wetlands Conservation Act of 1989

Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between the United States, Canada, and Mexico. North American Wetlands Conservation Council is created to recommend projects to be funded under the act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States' share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).

Partnerships for Wildlife Act of 1992

Established a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the

state fish and game agencies in carrying out their responsibilities for conservation of non-game species. The funding formula is no more than 1/3 federal funds, at least 1/3 foundation funds, and at least 1/3 state funds.

Refuge Recreation Act of 1962, as amended

Requires that any recreational use on areas of the National Wildlife Refuge System be "compatible" with the primary purpose(s) for which the area was acquired or established. This act also requires that sufficient funding be available for the development, operation and maintenance of recreational uses that are not directly related to the area's primary purpose(s).

Refuge Revenue Sharing Act of 1935

Provides for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges. A major revision in 1964 requires all revenues received from refuge products be distributed to counties for public schools and roads (this stipulation later removed). Another revision in 1974 requires that any remaining funds be transferred to the Migratory Bird Conservation Fund for land acquisition. A 1978 amendment stated payments to counties were established as:

- on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land, and
- on land withdrawn from the public domain, 25 percent of net receipts and basic payments.

This amendment also required counties to pass payments along to other units of local government within the county that suffer losses in revenues due to the establishment of U.S. Fish and Wildlife Service areas.

Rehabilitation Act of 1973, as amended

Prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance.

Rivers and Harbors Appropriations Act of 1899, as amended

Requires the authorization by the Chief of Engineers prior to any work in, on, over, or under navigable waters of the United States. The Fish and Wildlife Coordination Act provides authority for the U.S. Fish and Wildlife Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the COE. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.

Secretarial Order 3289 Amendment 1: Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources (2010)

Secretarial Order 3285, issued in March 2009, made production and transmission of renewable energy on public lands a priority for the Department of the Interior. This Secretarial Order, 3289A1, issued in February 2010 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.

Sikes Act of 1960, as amended

Provides for the cooperation by the U.S. Departments of the Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the United States. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction and requires federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.

Surface Mining Control and Reclamation Act of 1977

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 of 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 the Interior if the land has particular value for migratory birds or to a state agency for other wildlife conservation purposes.

Transportation Equity Act for the 21st Century of 1998

Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations, and bicycle/pedestrian facilities.

Treasury and General Government Appropriations Act of 2000

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 Department of the Interior instructed bureaus to prepare separate guidelines on how they would apply the act. The U.S. Fish and Wildlife Service has developed "Information Quality Guidelines" to address the law.

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970

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

Water Resources Planning Act of 1965

Established the Water Resources Council to be composed of Cabinet representatives, including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational, and fish and wildlife needs. The act also established a grant program to assist states in participating in the development of related comprehensive water and land use plans.

Wild and Scenic Rivers Act of 1968

Established a National Wild and Scenic Rivers System and prescribes the methods and standards through which additional rivers may be identified and added to the system. Section 5(d)(1) requires that in all planning by federal agencies for the use and development of water and related land resources, consideration be given to potential wild, scenic, and recreation rivers. Rivers are added to the national system based on their free-flowing character and their outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural,

ecological, or other values. Rivers in the system are managed to maintain and protect these outstandingly remarkable values for present and future generations.

Wilderness Act of 1964

Defined the Wilderness resource and established the National Wilderness Preservation System. It directed the Secretary of the 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. This act also prescribes the management of new inclusions as wilderness.

Youth Conservation Corps Act of 1970

Established a permanent Youth Conservation Corps program within the Departments of the Interior and Agriculture. Within the U.S. Fish and Wildlife Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

Appendix E: Literature Cited

- American Rivers. (1997). *North America's Most Endangered and Threatened Rivers of 1997*. Available at: <http://www.americanrivers.org/our-work/protecting-rivers/endangered-rivers/background/past-reports.html>
- American Society of Mammalogists. (2012). *Mammals of Nebraska*. Available online at: <http://www.mammalsociety.org/mammals-nebraska-0>
- Brown, S., Hickey, C., Harrington, B., and Gill, R. editors. (2001). *United States Shorebird Conservation Plan, 2nd edition*. Manomet Center for Conservation Sciences: Manomet, MA, 61.
- Burchett, R. R. (1959). *Stratigraphy of the Upper Part of the Kansas City Group (Pennsylvanian) in Southeastern Nebraska and Adjacent Regions: Master's Thesis*. University of Nebraska Kansas. Geological Survey Open File Report 59-1.
- Burchett, R. R. (1986). *Geologic Bedrock Map of Nebraska*: Nebraska Geological Survey. Scale 1:1 Million.
- Carver, E. and Caudill, J. (2007). *Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*. U.S. Fish and Wildlife Service: Division of Economics. Washington D.C.
- Caudill, J. and Henderson, E. (2005). *Banking on Nature 2004: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*. U.S. Fish and Wildlife Service: Division of Economics. Washington D.C.
- Chapman, S.; Omernik, J; Freeouf, J; Huggins, D; McCauley, J; Freeman, C; Steinauer, G; Angelo, R; and Schlepp, R. (2001). *Ecoregions of Nebraska and Kansas* (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,950,000).
- Commission for Environmental Cooperation. (1997). *Ecological Regions of North America: Toward a Common Perspective*. Montreal, Canada.
- Commission for Environmental Cooperation. (2011). *Ecoregions of North America-Level II (CEC)*. In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). Accessed 13 June 2011, from: [http://www.eoearth.org/article/Ecoregions_of_North_America-Level_II_\(CEC\)](http://www.eoearth.org/article/Ecoregions_of_North_America-Level_II_(CEC))
- Conant, R. and Collins, J. T. (1998). *A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Third Edition, Expanded*. New York: Houghton Mifflin Company.
- Cox, C. (1991). *Pesticides and Birds: From DDT to Today's Poisons*. Journal of Pesticide Reform 11(4): 2–6.
- Dahl, T. E. (1990). *Wetlands - Losses in the United States - 1780's to 1980's*. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 21 pp.

- Dixon, M. D.; Johnson, W. C.; Scott, M. L.; and Bowen D. (2010). *Status and Trend of Cottonwood Forests along the Missouri River: Final Report of the U.S. Army Corps of Engineers*. Annual Report to the Army Corps of Engineers, Contract #W9912DQ-07-C-0011.
- Edwards, E. A. (1983). *Habitat Suitability Index Models: Bigmouth Buffalo*. U.S. Fish and Wildlife Service: Washington, D.C. FWS/OBS-82/10.34.
- Elliott, C. M., Jacobson, R. B., and Chojnacki, K. A. (2006). *Hydroacoustic mapping to define sedimentation rates and characterize lentic habitats in DeSoto Lake, DeSoto National Wildlife Refuge*. U.S. Geological Survey. Open-File Report 2006-1254, 28p. Available online at: <http://pubs.usgs.gov/of/2006/1254/downloads/pdf/OF06-1254.pdf>
- Evelsizer, V. and Johnson, J. L. (2010). *Wetland Action Plan for Iowa: Iowa Geological and Water Survey Special Report No. 4* (April 2010). Iowa DNR: Iowa City, Iowa.
- Funk, J. L. and Robinson J. W. (1974). *Changes in the Channel of the Lower Missouri River and Effects on Fish and Wildlife*. Aquatic Series No. 11, Missouri Department of Conservation: Jefferson City, Missouri, 52.
- Grady, J. (1996). *Lower Missouri River Rare and Endangered Fishes Distribution, Relative Abundance, and Community Association – 1998 Revision*. USFWS, Columbia Fisheries Resources Office: Columbia, Missouri, 57.
- Green, R., Harley, M., Spalding, M., and Zockler, C. (2000). *Impacts of Climate Change on Wildlife*. Royal Society for the Protection of Birds. Available online at: <http://naturalengland.etraderstores.com/NaturalEnglandShop/UserFiles/Files/cc1.pdf>
- Hesse, L. W.; Mestl, G. E.; and Robinson, J. W. (1993). *Status of Selected fishes in the Missouri River in Nebraska with Recommendations for their Recovery*. Nebraska Game and Parks Commission – Staff Research Publications. University of Nebraska – Lincoln.
- Hesse, L. W.; Schmulbach, J. C.; Carr, J. M.; Keenlyne, K. D.; Unkenholz, D. G.; Robinson, J. W.; and Mestl, G. E. (1989). *Missouri River Fishery Resources in Relation to Past, Present, and Future Stresses*, 352–371. In D.P. Dodge (ed) *Proceedings of the International Large River Symposium*. Special Publication. Aquatic Science 106.
- Homer, C.; Dewitz, J.; Fry, J.; Coan, M.; Hossain, N.; Larson, C.; Herold, N.; McKerrow, A.; VanDriel, J. N.; and Wickham, J. (2007). *Completion of the 2001 National Land Cover Database for the Conterminous United States*. Photogrammetric Engineering and Remote Sensing, Vol. 73, No. 4, pp. 337-341.
- Iowa Climate Change Advisory Council (ICCAC). (2008). *Iowa Climate Change Advisory Council Final Report*. Available on-line: <http://www.iaclimatechange.us/capag.cfm>.
- Iowa Climate Change Impacts Committee (ICCIC). (2011). *Climate Change Impacts on Iowa: Report to the Governor and the Iowa General Assembly*. Available on-line: http://www.iowadnr.gov/portals/idnr/uploads/air/environment/climatechange/complete_report.pdf?amp;tabid=1077.

- Iowa Department of Natural Resources. (2010). *Iowa's Draft 2010 Integrated Report*. December 23, 2010. Available at: <http://www.igsb.uiowa.edu/wqm/ImpairedWaters/303d.html>
- Iowa Department of Natural Resources. (2012). *DeSoto Bend Lake*. Iowa Department of Natural Resources - Iowa Geologic and Water Survey - Watershed Monitoring and Assessment. Website accessed 15 November 2012 at <http://www.igsb.uiowa.edu/wqm/Lakes/LakeWatershedCharacteristics/desotobend.htm>
- Iowa Department of Natural Resources. (2013). *Iowa Natural Areas Inventory*. Website accessed 22 April 2013 at: <https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx>
- Iowa Ornithologists' Union. (1968). *Iowa Bird Life*. Vol.38, No. 3: page 88.
- Iowa Ornithologists' Union. (1973). *Iowa Bird Life*. Vol.43, No. 3: page 75.
- Jacobson, R. B.; Chojnacki, K. A.; and Reuter, J. M. (2007). *Land capability potential index (LCPI) for the Lower Missouri River Valley*. U.S. Geological Survey Scientific Investigations Report 2007-5256, 19.
- Jensen, R. E. (1998). *The Fontenelle and Cabanne Trading Posts: The History and Archaeology of Two Missouri River Sites, 1822–1838*. Nebraska State Historical Society, Publications in Anthropology 11, 169.
- Johnsgard, P. A. (1979). *The Breeding Birds of Nebraska*. Nebraska Bird Review 47:1 (March): 3–16.
- Johnsgard, P. A. (1998). *Endemicity and Regional Biodiversity in Nebraska's Breeding Avifauna*. The Nebraska Bird Review 66:4 (December): 115–121.
- Johnsgard, P. A. (2009). *Birds of the Great Plains: Breeding Species and Their Distribution: New Expanded Edition*. University of Nebraska-Lincoln Libraries: Lincoln, Nebraska.
- Johnson, W. C.; Werner, B.; Guntenspergen, R. A.; Voldseth, R. A.; Millett, B.; Naugle, D. E.; Tulbure, M.; Carroll, R. W. H.; Tracy, J.; and Olawsky, C. (2010). *Prairie Wetland Complexes as Landscape Functional Units in a Changing Climate*. BioScience. Vol. 60, No. 2. Available online at: http://researchrepository.murdoch.edu.au/6192/1/prairie_wetland_complexes.pdf
- Kallameyn, L. W. and Novotny, J. F. (1977). *Fish and Fish Food Organisms in Various Habitats of the Missouri River in South Dakota, Nebraska, and Iowa*. U.S. Fish and Wildlife Service, Office of Biological Services: Columbia, Missouri. FWS/OBS7-77-25, 100.
- Kane, K. L.; Klaas, E. E.; Andersen, K. L.; Brown, P. D., and McNeely, R. L. (2003). *The Iowa Gap Analysis Project Final Report*. Iowa Cooperative Fish and Wildlife Research Unit, Iowa State University, Ames, Iowa. Available online at: <http://www.gis.iastate.edu/gap/>
- Karl, T. R., Melillo, J. M., and Peterson, T. C. (2009). *Global Climate Change Impacts in the United States: A State of Knowledge Report from the U.S. Global Change Research Program*. Cambridge University Press: New York, NY. Available at:

- <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/download-the-report>
- Kent, T. H. and Dinsmore J. J. (1996). *Birds in Iowa*. University of Iowa, Publications Department.
- Kushlan, J. A.; Steinkamp, M. J.; Parsons, K. C.; Capp, J.; Cruz, M. A.; Erwin, M.; Hatch, S.; Kress, S.; Milko, R.; Miller, S.; Mills, K.; Paul, R.; Phillips, R.; Saliva, J. E.; Sydeman, B.; Trapp, J.; Wheeler, J.; and Wohl, K. (2002). *Waterbird Conservation for the Americas: North American Waterbird Conservation Plan – Version 1*. Waterbird Conservation for the Americas: Washington, D.C., 78.
- Laird, C. A. and Page, L. M. (1996). *Non-native fishes inhabiting the streams and lakes of Illinois*. Illinois Natural History Survey Bulletin 35(1), 1–51.
- Lemen, C.; Johnson, R.; Siebert, T.; Ferraro, D.; and Lynch, J. (2003). *Reptiles and Amphibians of Nebraska*. Cooperative Extension, University of Nebraska, Lincoln, Nebraska. Available online at: <http://snr.unl.edu/herpneb/index.htm>
- Lewis, M.; Clark, W.; and Members of the Corps of Discovery. (2002). September 4, 1806. In G. Moulton (Ed.), *The Journals of the Lewis and Clark Expedition*. Lincoln: University of Nebraska Press. Website accessed 14 June 2011 at: <http://lewisandclarkjournals.unl.edu/journals.php?id=1806-09-04>
- Loan-Wilsey, A. K.; Pierce, C. L.; Kane, K. L.; Brown, P. D.; and McNeely, R. L. (2005). The Iowa Aquatic Gap Analysis Project Stream Fish Atlas. Iowa Cooperative Fish and Wildlife Research Unit, Iowa State University, Ames, Iowa. Available online at: <http://maps.gis.iastate.edu/iris/fishatlas/>
- Lynch, J. D. (1985). *Annotated Checklist of the Amphibians and Reptiles of Nebraska*. Transactions of the Nebraska Academy of Sciences, XIII, 33–57.
- Magness, D. R., Morton, J. M.; Huettmann, F.; Chapin, III, F. S.; and McGuire, A. D. (2011). *A Climate-change Adaptation Framework to Reduce Continental-scale Vulnerability Across Conservation Reserves*. Ecosphere 2(10):112. doi: 10.1890/ES11-00200.1
- McCarty, J. P.; Wolfenbarger L. L.; Jones, S; and Unstad, K. (2003). *Species Lists for USFWS: Version 2.1*. Department of Biology, University of Nebraska at Omaha.
- McCarty, J. P. and Wolfenbarger, L. L. (2009). *Inventory and Monitoring of Grassland and Forest Birds at Boyer Chute and DeSoto National Wildlife Refuges from 2002–2007 – Interim Report (April 2009)*. Department of Biology, University of Nebraska at Omaha: Omaha, Nebraska.
- Missouri Department of Conservation. (2010). *Zebra Mussels: Missouri's Most Unwanted*. Website accessed 13 April 2010 at <http://mdc.mo.gov/landwater-care/animal-management/invasive-animal-management/zebra-mussels-missouris-most-unwanted>
- Missouri River National Resource Committee. (1998). *Missouri River Environmental Assessment Program*. Downloaded 24 January 2011 from: <http://infolink.cr.usgs.gov/Science/MoREAP/MoREAP.pdf>

- National Assessment Synthesis Team. (2001). *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change*. Cambridge University Press: Cambridge, U.K. Available at: <http://www.usgcrp.gov/usgcrp/nacc/>
- NatureServe. (2011). *NatureServe Explorer: An Online Encyclopedia of Life*. Website accessed 8 February 2011 at: <http://www.natureserve.org/explorer/index.htm>.
- National Oceanic and Atmospheric Administration (NOAA). (2011). *Palmer Drought Severity Index*. National Oceanic and Atmospheric Administration, National Climatic Data Center: Asheville, NC. Website accessed 18 April 2011 at: <http://lwf.ncdc.noaa.gov/temp-and-precip/time-series/>
- National Research Council Panel. (2002). *The Missouri River Ecosystem: Exploring the Prospects for Recovery*. National Academy Press: Washington, DC., 175.
- National Wilderness Institute. (1995). *Public Land Ownership by State*. Website accessed 26 April 2011 at: <http://www.nrcm.org/documents/publiclandownership.pdf>
- Nebraska Department of Environmental Quality. (2010). *2010 Water Quality Integrated Report*. Nebraska Dept. of Environmental Quality – Water Quality Division. April 1, 2010. Available at: <http://www.deq.state.ne.us/SurfaceW.nsf/pages/TMDL>
- Nebraska Game and Parks Commission. (2008). *Estimated Current Ranges of Threatened and Endangered Species: List of Species by County (November 2008)*. Nebraska Natural Heritage Program.
- Nebraska Game and Parks Commission. (2010). *Statewide Comprehensive Outdoor Recreation Plan: A Guide to an Active Nebraska; 2011–2015*. Nebraska Game and Parks Commission: Lincoln, Nebraska.
- Olson, D. M.; Dinerstein, E.; Wikramanayake, E. D.; Burgess, N. D.; Powell, G. V. N.; Underwood, E. C.; D'Amico, J. A.; Itoua, I.; Strand, H. E.; Morrison, J. C.; Loucks, C. J.; Allnutt, T. F.; Ricketts, T. H.; Kura, Y.; Lamoreux, J. F.; Wettengel, W. W.; Hedao, P.; and Kassem, K. R. (2001). *Terrestrial Ecoregions of the World: A New Map of Life on Earth*. *Bioscience* 51:933–938.
- Omernik, J. M. (1987). *Ecoregions of the Conterminous United States (map supplement)*. *Annals of the Association of American Geographers*, v. 77, no. 1, 118–125, scale 1:7,500,000.
- Omernik, J. M. (1995). *Ecoregions—A Spatial Framework for Environmental Management*, in Davis, W.S. and Simon, T.P., eds., *Biological Assessment and Criteria – Tools for Water Resource Planning and Decision Making*. Boca Raton, Florida: Lewis Publishers, 49–62.
- Palmer, W. C. (1965). *Meteorological Drought*. U.S. Weather Bureau, Office of Climatology: Washington D.C. Research Paper No. 45. Available on-line at: <http://lwf.ncdc.noaa.gov/temp-and-precip/drought/docs/palmer.pdf>
- Petsche, J. E. (1974). *The Steamboat Bertrand: History, Excavation, and Architecture*. U.S. Department of the Interior, National Park Service. Washington D.C.

- PRISM Climate Group. (2011). *Climatology Normals and Monthly Products*. Oregon State University. Data downloaded May 2011 from <http://prism.oregonstate.edu/products/>
- Rainwater Basin Joint Venture. (2011). *Rainwater Basin Fact Sheet*. Downloaded 14 April 2011 from: http://www.rwbjv.org/pdf/Rainwater_Basin_Fact_Sheet.pdf
- Rich, T. D.; Beardmore, C. J.; Berlanga, H.; Blancher, P. J.; Bradstreet, M. S. W.; Butcher, G. S.; Demarest, D. W.; Dunn, E. H.; Hunter, W. C.; Inigo-Elias, E. E.; Kennedy, J. A.; Martell, A. M.; Panjabi, A. O.; Pashley, D. N.; Rosenberg, K. V.; Rustay, C. M.; Wendt, J. S.; and Will, T. C. (2004). *Partners in Flight, North American Landbird Conservation Plan*. Cornell Lab of Ornithology: Ithaca, NY., 84.
- Ringelman, J. K., Ed. (2005). *Prairie Pothole Joint Venture: 2005 Implementation Plan*.
- Ryan, M. G.; Archer, S. R.; Birdsey, R.; Dahm, C.; Heath, L.; Hicke, J.; Hollinger, D.; Huxman, T.; Okin, G.; Oren, R.; Randerson, J.; and Schlesinger W. (2008). "Land Resources." In: *The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States* [Backlund, P., A. Janetos, D. Schimel, J. Hatfield, K. Boote, P. Fay, L. Hahn, C. Izaurralde, B. A. Kimball, T. Mader, J. Morgan, D. Ort, W. Polley, A. Thomson, D. Wolfe, M.G. Ryan, S.R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, W. Schlesinger, D. Lettenmaier, D. Major, L. Poff, S. Running, L. Hansen, D. Inouye, B. P. Kelly, L. Meyerson, B. Peterson, and R. Shaw (eds.)]. Synthesis and Assessment Product 4.3. U.S. Department of Agriculture, Washington, DC., 75–120.
- Sauer, J. R.; Hines J. E.; Thomas, I.; Fallon, J. and Gough, G. (2008). *The North American Breeding Bird Survey, Results and Analysis 1966–2007*. Version 5.15.2008, U.S. Geological Survey Patuxent Wildlife Research Center, Laurel, MD, USA.
- Schneider, R. S.; Humpert, M.; Stoner, K.; Steinauer, G. (2005). *The Nebraska Natural Legacy Project: A Comprehensive Wildlife Conservation Strategy*. The Nebraska Game and Parks Commission: Lincoln, Nebraska.
- Schneider, S. H. and Root, T. L. (2002). *Wildlife Responses to Climate Change: North American Case Studies*. Island Press. Washington, D.C.
- Scott, M.; Griffith, B.; Adamcik, B.; Ashe, D.; Czech, B.; Fischman, R.; Gonzales, P.; and Pidgorna, A. (2009). *Managing to Accommodate Change: Climate Change and the National Wildlife Refuge System*. A PowerPoint presentation given at the 2009 FWS National Planners Conference.
- Sexton, N. R.; Dietsch, A. M.; Don Carlos, A. W.; Koontz, L.; Solomon, A. N.; and Miller, H. M. (2011). *National Wildlife Refuge Visitor Survey 2010/2011: Individual Refuge Results for DeSoto National Wildlife Refuge*. U. S. Geological Survey Data Series 643.
- U.S. Army Corps of Engineers. (1995). *Boyer Chute Restoration Section 1135 Project: Operation and Maintenance Manual*. U.S. Army Engineer District, Corps of Engineers, Omaha District: Omaha, Nebraska.

- U.S. Army Corps of Engineers. (2004). *Missouri River Mainstem Reservoir System: Missouri River Stage Trends*. RCC Technical Report A-04. Northwestern Division, Reservoir Control Center: Omaha, Nebraska. Downloaded 3 June 2011 from: <http://www.google.com/url?sa=t&source=web&cd=1&ved=0CBsQFjAA&url=http%3A%2F%2Fwww.nwd-mr.usace.army.mil%2Frcr%2Freports%2Fpdfs%2FMRTrendsA04.pdf&ei=I0rpTfGYI6bX0QG50omIAQ&usq=AFQjCNHxUbAYZfkEdu8u3M9cSSdSNvfNKw>
- U.S. Army Corps of Engineers. (2006). *Missouri River Mainstem Reservoir System Master Water Control Manual – Missouri River Basin*. Northwestern Division, Reservoir Control Center: Omaha, Nebraska. Downloaded 24 January 2011 from: <http://www.nwd-mr.usace.army.mil/rcc/reports/mmanual/MasterManual.pdf>
- U.S. Census Bureau. (2010). *American Fact Finder*. Accessed 7 June 2011 at: <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>
- U.S. Department of Agriculture – Natural Resources Conservation Service. (2011). *Soil Survey Geographic (SSURGO) Database for Washington County, Nebraska; Pottawattamie County, Iowa; and Harrison County, Iowa – Online Series Descriptions*. Accessed 17 June 2011 at: <http://soildatamart.nrcs.usda.gov>
- U.S. Department of the Interior. (2005). *Administrative and Enforcement Procedures for FWS Easements: Wetland, Grassland, Habitat, Tallgrass, and FmHA*. Regions 3 & 6: Twin Cities, MN & Denver, CO.
- U.S. Environmental Protection Agency. (2000). *Level III Ecoregions of the Continental United States* (revision of Omernik, 1987). Corvallis, Oregon: U.S. Environmental Protection Agency – National Health and Environmental Effects Research Laboratory Map M-1, various scales.
- U.S. Environmental Protection Agency. (2011). *National Emission Inventory Database*. Website accessed 18 April 2011 at: <http://www.epa.gov/air/data/repst.html?st~NE~Nebraska>
- U.S. Fish and Wildlife Service. (1992). *Boyer Chute National Wildlife Refuge: Decision Document for Boyer Chute National Wildlife Refuge Establishment*. U. S. Fish and Wildlife Service, Region 6: Denver, CO.
- U.S. Fish and Wildlife Service. (1997). *Boyer Chute National Wildlife Refuge: Decision Document for Boyer Chute National Wildlife Refuge Expansion*. U. S. Fish and Wildlife Service, Region 6: Denver, CO.
- U.S. Fish and Wildlife Service. (1997a). *National Outreach Strategy: A Master Plan for Communicating the U.S. Fish and Wildlife Service*. Washington, D.C. Available at: <http://digitalmedia.fws.gov/cdm/ref/collection/document/id/71>
- U.S. Fish and Wildlife Service. (2000a). *Biological Opinion on the Operation of the Missouri River Mainstem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System*. U.S. Fish and Wildlife Service.

-
- U.S. Fish and Wildlife Service. (2000b). *Comprehensive Conservation Planning Process*. 602 FW 3. National Wildlife Refuge System, Department of Interior. Available online at: <http://www.fws.gov/policy/602fw3.html>
- U.S. Fish and Wildlife Service. (2001). *DeSoto National Wildlife Refuge Final Comprehensive Conservation Plan and Environmental Assessment*. U. S. Fish and Wildlife Service, Region 3: Bloomington, MN.
- U.S. Fish and Wildlife Service, Region 3. (2002). *Fish and Wildlife Resource Conservation Priorities, Version 2.0*. U.S. Fish and Wildlife Service, Region 3: Bloomington, MN, 34.
- U.S. Fish and Wildlife Service. (2003). *Amendment to the 2000 Biological Opinion on the Operation of the Missouri River Mainstem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System*. U.S. Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. (2004). *Squaw Creek National Wildlife Refuge Final Comprehensive Conservation Plan and Environmental Assessment*. U. S. Fish and Wildlife Service, Region 3: Bloomington, MN.
- U.S. Fish and Wildlife Service. (2005). *Why Save Endangered Species*. Endangered Species Program, Arlington, VA. Available at: http://www.fws.gov/nativeamerican/graphics/FWS_Pub/WhySaveEndangeredSpecies.pdf
- U.S. Fish and Wildlife Service. (2006). *Strategic Habitat Conservation: Final Report of the National Ecological Assessment Team*. (July): 45.
- U.S. Fish and Wildlife Service. (2007). *Iowa county distribution of federally endangered, threatened, proposed, and candidate species (September 2007)*. Rock Island Ecological Services Field Office: Moline, Illinois.
- U.S. Fish and Wildlife Service. (2008a). *Birds of Conservation Concern 2008*. U.S. Fish and Wildlife Service, Division of Migratory Bird Management: Arlington, Virginia, 87.
- U.S. Fish and Wildlife Service. (2008b). *General Overview of Wilderness Stewardship Policy*. 610 FW 1. National Wildlife Refuge System, Department of Interior. Available online at: <http://www.fws.gov/policy/610fw1.html>
- U.S. Fish & Wildlife Service. (2008c). *Strategic Habitat Conservation: An Operational Response to the Changing Conservation Landscape / A Summary Briefing Prepared for Ecological Services Assistant Regional Directors*. PowerPoint presentation given October 21, 2008. Albuquerque, New Mexico.
- U.S. Fish and Wildlife Service. (2008d). *Strategic Habitat Conservation Handbook: A Guide to Implementing the Technical Elements of Strategic Habitat Conservation, Version 1.0*. National Technical Assistance Team. (February), 22.
- U.S. Fish and Wildlife Service. (2009a). *Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service – As of September 30*. U.S. Fish and Wildlife Service, Division of Realty.

- U.S. Fish and Wildlife Service. (2009b). *Putting Science in the Right Places: National Geographic Framework for Landscape Conservation*. Available online at: <http://www.fws.gov/midwest/climate/documents/SHCNationalGeographicFrameworkEmployee090809nomaps.pdf>
- U.S. Fish and Wildlife Service (2010a). *Endangered, threatened, proposed, and candidate species in Nebraska counties (July 2010)*. Grand Island Ecological Services Field Office: Grand Island, Nebraska.
- U.S. Fish and Wildlife Service. (2010b). *Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change*. U.S. Fish and Wildlife Service: Washington, D.C. (September).
- U.S. Fish and Wildlife Service. (2011a). *Iowa county distribution of federally endangered, threatened, proposed, and candidate species (January 2011)*. Rock Island Ecological Services Field Office: Moline, Illinois.
- U.S. Fish and Wildlife Service. (2011b). *Endangered Species Program – U.S. Species List*. Website accessed 27 July 2011 at <http://www.fws.gov/endangered/species/us-species.html>
- U.S. Fish and Wildlife Service. (2011c). *Conserving the Future: Wildlife Refuges and the Next Generation*. Available on-line: <http://americaswildlife.org/wp-content/uploads/2012/01/Final-Documents-Conserving-the-Future.pdf>
- U.S. Fish and Wildlife Service. (2011d). *Migratory Bird Program: Focal Species Strategy*. U.S. Fish and Wildlife Service, Division of Migratory Bird Management: Arlington, Virginia. Available at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/FocalSpecies.html>
- U. S. Fish and Wildlife Service. (2011e). *Environmental Assessment: Use of row crop farming and genetically-modified glyphosate-tolerant corn and soybeans on National Wildlife Refuges and Wetland Management Districts*. Bloomington, MN. Available on-line: <http://www.fws.gov/midwest/planning/farmingNEPA/eafinal.pdf>.
- U.S. Fish and Wildlife Service; Environment Canada, Canadian Wildlife Service. (1986). *North American Waterfowl Management Plan: A Strategy for Cooperation*.
- U.S. Fish and Wildlife Service, U.S. Department of Commerce, and U.S. Census Bureau. (2007). 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available at: <http://www.census.gov/prod/2008pubs/fhw06-nat.pdf>
- U.S. Geological Survey. (2003). *National Land Cover Database (NLCD)*. Earth Science Information Center: Sioux Falls, SD.
- U.S. Geological Survey. (2011). *USGS Water Data for the Nation*. Data downloaded May 2011 from <http://waterdata.usgs.gov/nwis>

- University of Georgia – Center for Invasive Species and Ecosystem Health. (2011). *Early Detection & Distribution Mapping System (EDDMapS)*. Accessed 29 June 2011 at <http://www.eddmaps.org/tools/choosecounty.cfm>
- Van Dyke, F.; Van Kley, S. E.; Page, C. E.; Van Beek, J. G. (2004). *Restoration Efforts for Plant and Bird Communities in Tallgrass Prairies Using Prescribed Burning and Mowing*. *Restoration Ecology* 12-4: 575–585.
- West Virginia Division of Natural Resources. (1999). *Fundamentals of Deer Harvest Management*. West Virginia Cooperative Extension, Bulletin No. 806 (March). Downloaded 13 April 2011 from <http://anr.ext.wvu.edu/r/download/48142>
- Whitmore, S. B. and Keenlyne, K. D. (1990). *Rare, threatened and endangered endemic species of the Missouri River floodplain*. Missouri River Coordinator's Office, Report MRC–90–1. Pierre, SD: United States Fish & Wildlife Service, 24.
- Wiken, E.; Jiménez Nava, F.; and Griffith, G. (2011). *North American Terrestrial Ecoregions—Level III*. Commission for Environmental Cooperation: Montreal, Canada.
- Witzke, B.J.; Anderson, R.R.; and Pope, J.P. (2010). *Bedrock Geologic Map of Iowa*. 1:50,000. Iowa Geological and Water Survey, Iowa City, Iowa
- Zohrer, J. J. (2006). *Securing a Future for Fish and Wildlife: A Conservation Legacy for Iowans (May 2006 Revision)*. Iowa Department of Natural Resources: Des Moines, Iowa.

Appendix F: Appropriate Use Designations

In this appendix:

[Introduction](#)
[Mushroom Gathering](#)
[Research Programs](#)
[Wood Cutting](#)

Introduction

National wildlife refuge (NWR, refuge) managers decide if a new or existing use is an appropriate refuge use. This appendix provides copies of the appropriate use designations for DeSoto and Boyer Chute Refuges.

The U.S. Fish and Wildlife Service (FWS, Service) appropriate use policy (603 FW 1) explains the decision process that the refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must first find a use to be appropriate before undertaking a compatibility review of the use and outlining the stipulations of the use.

The appropriate use policy clarifies and expands on the compatibility policy (603 FW 2 2.10D(1)), which describes when the refuge manager should deny a proposed use without determining compatibility. If a proposed use is found “not appropriate,” the use will not be allowed and a compatibility determination will not be prepared. By screening out proposed uses not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews. Although a use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or modify the use.

This policy does not generally apply to proposed public use of wetland and grassland easement areas of the National Wildlife Refuge System (NWRS, Refuge System). The rights we have acquired on these areas generally do not extend to control over such public uses except where those uses would conflict with the conditions of the easement (603 FW 1 1.2A).

Background for this policy as it applies to DeSoto and Boyer Chute Refuges is found in the following statutory authorities:

- *National Wildlife Refuge System Administration Act of 1966 (administration act), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) (16 U.S.C. § 668dd–668ee).* This law provides the authority for establishing policies and regulations governing refuge uses, including the authority to prohibit certain harmful activities. The administration act does not authorize any particular use, but rather authorizes the Secretary of the Interior to allow uses only when they are deemed compatible. The Improvement Act provides the Refuge System mission and includes specific directives and identifies six wildlife-dependent uses as priorities for the Refuge System.
- *Refuge Recreation Act of 1962, (16 U.S.C. § 460k).* This law authorizes the Secretary of the Interior to allow public recreation in areas of the Refuge System when the use is an “appropriate incidental or secondary use.”

Refuge uses must meet at least one of the following four conditions to be deemed appropriate:

1. It is a wildlife-dependent recreational use as identified in the Improvement Act.
2. It contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after the Improvement Act was signed into law.
3. The use involves the take of fish and wildlife under state regulations.
4. The refuge has evaluated the use following the guidelines in this policy and found that it is appropriate. The criteria used by the manager to evaluate appropriateness can be found on each of the appropriate use forms included in this appendix.

Uses that have been administratively determined to be appropriate but still require compatibility determinations are:

- six wildlife-dependent recreational uses as defined by the Improvement Act as hunting, fishing, wildlife observation and photography, and environmental education and interpretation; and
- take of fish and wildlife under state regulations including hunting, fishing, and trapping.

Also covered under this policy are “specialized uses,” or uses that require specific authorization from the Refuge System, often in the form of a special use permit, letter of authorization, or other permit document. These uses do not include uses already granted by a prior existing right. Appropriateness findings for specialized uses are made on a case-by-case basis.

This policy does NOT apply to:

- situations where reserved rights or legal mandates provide certain uses must be allowed; and
- refuge management activities conducted by the Refuge System or a Refuge System-authorized agent designed to conserve fish, wildlife, and plants and their habitats. These activities fulfill refuge purpose(s) or the Refuge System mission and are based on sound professional judgment.

Appropriate use findings are made without public review and comment. However, if a proposed use is found to be appropriate, we must still determine that the use is compatible. The compatibility determination includes an opportunity for public involvement (603 FW 1 1.9B).

The following uses are deemed appropriate:

- Farming and Haying
- Gathering
- Research Programs
- Wood Cutting

Refuges are national treasures for the conservation of wildlife. Through careful planning, consistent application of regulations and policies, diligent monitoring of the impacts of uses on wildlife resources, and preventing or eliminating uses not appropriate, the Refuge System conservation mission can be achieved while also providing the public with lasting opportunities to enjoy quality, compatible, wildlife-dependent recreation.

FINDING OF APPROPRIATENESS OF A REFUGE USERefuge Name: DeSoto and Boyer Chute National Wildlife RefugesUse: Mushroom Gathering

This form 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, 603 FW 1, 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 X Refuge Manager: /Tom Cox/Date: 08/01/2013

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: /Kevin Foerster/Date: 08/01/2013

A compatibility determination is required before the use may be allowed.

**FWS Form 3-2319
02/06**

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: DeSoto and Boyer Chute National Wildlife RefugesUse: Research Programs

This form 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, 603 FW 1, 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 X

Refuge Manager: /Tom Cox/Date: 08/01/2013

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: /Kevin Foerster/Date: 08/01/2013

A compatibility determination is required before the use may be allowed.

**FWS Form 3-2319
02/06**

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: DeSoto and Boyer Chute National Wildlife Refuges

Use: Wood Cutting

This form 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, 603 FW 1, 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 X

Refuge Manager: /Tom Cox/

Date: 08/01/2013

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: /Kevin Foerster/

Date: 08/01/2013

A compatibility determination is required before the use may be allowed.

**FWS Form 3-2319
02/06**

Appendix G: Compatibility Determinations

In this appendix:

Introduction

DeSoto National Wildlife Refuge

Upland and Big Game Hunting

Fishing

Wildlife Observation and Photography

Interpretation and Environmental Education

Gathering Mushrooms

Research Programs

Wood Cutting

Boyer Chute National Wildlife Refuge

Upland and Big Game Hunting

Waterfowl Hunting (2008 version)

Fishing

Wildlife Observation and Photography

Interpretation and Environmental Education

Gathering Mushrooms

Research Programs

Wood Cutting

Introduction

Compatibility determinations are documents written, signed, and dated by the refuge manager and the regional chief of refuges that signify whether proposed or existing uses of the National Wildlife Refuge (NWR, refuge) are compatible with its establishing purposes and the mission of the National Wildlife Refuge System (NWRS, Refuge System). This appendix provides copies of the compatibility determinations for DeSoto and Boyer Chute Refuges.

Before undertaking a compatibility review of a use, the refuge manager must first determine that the use is appropriate (see appendix F). A compatible use is any proposed or existing wildlife-dependent recreational use or other use of a refuge by the public or entity other than the U.S. Fish and Wildlife Service (FWS, Service) that, based on sound professional judgment, will not materially interfere with or detract from fulfilling the mission of the Refuge System or the purposes of the refuge. The final policy and regulations required by the National Wildlife Refuge System Improvement Act of 1997 provide guidance for determining compatibility.

If a proposed use is not appropriate, the use will not be allowed, and a compatibility determination will not be prepared.

A compatibility determination is required for activities on a refuge by the public or entity other than the Service including:

- all refuge recreational and educational programs;
- construction or expansion of recreational and educational facilities such as boardwalks and boat ramps;
- management activities performed by private parties in return for a market commodity, such as cooperative farming to provide food for wildlife; and

- granting or modifying rights-of-way through refuges for pipelines, roads, or electrical transmission lines.

Activities when a compatible determination is NOT required include:

- refuge management activities such as prescribed burning, managing water levels, and controlling invasive species;
- routine scientific monitoring, studies, surveys, and censuses;
- conducting historic preservation;
- law enforcement activities; and
- maintaining or improving refuge facilities and structures.

Although a refuge use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or modify the use.

DeSoto National Wildlife Refuge

Compatibility Determination

Use: Upland and Big Game Hunting

Refuge Name: DeSoto National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1969 (16 U.S.C., 715d)

Refuge Recreation Act of 1962 (16 U.S.C., 460k–460k-4)

Refuge Purposes:

DeSoto National Wildlife Refuge was established March 12, 1958:

“ . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929)

“ . . . 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 . . . ” 16 U.S.C. 460k–460k-4 (Refuge Recreation Act of 1962*)

*This purpose was applied post facto to DeSoto NWR.

National Wildlife Refuge System Mission:

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.

Description of Use:

Hunting of game is a public use granted under the authority of the National Wildlife Refuge System Improvement Act of 1997 and is considered a priority public use of the Refuge System.

With lands in both Iowa and Nebraska, the refuge established a reciprocal agreement with the states in 2003. The agreement allows hunters with a license in either state to hunt in designated areas of the refuge. Reciprocity has enabled the refuge to conduct hunts with greater ease for both the hunters and management staff.

The refuge manages the deer herd by offering quality weekend (deer gun) hunt events. During the hunts the refuge is closed to other visitors. The number of hunt events conducted each year typically ranges from two to four and depends on the size of the deer herd. The hunts are generally held in October, December, and/or January. The hunts are scheduled in coordination with Nebraska Game and Parks Commission and the Iowa Department of Natural Resources.

Upland game hunting, specifically Ring-necked Pheasant and Wild Turkey, is also offered on the refuge. Special weekend (turkey gun) hunting events are held in the spring for persons with disabilities and for youth hunters. Hunt event dates are selected to fit within the seasons of both Iowa and Nebraska. Youth hunters are required to hunt under the supervision of a parent or a mentor chosen by their parent. Disabled hunters hunt with a companion. The refuge also provides a limited number of hunting blinds for disabled hunters that do not otherwise have access to blinds. Ring-necked Pheasant hunting in the fall is scheduled during the seasons of both states. The pheasant and turkey hunts are carefully scheduled, organized, and limited so that they can occur without closing the refuge to other visitor uses.

Archery deer hunting in the fall and archery turkey hunting in the spring are also offered. The seasons are set to fall within the two states' seasons. The refuge is not closed to the public during these hunts.

Why is the use being proposed?

Hunting is a priority public use of the Refuge System and an important wildlife management tool. The Service recognizes hunting as a healthy, traditional outdoor activity, deeply rooted in American heritage. Hunting can instill a unique understanding and appreciation of wildlife, animal behavior, and habitat needs. Hunting programs can promote understanding and appreciation of natural resources and their management on the lands and waters of the Refuge System.

Is the use a proposed new use or an existing use?

Hunting is an existing use of the refuge.

Is the use a priority public use?

Hunting is a priority public use of the Refuge System.

Availability of Resources:**What resources are needed to properly and safely administer use?**

Road maintenance, mowing, and other grounds upkeep will be required, but these activities are considered a part of routine refuge management and maintenance activities. There is also time spent by refuge staff on deer herd monitoring and hunt program planning. Administrative time is required for hunt program implementation, including answering questions, making maps, etc. Law enforcement is an essential tool for proper and safe administration of this use. The refuge has a full time officer dedicated to this function. Based on a review of the current refuge budget, there is adequate funding to ensure compatibility and to administer and manage this public use.

Anticipated Impacts of the Use:

Short-term impacts: Providing carefully planned and managed hunting events with restricted access to specified refuge hunting zones will generally minimize disturbance to wildlife populations, the refuge environment, infrastructure, and non-consumptive users. Hunting causes mortality of target species with the intent of harvesting populations to the carrying capacity of existing habitat. By limiting take to harvestable surplus, the refuge can ensure the long-term health and survival of game species, populations, and their associated ecosystem. The presence and activity of hunters may cause disturbance to other wildlife in the area, but these impacts are minor and temporary. There is the potential to impact non-target species that are sensitive to disturbance, especially during spring turkey hunts when many animals are breeding or nesting. For visitors, non-hunting public uses may be temporarily disrupted or

postponed during hunt events. Visitor safety is the highest priority when designing and planning all hunting activities on refuges. Vehicle traffic will increase slightly during hunting events, and the sound of gun shots will temporarily reduce the serenity for the non-hunting public. Loss of vegetation from foot traffic is minor or temporary. Soil and plant disturbance may occur in ingress and egress routes but will be minor and temporary because of the limited and controlled use associated with the managed hunts.

Long-term impacts: No adverse long-term impacts from hunting are anticipated as long as wildlife populations are monitored through the refuge biological program or by state officials. Long-term beneficial impacts of this use include the ability to manage targeted wildlife populations to levels that fall within the carrying capacity of the ecosystem. When deer populations grow beyond a sustainable capacity herbivory can have profound negative impacts to the local environment, native plants, and other wildlife species.

Cumulative impacts: There are no anticipated cumulative impacts. Harvest on the refuge would be limited by management and would fall within the state's population management goals, which are based on the best available science. All hunts would follow all applicable laws, regulations, and policies including title 50 of the Code of Federal Regulations, the U.S. Fish and Wildlife Service Manual, the mission and goals of the Refuge System, and the purposes, goals, and objectives of DeSoto NWR. Careful management of this public use maintains the safety of the area's citizens, contributes to the refuge's wildlife and habitat goals, and supports several of the primary objectives of the refuge.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with Refuge System and DeSoto NWR goals and objectives, hunting activities can only occur under the following stipulations:

3. All hunting will adhere to the hunting section of the refuge's visitor services step-down management plan.
4. All applicable state and federal regulations apply.
5. Hunting is prohibited on, across, or within 100 feet of refuge roads or parking lots.
6. Camping, overnight use, and fires are prohibited.
7. During hunting activities, the refuge is open two hours before the legal shooting time and one hour after the legal shooting time.

8. Refuge-specific authorization is required for all special hunts.
9. No motorized vehicles are allowed within the hunting units except at designated parking areas or as specified by a special use permit.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is being permitted because it is a priority public use and will not diminish the primary purposes of the refuge. This use will meet the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on refuge lands.

Hunting is one of the six priority wildlife-dependent recreational uses identified in the National Wildlife Refuge System Improvement Act of 1997. Service policy directs us to provide hunting opportunities when compatible with refuge management. Managed hunting programs help promote an understanding and appreciation of natural resources and their management. Additionally, managed hunts on the refuge provide a traditional recreational activity with minimal adverse impacts to the biological integrity or sustainability of refuge resources.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Fishing

Refuge Name: DeSoto National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1969 (16 U.S.C., 715d)
Refuge Recreation Act of 1962 (16 U.S.C., 460k–460k-4)

Refuge Purposes:

DeSoto National Wildlife Refuge was established March 12, 1958:

“ . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929)

“ . . . 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 . . . ” 16 U.S.C. 460k–460k-4 (Refuge Recreation Act of 1962*)

*This purpose was applied post facto to DeSoto NWR.

National Wildlife Refuge System Mission:

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.

Description of Use:

Allow general public access during specific times of the year to open areas of the refuge for sport and commercial fishing. Archery and spearfishing are permitted (for rough fish only). An Iowa or Nebraska fishing license is required. State and federal regulations apply; refuge specific regulations also apply.

Is the use a proposed new use or an existing use?

Fishing is an existing use of the refuge.

Is the use a priority public use?

Fishing is a priority wildlife-dependent recreational use under the National Wildlife Refuge System Improvement Act of 1997.

Where would the use be conducted?

Use consists of bank (shoreline and pier) and boat fishing on DeSoto Lake under state regulations, ice fishing on DeSoto Lake during appropriate conditions, bank fishing on the Missouri River, and bank fishing on all other refuge bodies of water (small ponds and scour holes) in open areas of the refuge unless specifically closed by refuge management. Fishing is

most active in DeSoto Lake and Bullhead Pond. Boat fishing is also allowed on the Missouri River, but this use is regulated by the U.S. Army Corps of Engineers.

Allowable forms of access on the refuge include hiking, snowshoeing, cross-country skiing, biking, motorized and nonmotorized boats, and motorized vehicles. Horses, all-terrain vehicles, off-road vehicles, snowmobiles, and jet skis are not allowed on the refuge.

When would the use be conducted?

DeSoto NWR is open during daylight hours. Open water fishing is permitted during the nonmigration periods (April 15 through October 14); ice fishing is permitted when conditions allow—typically from January 2 to the end of February; and bank fishing on the Missouri River has no seasonal restrictions.

Entry to any or all portions of the refuge may be suspended by refuge management in the case of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Any closures would be accompanied by appropriate signage and notifications.

How would the use be conducted?

Public and commercial fishing opportunities are articulated in an approved Fishery Management Plan. Refuge resources to facilitate fishing include boat-launching ramps, docks, fully accessible fishing piers, and pedestrian accessible fishing jetties. All motorized boating is no wake only.

Why is this use being proposed?

Access for fishing is a priority wildlife-dependent recreational use of the Refuge System, and available refuge resources can support this activity. Fishing activities provide enjoyment of scenic views and a variety of wildlife not usually available on adjacent private land.

Availability of Resources:

What resources are needed to properly and safely administer use?

Visitors coming to the refuge for fishing on refuge waters, including bank fishing on the Missouri River, need access via road. Once on the refuge, visitors might use parking lots, hiking trails, fishing jetties, piers, and boat launches. Appropriate refuge funding as well as visitor services, facility maintenance, and law enforcement staff are needed to provide and maintain facilities and ensure public safety.

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

The refuge has been open for many years to this priority public use. Fishing often occurs in tandem with other public uses such as boating (both motorized and nonmotorized), hiking, and auto touring. Fishing use often occurs as youth group or family related activities. Because fishing requires the same accommodations as other appropriate and compatible public uses, refuge roads, parking lots, trails, boat launches, and other visitor services infrastructure are adequate to accommodate this public use. The refuge also has adequate staff to provide enjoyable and safe fishing opportunities to the public.

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Fishing is a priority public use, and those participating in this activity are exposed to the Refuge System and its mission. Fishing is a great way to introduce young people to the outdoors and to the values of our natural resources.

Regulated fishing poses no appreciable impact on the purposes for which the refuge was established. Fishing and boating on DeSoto Lake is prohibited during spring and fall migrations from October 15 through April 14—the period most likely to impact refuge purposes. Damage to habitat by foot traffic is limited to developed or designated fishing waterfront areas. Littering is one visible impact of fishing but is of minor consequence to wildlife and is attended to by staff and volunteers. There are minor wildlife impacts when anglers inadvertently disturb duck broods, shorebirds, or other wildlife in and around the water. Refuge access by motorized vehicles and bicycles is limited to established trails, public roads, and parking lots. Water access is typically by foot or boat, from individuals or small groups arriving via non-commercial vehicle at developed fishing access areas. Motorized boating is limited to slow speeds and no wake conditions to minimize impacts to wildlife. No other associated impacts from fishing are considered to be substantial constraints to achieving the refuge purpose and the mission of the Refuge System.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Only day-use activities are permitted on DeSoto NWR. Fishing seasons are set to avoid conflicts with migratory bird concentrations and waterfowl hunting. All fishing is regulated by state and refuge-specific regulations.
2. Modes of access including motorized vehicle and bicycles are limited to designated trails, public roads, and parking lots.
3. Camping, overnight use, and fires are prohibited.
4. Harassment of wildlife and excessive damage to vegetation are prohibited.

Justification:

Fishing is a priority wildlife-dependent recreational use of the Refuge System.

Fishing has been determined to be a compatible use of DeSoto NWR because this use will not materially interfere with or detract from management objectives, refuge purposes, or the Refuge System mission. This activity introduces the public to fishing, wetland ecology, and the mission of U.S. Fish and Wildlife Service; it enhances their understanding of the natural environment and of the need for fish and wildlife conservation. The level of fishing use is moderate throughout the entire length of the permitted season (April 15 – October 14) and the associated disturbance to wildlife is temporary and minor.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Wildlife Observation and Photography (including the means of access such as hiking, snowshoeing, cross-country skiing, motorized and nonmotorized boating, and motorized vehicles)

Refuge Name: DeSoto National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1969 (16 U.S.C., 715d)
Refuge Recreation Act of 1962 (16 U.S.C., 460k–460k-4)

Refuge Purposes:

DeSoto National Wildlife Refuge was established March 12, 1958:

“ . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929)

“ . . . 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 . . . ” 16 U.S.C. 460k–460k-4 (Refuge Recreation Act of 1962*)

*This purpose was applied post facto to DeSoto NWR.

National Wildlife Refuge System Mission:

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.

Description of Use:

Allow general public access during anytime of the year to open areas of the refuge for the observation and photographing of associated flora and fauna. DeSoto NWR is open during daylight hours. All of the refuge will be open to the public for photography unless specifically closed by refuge management. Allowable forms of access to the refuge include hiking, snowshoeing, cross-country skiing, biking, motorized and nonmotorized boats, and motorized vehicles. Access by motorized vehicles and bicycles is limited to established trails, public roads, and parking lots. Horses, all-terrain vehicles, off-road vehicles, snowmobiles, and jet skis are not allowed on the refuge. Wildlife observation and photography are priority public uses on Refuge System lands as identified in the National Wildlife Refuge System Improvement Act of 1997. Entry to any or all portions of the refuge may be suspended by refuge management in the case of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Any closures would be accompanied by appropriate signage and notifications. Access for wildlife observation and photography will allow public access for enjoyment of scenic views and an array of wildlife including waterfowl, other migratory birds, tallgrass prairie plants, and resident wildlife. Wildlife refuges provide opportunities for wildlife enjoyment not usually available on adjacent private land.

Is the use a proposed new use or an existing use?

Wildlife observation and photography are existing uses.

Is the use a priority public use?

Wildlife observation and photography are priority wildlife-dependent recreational uses under the National Wildlife Refuge System Improvement Act of 1997.

Availability of Resources:

What resources are needed to properly and safely administer use?

Visitors that come to the refuge for wildlife photography and observation would need access via road. Once on the refuge, visitors might use parking lots, hiking trails, and boat launches. Visitor services staff and law enforcement are needed to provide safe facilities and security to the public.

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

The refuge has been open for many years to these priority public uses. Wildlife photography and observation usually happen hand-in-hand with other public use such as hiking and auto touring. Thus, the facilities and services needed for wildlife observation and photography overlap with numerous other public uses. The refuge has adequate roads, parking lots, trails, boat launches, etc., to accommodate photography and observation by the public. The Service has provided the facilities for the activities and staff to enforce regulations.

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Wildlife observation and photography pose minimal impacts on the purposes for which national wildlife refuges were established. Access is typically by individuals or small groups on foot or using snowshoes or skis along established trails. Access by motorized vehicles and bicycles is limited to established trails, public roads, and parking lots. Damage to vegetation from walking is minimal and temporary. Visitors typically use established foot trails with little impact on vegetation. There is some temporary disturbance to wildlife due to presence of humans, such as flushing a nesting bird. The most likely impact to wildlife, related to the refuge purposes, would occur during spring and fall migrations, but the sporadic and limited use by the public should not create unreasonable impacts. Winter activities pose no impacts to waterfowl and little impact to vegetation. The winter disturbance to resident wildlife is also temporary and minor. Any unreasonable wildlife harassment would be grounds for law enforcement or for refuge management to restrict access or close an area to these uses.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Certain modes of access such as motorized vehicles and bicycles will be limited to designated trails, public roads, and parking lots.
2. Camping, overnight use, and fires are prohibited.
3. No photo or viewing blinds may be left overnight.
4. Harassment of wildlife and excessive damage to vegetation are prohibited.

Justification:

This use has been determined compatible, because wildlife viewing and photography will not materially interfere with or detract from refuge purposes. The level of use for wildlife observation and photography is moderate. The associated disturbance to wildlife is temporary and minor. Wildlife observation and photography are priority public uses and inculcate visitors with an appreciation for wildlife and an enthusiasm for nature and the outdoors. These uses also help fulfill the mission of the Refuge System.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Interpretation and Environmental Education

Refuge Name: DeSoto National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1969 (16 U.S.C., 715d)

Refuge Recreation Act of 1962 (16 U.S.C., 460k–460k-4)

Refuge Purposes:

DeSoto National Wildlife Refuge was established March 12, 1958:

“ . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929)

“ . . . 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 . . . ” 16 U.S.C. 460k–460k-4 (Refuge Recreation Act of 1962*)

*This purpose was applied post facto to DeSoto NWR.

National Wildlife Refuge System Mission:

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.

Description of Use:

Is the use a proposed new use or an existing use?

Interpretation and environmental education are existing uses of the refuge.

Is the use a priority public use?

Interpretation and environmental education are priority wildlife-dependent recreation uses under the National Wildlife Refuge System Improvement Act of 1997.

Where would the use be conducted?

The use would occur in all areas of the refuge open to the public and selected closed sites as warranted by the specific situation and staff judgment. Areas for environmental education activities and interpretive tours are scheduled and planned to avoid interference with wildlife management goals.

When would the use be conducted?

These uses occur year round.

How would the use be conducted?

Environmental education activities are provided by the refuge staff, volunteers, teachers, or leaders of visiting groups. All environmental education visits are curriculum based, and lessons help students meet state educational standards. Interpretation includes staff-led or volunteer-led services such as interpretive walks, talks, tours, and roving interpretation plus non-staffed services such as exhibits, signs, and brochures.

Why is this use being proposed?

These uses are being proposed to continue and build on successful environmental education and interpretation programs already in place at the refuge. These uses are priority wildlife-dependent recreational uses of the Refuge System.

Availability of Resources:

What resources are needed to properly and safely administer use?

Staff time from a visitor services specialist is needed to properly and safely administer these uses.

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

Existing refuge resources are adequate to maintain current level of environmental education and interpretive services. Increases or decreases in available resources require correlated changes in the interpretation and environmental education programs.

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Environmental education and interpretation are priority public uses listed in the National Wildlife Refuge System Improvement Act of 1997. By providing for these uses on the refuge, the participant's knowledge and appreciation of fish and wildlife ecology are enhanced, leading to increased public awareness of the ways healthy wildlife populations and natural habitats benefit present and future generations. Increased public awareness of natural and cultural environments contributes to the achievement of the refuge's purposes and the mission of the Refuge System.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Environmental education and interpretation activities will be reviewed annually to ensure the quality of their contributions to visitors and students and that the associated impacts to fish, wildlife, plants, and their habitats are not detracting from biological management of the refuge.

Justification:

This use has been determined compatible. Environmental education and interpretation will not materially interfere with or detract from the refuge purposes. The level of use for environmental education and interpretation is moderate. The associated disturbance to wildlife is temporary and minor. Environmental education and interpretation are priority public uses that promote visitor understanding of, and increased appreciation for, America's natural and cultural resources. All activities and programming are designed to provide safe, informative, enjoyable, and accessible interpretive opportunities, products, and facilities. These uses also aid in the development a sense of environmental stewardship leading to actions and attitudes that reflect interest and respect for wildlife resources, cultural resources, and the environment. These uses also help fulfill the mission of the Refuge System.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Gathering Mushrooms

Refuge Name: DeSoto National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1969 (16 U.S.C., 715d)
Refuge Recreation Act of 1962 (16 U.S.C., 460k–460k-4)

Refuge Purposes:

DeSoto National Wildlife Refuge was established March 12, 1958:

“ . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929)

“ . . . 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 . . . ” 16 U.S.C. 460k–460k-4 (Refuge Recreation Act of 1962*)

*This purpose was applied post facto to DeSoto NWR.

National Wildlife Refuge System Mission:

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.

Description of Use:

Allow general public access in all open areas of the refuge to gather mushrooms.

Is the use a proposed new use or an existing use?

Gathering is an existing use of the refuge.

Is the use a priority public use?

Gathering is not a priority use of the Refuge System.

Where would the use be conducted?

Access for gathering mushrooms is allowed in all areas of the refuge open to the public, including the Public Use, East Dike South, and West Side Units. Refuge kiosk maps, brochure map, and other handouts show the areas open to mushroom gathering (see also figure 4-4 in chapter 4 of the CCP for a map depicting future visitor services at DeSoto NWR).

Entry to any or all portions of the refuge may be suspended by refuge management in the case of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Any closures would be accompanied by appropriate signage and notifications.

When would the use be conducted?

Mushroom gathering is allowed during daylight hours and within areas open to the public whenever the mushrooms are present. The actual season of mushroom growth varies from year-to-year depending on temperatures and moisture.

How would the use be conducted?

Refuge resources to facilitate gathering include refuge roads and hiking trails. Allowable forms of access to the refuge include hiking, snowshoeing, cross-country skiing, biking, motorized and nonmotorized boats, and motorized vehicles. Horses, all-terrain vehicles, off-road vehicles, snowmobiles, and jet skis are not allowed on the refuge. Spot checks of gatherers are made to assess the harvest success and compliance with the rules.

Why is this use being proposed?

Access for gathering is a non-priority, wildlife-dependent recreational use of the Refuge System. However, refuge resources can support this activity, which also provides enjoyment of natural scenery and a diversity of wildlife not usually available on adjacent private lands. Access for mushroom gathering is a high priority for many refuge visitors.

Availability of Resources:**What resources are needed to properly and safely administer use?**

The primary means of visitor access to the refuge for gathering is public and refuge roads. Once on refuge roads, visitors may also use existing parking lots and hiking trails. Visitor services, facility maintenance, and law enforcement staff are needed to provide and maintain safe facilities and security to the public.

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

The refuge has been open to this non-priority public use for many years during which time the Service has provided the facilities and staff for this use. Gathering can occur in tandem with other public use such as hiking, wildlife observation, photography, and auto touring. This use requires the same services and infrastructure as other public uses on the refuge. The refuge has adequate roads, parking lots, and trails to accommodate mushroom gathering by the public.

Anticipated Impacts of the Use:**How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?**

The opportunity for mushroom gathering leads to the public enjoyment of outdoor activities and nature. Gathering is a great way to introduce people to the refuge and to the values of local natural resources. Although gathering is a non-priority public use, it offers participants exposure to the Refuge System and its mission. This activity also accompanies and supports a number of priority public uses including wildlife observation and photography, and it provides practical and applied environmental education.

Gathering poses no substantial adverse impacts on the purposes for which the refuge was established. Some wildlife and habitat disturbance may occur during mushroom gathering, but the impacts are minimal, limited by designated areas and seasonal restrictions, and do not detract from the refuge purposes and the mission of the Refuge System.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

_____ Use is Not Compatible

 X Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Mushroom gathering is only allowed in refuge areas open to the public. Refuge staff will monitor this activity to ensure that gathering is done in modest quantities for personal consumption only.
2. Certain modes of access including motorized vehicles and bicycles will be limited to designated trails, public roads, and parking lots.
3. Camping, overnight use, and fires are prohibited.
4. Harassment of wildlife and excessive damage to vegetation are prohibited.

Justification:

Mushroom gathering is a non-priority recreational use of the Refuge System. This use has been determined compatible at DeSoto NWR, because gathering will not materially interfere with or detract from refuge purposes. This activity facilitates the public appreciation of nature and the outdoors, and provides opportunities to learn about the U.S. Fish and Wildlife Service. It also reinforces and enhances the public's understanding of the natural environment and of the need for fish and wildlife conservation.

The level of gathering activity is moderated through designated areas and seasons; the associated disturbance to wildlife is temporary and minor.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2023

Compatibility Determination

Use: Research Programs

Refuge Name: DeSoto National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1969 (16 U.S.C., 715d)
Refuge Recreation Act of 1962 (16 U.S.C., 460k–460k-4)

Refuge Purposes:

DeSoto National Wildlife Refuge was established March 12, 1958:

“ . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929)

“ . . . 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 . . . ” 16 U.S.C. 460k–460k-4 (Refuge Recreation Act of 1962*)

*This purpose was applied post facto to DeSoto NWR.

National Wildlife Refuge System Mission:

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.

Description of Use:

Research is the planned, organized, and systematic gathering of data to discover or verify facts. In principle, research conducted on the refuge by universities, cooperative units, nonprofit organizations, and other research entities furthers refuge management and serves the purposes, vision, and goals of the refuge. The refuge hosts research from a variety of research institutions, including various universities and private research groups. All research activities, whether conducted by governmental agencies, public research entities, universities, private research groups, or any other entity, shall be required to obtain special use permits from the refuge. Approved refuge special use permits will contain conditions under which researchers must operate to help minimize negative impacts to refuge resources. Refuge staff will oversee all research activities. Priority consideration will be given to projects that are fish and wildlife management-oriented and that provide needed information for refuge operation and management.

Is the use a proposed new use or an existing use?

Research programs are an existing use of the refuge.

Is the use a priority public use?

Research programs are not a priority public use of the Refuge System.

Availability of Resources:

What resources are needed to properly and safely administer use?

Needed resources include the administration of associated special use permits and oversight by refuge staff.

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

Yes

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Disturbance is expected with some research activities, especially where researchers are entering sensitive habitats and/or working with species of concern. Researcher disturbance would include altering wildlife behavior, temporarily displacing wildlife, collecting soil and plant samples, or trapping and handling wildlife. However, most of these effects would be short-term, and only the minimum number of samples (e.g., water, soils, vegetative litter, plants, and wildlife) required for identification, experimentation, and statistical analysis would be permitted; captured and marked wildlife would be released. It is possible that direct or indirect mortality could result as a by-product of research activities. Mist netting, for example, can cause mortality directly through the capture method, in trap predation, and indirectly through capture injury or stress caused to the organism. Overall, allowing well designed and properly reviewed research is likely to have very little impact on refuge wildlife populations. The refuge does not anticipate adverse impacts on non-target species or other resources from research activities as these activities are typically geared towards benefiting refuge management of trust resources.

Negative impacts to public use activities are not expected, and no adverse socioeconomic impacts are anticipated. The proposed use will cause only minor and short-term disturbances to some wildlife and little or no disturbance to refuge visitors. The continuance of research projects is an important management tool that can have considerable beneficial effects on refuge lands and waters. Research findings will assist refuge staff in providing quality wildlife and habitat management and enhance the primary purposes for which this refuge was acquired. Furthermore, research can allow refuge staff to meet management goals at a modest cost to the refuge. This use should not result in short-term or long-term impacts that adversely affect the purpose for this refuge or the mission of the Refuge System. The cumulative impacts are minor, as evidenced by the durability of the terrain, the resiliency of vegetation, and the number and diversity of wildlife that remains in the area throughout years of high public use.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:☐ Use is Not Compatible☒ Use is Compatible with the Following Stipulations**Stipulations Necessary to Ensure Compatibility:**

All research conducted on the refuge must further the purposes of the refuge and the mission of the Refuge System. All research will adhere to established refuge policy on research and policy on collecting specimens (Directors Order Number 109). To ensure that research activities are compatible, the refuge requires that a special use permit be obtained before any research activity may occur. Research proposals and/or research special use permit applications must be submitted in advance of the activity to allow for review by refuge staff to ensure minimal impacts to the resources, staff, and programs of the refuge. Each special use permit may contain conditions under which the research will be conducted. Each special use permit holder will submit annual reports or updates to the refuge on research activities, progress, findings, and other information. Further, each special use permit holder will provide copies of findings, final reports, publications, and/or other documentation at the end of each project. The refuge may deny permits for research proposals that are determined not to serve the purposes of the refuge and the mission of the Refuge System. The refuge will also deny permits for research proposals that are determined to negatively impact resources, or that materially interfere with or detract from the purposes of the refuge. All research activities are subject to the conditions of their special use permits.

Justification:

There is a continuing need for research for the conservation of federal trust and focal species that occur on DeSoto NWR. The Service encourages scientific research to further the understanding of refuge natural resources. Many research needs, if undertaken, would support refuge conservation and management efforts. Some of these research needs are to meet the objectives found in various plans and federal mandates. Priority will be given to research projects that can be applied to current wildlife management or conservation issues, thereby contributing to adaptive refuge management practices and management decisions that are based on the best available science. There will be no notable, permanent negative impacts to any refuge wildlife. This use will not diminish the primary purpose for the refuge and will help meet the mission of the Refuge System by sustaining natural resources for the benefit of the American public and conserving fish, wildlife, and plants on these lands. Scientific research on DeSoto NWR is consistent with the refuge and Refuge System objectives and thus compatible.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2023

Compatibility Determination

Use: Wood Cutting

Refuge Name: DeSoto National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1969 (16 U.S.C., 715d)
Refuge Recreation Act of 1962 (16 U.S.C., 460k–460k-4)

Refuge Purposes:

DeSoto National Wildlife Refuge was established March 12, 1958:

“ . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929)

“ . . . 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 . . . ” 16 U.S.C. 460k–460k-4 (Refuge Recreation Act of 1962*)

*This purpose was applied post facto to DeSoto NWR.

National Wildlife Refuge System Mission:

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.

Description of Use:

This compatibility determination is for the removal of fallen trees by private individuals and applies to all wood removal activities regardless of the ultimate use of the wood (e.g., firewood, pulp, etc.). Differences in the scope of the activities and the necessary equipment will occur depending on the amount and type of wood available for removal. This activity will only occur if the Service has determined that a management need exists to remove wood from the refuge consistent with DeSoto NWR’s CCP or other management purposes.

Wood cutting is not a priority public use of the Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997. Wood removal may occur within former homesites, along existing windbreaks/shelter belts, and in other areas of the refuge where trees are dying or otherwise undesirable. Harvest sites will vary in size from a portion of an acre up to several hundred acres depending on the site and management objectives. Wood removal activities may be authorized throughout the year. Most often, wood removal activities occur during the winter months when frozen ground facilitates access and affords protection to underlying soils and vegetation. The main application of this use is the collection of firewood along refuge roads by individuals for personal use. Large trees fall along the roads and must be cleaned up by the staff. Allowing the public access to this wood saves time and money for the refuge.

The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Equipment used for harvest may range from chainsaws and axes to traditional logging equipment such as feller bunchers and log skidders. Access may be pickup truck, farm tractor, or larger traditional logging equipment.

Is the use a proposed new use or an existing use?

Wood cutting is an existing use of the refuge.

Is the use a priority public use?

Wood cutting is not a priority public use of the Refuge System.

Availability of Resources:

What resources are needed to properly and safely administer use?

A staff member will be responsible for writing special use permits when needed. Law enforcement during regular patrols will check for violations regarding refuge wood harvest.

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

Yes

Anticipated Impacts of the Use:

In permitting this type of activity, the potential exists to directly impact nesting birds both on the ground and in the trees. These impacts are easily avoided by careful timing of the activity. Wood cutting will be done, if at all possible, during the winter months when birds are not nesting. Access for removing wood may impact habitat by rutting soils, destroying ground cover, creating weed seedbeds, and increasing runoff and sedimentation in nearby wetlands. These impacts can again be avoided by careful timing of the activity. Allowing access during the winter months when the ground is frozen will avoid these impacts.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. If at all possible, wood cutting will take place during winter months to avoid nesting birds and soil disturbance.

2. A special use permit will be issued so that site-specific impacts can be reduced or eliminated and Service management goals are met.

Justification:

Impacts to the habitat as a result of access to the refuge for wood removal purposes are potentially substantial, but can be avoided. Access to and from these areas will need to be carefully controlled (via special use permit) to avoid impacts such as rutting and increased sedimentation in area wetlands. Areas that do not have roads will be protected by issuing special use permits only during winter months when the ground is frozen. Individuals participating in the wood harvest program will be under special use permit, and site-specific stipulations will ensure resource protection and achievement of management goals.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2023

Boyer Chute National Wildlife Refuge

Compatibility Determination

Use: Upland and Big Game Hunting

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

Hunting of game is a public use granted under the authority of the Refuge System Improvement Act of 1997 and is considered a priority public use of the National Wildlife Refuge System.

The refuge manages the deer herd by offering quality weekend (deer gun) hunt events. During the hunts the refuge is closed to other visitors. The number of hunt events conducted each year typically ranges from one to three, and depends on the size of the deer herd. The hunts are generally held in October, December, and/or January. The hunts are scheduled in coordination with Nebraska Game and Parks Commission. No land within the authorized refuge boundary has been acquired in the State of Iowa.

Archery deer hunting in the fall is proposed for the refuge as a part of the comprehensive conservation plan (CCP). A season would be set according to the State of Nebraska's season. Selected areas of the refuge would be open to archery hunting.

Upland game hunting, specifically Ring-necked Pheasant and Wild Turkey, is also proposed for the refuge in the CCP. Special turkey and pheasant gun hunting events could be held in the spring or fall. These hunt dates would be selected to fit within the state seasons.

Is the use a proposed new use or an existing use?

Hunting is an existing use of the refuge.

Is the use a priority public use?

Hunting is a priority public use of the Refuge System and an important wildlife management tool. The Service recognizes hunting as a healthy, traditional outdoor activity, deeply rooted in American heritage. Hunting can instill a unique understanding and appreciation of wildlife, animal behavior, and habitat needs. Hunting programs can promote understanding and appreciation of natural resources and their management on the lands and waters of the Refuge System.

Availability of Resources:

What resources are needed to properly and safely administer use?

Road maintenance, mowing, and other grounds upkeep will be required, but these activities are considered a part of routine refuge management and maintenance activities. There is also time spent by refuge staff on deer herd monitoring and hunt program planning. Administrative time is required for hunt program implementation, including answering questions, making maps, etc. Law enforcement is an essential tool for proper and safe administration of this use. The refuge has a full time officer dedicated to this function. Based on a review of the current refuge budget, there is adequate funding to ensure compatibility and to administer and manage this public use.

Anticipated Impacts of the Use:

Short-term impacts: Providing carefully planned and managed hunting events with restricted access to specified refuge hunting zones will generally minimize disturbance to wildlife populations, the refuge environment, infrastructure, and non-consumptive users. Hunting causes mortality of target species with the intent of harvesting populations to the carrying capacity of existing habitat. By limiting take to harvestable surplus, the refuge can ensure the long-term health and survival of game species, populations, and their associated ecosystem. The presence and activity of hunters may cause disturbance to other wildlife in the area, but these impacts are minor and temporary. There is the potential to impact non-target species that are sensitive to disturbance, especially during spring turkey hunts when many animals are breeding or nesting. For visitors, non-hunting public uses may be temporarily disrupted or postponed during hunt events. Visitor safety is the highest priority when designing and planning all hunting activities on refuges. Vehicle traffic will increase slightly during hunting events, and the sound of gun shots will temporarily reduce the serenity for the non-hunting public. Loss of vegetation from foot traffic is minor or temporary. Soil and plant disturbance may occur in ingress and egress routes but will be minor and temporary because of the limited and controlled use associated with the managed hunts.

Long-term impacts: No adverse long-term impacts from hunting are anticipated as long as wildlife populations are monitored through the refuge biological program or by state officials. Long-term beneficial impacts of this use include the ability to manage targeted wildlife populations to levels that fall within the carrying capacity of the ecosystem. When deer populations grow beyond a sustainable capacity herbivory can have profound negative impacts to the local environment, native plants, and other wildlife species.

Cumulative impacts: There are no anticipated cumulative impacts. Harvest on the refuge would be limited by management and would fall within the state's population management goals,

which are based on the best available science. All hunts would follow all applicable laws, regulations, and policies including title 50 of the Code of Federal Regulations, the U.S. Fish and Wildlife Service Manual, the mission and goals of the Refuge System, and the purposes, goals, and objectives of Boyer Chute NWR. Careful management of this public use maintains the safety of the area's citizens, contributes to the refuge's wildlife and habitat goals, and supports several of the primary objectives of the refuge.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with Refuge System and Boyer Chute NWR goals and objectives of the activity can only occur under the following stipulations:

1. Hunting will only occur during special, managed hunting events.
2. All hunting will adhere to the hunting section of the refuge's visitor services step-down management plan.
3. All applicable state and federal regulations apply.
4. Hunting is prohibited on, across, or within 100 feet of refuge roads or parking lots.
5. Camping, overnight use, and fires are prohibited.
6. During hunting activities, the refuge is open two hours before the legal shooting time and one hour after the legal shooting time.
7. Refuge-specific authorization is required for all special hunts.
8. All personal property, including stands, must be removed at the end of each day.
9. No motorized vehicles are allowed within the hunting units except at designated parking areas or as specified by a special use permit.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is being permitted because it is a priority public use and will not diminish the primary purposes of the refuge. This use will meet the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on refuge lands.

Hunting is one of the six priority wildlife-dependent recreational uses identified in the National Wildlife Refuge System Improvement Act of 1997. Service policy directs us to provide hunting opportunities when compatible with refuge management. Managed hunting programs help promote an understanding and appreciation of natural resources and their management. Additionally, managed hunts on the refuge provide a traditional recreational activity with minimal adverse impacts to the biological integrity or sustainability of refuge resources.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Waterfowl Hunting

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

Allow public waterfowl hunting on the Boyer Chute National Wildlife Refuge. Hunting is a priority public use on National Wildlife Refuge system lands. Only a small portion of the refuge is open to waterfowl hunting, as to reduce wildlife disturbance and conflict with other refuge users. Hunting regulations are generally consistent with state regulations, with a few refuge-specific regulations.

Availability of Resources:

Adequate resources are available to manage the existing hunting program at the current level of participation.

The designated areas open to public hunting are open in accordance with state and refuge regulations and require no preparation and administration of special hunts.

A refuge waterfowl hunting regulations brochure and map is available from the refuge office to inform the public of hunting opportunities and refuge regulations. Waterfowl hunting regulations and map are also posted in the informational kiosks.

Hunters utilize the existing network of walk-in trails or use a boat to access the area open to waterfowl hunting. Parking lots, restrooms, leaflets, information kiosks, and signs are provided

by the refuge for use by hunters. The refuge also provides staff to maintain these facilities and disseminate information to visitors. Refuge law enforcement officers, Service special agents, and state conservation officers enforce state and refuge hunting regulations.

Anticipated Impacts of the Use:

Accommodating this wildlife-dependent use is expected to result in minimal impacts. Migratory birds currently hunted on the refuge include only ducks, geese, and coots. The refuge waterfowl hunting area is small in area as to reduce conflict with other refuge users. Additionally, under current regulations, conflicts between other refuge user groups have been few, largely because migratory bird hunting seasons occur in the fall or late winter when fewer people use the refuge. Populations of migratory waterfowl species are monitored by the U.S. Fish and Wildlife Service, and season dates and bag limits are set with the long-term health of populations in mind. Therefore, this activity will have insignificant cumulative impacts on waterfowl populations.

Disturbance to other wildlife may also result from hunting activity. This disturbance is expected to be limited in scope and duration. All motor vehicle use is restricted to designated roads, trails, and parking areas, which reduces disturbance to wildlife. Disturbance to habitat is minimal given the nature of this hunting and restriction of vehicle use.

Public Review and Comment:

A Draft Environmental Assessment, titled "Waterfowl Hunting at Boyer Chute National Wildlife Refuge," was available for public comment from March 17–April 17, 2007.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, managed waterfowl hunting can occur on the refuge if the following stipulations are met:

1. Hunts must be conducted in accordance with state and federal regulations and special refuge regulations published in the refuge hunting regulations and public use regulations brochures.
2. To minimize potential conflicts between user groups, the waterfowl hunting area should be limited in size and located in areas of low public use.
3. Hunts are subject to modification if onsite monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats.

Justification:

Migratory bird hunting seasons and bag limits are established by the states within a framework set nationally by the U.S. Fish and Wildlife Service. These restrictions ensure the continued well-being of overall populations of migratory birds. Hunting does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard an adequate breeding population from year to year. Most of the wetland habitat on Boyer Chute NWR is closed to hunting, and provides feeding and resting areas for migratory birds during the hunting season. Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas. Loss of plants through boat traffic or blind construction is minor or temporary since hunting occurs mainly after the growing season.

Conflicts between hunters are localized and are addressed through law enforcement, public education, and proposed changes to hunting regulations. Conflicts between other various user groups are minor given the season of the year for hunting, and the location of most hunting in marsh habitat and more remote shorelines.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also 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.

Signature: Refuge Manager /Larry Klimek/ 04/18/2008
(Signature and Date)

Concurrence: Regional Chief (Acting) /Tom Worthington/ 05/21/2008
(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: 2023

Compatibility Determination

Use: Fishing

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

Allow general public access during specific times of the year to open areas of the refuge for sport and commercial fishing. Archery and spearfishing are permitted (for rough fish only). An Iowa or Nebraska fishing license is required. State and federal regulations apply; refuge specific regulations also apply.

Is the use a proposed new use or an existing use?

Fishing is an existing use of the refuge.

Is the use a priority public use?

Fishing is a priority wildlife-dependent recreational use under the National Wildlife Refuge System Improvement Act of 1997.

Where would the use be conducted?

Bank fishing is permitted on all open waters of refuge units open to the public, including the Missouri River, Boyer Chute, ponds, and scour holes unless specifically closed by refuge management. Bank fishing access consists of shorelines and fishing piers. Certain areas are closed during the migration period (September 14 to April 15). Bank fishing is allowed on all portions of the Boyer Chute during the warm season but is not permitted in the Chute when it is covered by ice. For safety reasons, all watercraft including kayaks and canoes are prohibited in

the Boyer Chute. Boat fishing is also allowed on the Missouri River, but this use is regulated by the U.S. Army Corps of Engineers.

Allowable forms of access to the refuge include hiking, snowshoeing, cross-country skiing, biking, and motorized vehicles. Horses, all-terrain vehicles, off-road vehicles, snowmobiles and jet skis are not allowed on the refuge.

When would the use be conducted?

Boyer Chute NWR is open during daylight hours. Year round use is permitted unless specifically closed by refuge management. Entry to any or all portions of the refuge may be suspended by refuge management in the case of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Any closures would be accompanied by appropriate signage and notifications.

How would the use be conducted?

Refuge resources to facilitate fishing include fully accessible fishing piers and pedestrian accessible shorelines.

Why is this use being proposed?

Access for fishing is a priority wildlife-dependent recreational use of the Refuge System, and available refuge resources can support this activity. Fishing activities provide enjoyment of scenic views and a variety of wildlife not usually available on adjacent private land.

Availability of Resources:

What resources are needed to properly and safely administer use?

Visitors coming to the refuge for fishing on refuge waters, including from the banks of the Boyer Chute and Missouri River, need access via road. Once on the refuge, visitors might use parking lots, hiking trails, and piers. Appropriate refuge funding as well as visitor services, facility maintenance, and law enforcement staff are needed to provide and maintain facilities and ensure public safety.

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

The refuge has been open for many years to this priority public use. Fishing often occurs in tandem with other public use such as hiking and auto touring. Fishing use often occurs as youth group or family related activities. Because fishing requires the same accommodations as other appropriate and compatible public uses, refuge roads, parking lots, trails, and other visitor services infrastructure are adequate to accommodate this public use. The refuge also has adequate staff to provide enjoyable and safe fishing opportunities to the public.

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Fishing is a priority public use, and those participating in this activity are exposed to the Refuge System and its mission. Fishing is a great way to introduce young people to the outdoors and to the values of our natural resources.

Regulated fishing poses no appreciable impact on the purposes for which the refuge was established. Damage to habitat by foot traffic is limited to developed or designated fishing waterfront areas. Littering is one visible impact of fishing but is of minor consequence to wildlife

and is attended to by staff and volunteers. There are minor wildlife impacts when anglers inadvertently disturb duck broods, shorebirds, or other wildlife in and around the water. No other associated impacts from fishing are considered to be substantial constraints to achieving the refuge purpose and the mission of the Refuge System.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Only day-use activities are permitted on Boyer Chute NWR. All fishing is regulated by state and refuge-specific regulations.
2. Modes of access including motorized vehicle and bicycles are limited to designated trails, public roads, and parking lots.
3. Camping, overnight use, and fires are prohibited.
4. Harassment of wildlife and excessive damage to vegetation are prohibited.

Justification:

Fishing is a priority wildlife-dependent recreational use of the Refuge System.

Fishing has been determined to be a compatible use of Boyer Chute NWR because the use will not materially interfere with or detract from management objectives, refuge purposes, or the Refuge System mission. This activity introduces the public to fishing, wetland ecology, and the mission of U.S. Fish and Wildlife Service; it enhances their understanding of the natural environment and of the need for fish and wildlife conservation. The level of fishing use is moderate throughout the year and the associated disturbance to wildlife is temporary and minor.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Wildlife Observation and Photography (including the means of access such as hiking, snowshoeing, cross-country skiing, motorized and nonmotorized boating, and motorized vehicles)

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

Allow general public access during anytime of the year to open areas of the refuge for the observation and photographing of associated flora and fauna. Boyer Chute NWR is open during daylight hours. All of the refuge will be open to the public for photography unless specifically closed by refuge management. Allowable forms of access to the refuge include hiking, snowshoeing, cross-country skiing, biking, motorized and nonmotorized boats, and motorized vehicles. Horses, all-terrain vehicles, off-road vehicles, snowmobiles, and jet skis are not allowed on the refuge. Wildlife observation and photography are priority public uses on Refuge System lands as identified in the National Wildlife Refuge System Improvement Act of 1997. Entry to any or all portions of the refuge may be suspended by refuge management in the case of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Any closures would be accompanied by appropriate signage and notifications. Access for wildlife observation and photography will allow public access for enjoyment of scenic views and an array of wildlife including waterfowl, other migratory birds, tallgrass prairie plants, and resident wildlife. Wildlife refuges provide opportunities for wildlife enjoyment not usually available on adjacent private land.

Is the use a proposed new use or an existing use?

Wildlife observation and photography are existing uses of the refuge.

Is the use a priority public use?

Wildlife observation and photography are priority wildlife-dependent recreation uses under the National Wildlife Refuge System Improvement Act of 1997.

Availability of Resources:

What resources are needed to properly and safely administer use?

Visitors coming to the refuge for wildlife photography and observation would need access via road. Once on the refuge visitors might use parking lots and hiking trails. Visitor services staff and law enforcement are needed to provide safe facilities and security to the public.

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

The refuge has been open for many years to these priority public uses. Wildlife photography and observation usually happen hand-in-hand with other public use such as hiking and auto touring. Thus, the facilities and services needed for wildlife observation and photography overlap with numerous other public uses. The refuge has adequate roads, parking lots, trails, boat launches, etc., to accommodate photography and observation by the public. The Service has provided the facilities for the activities and staff to enforce regulations.

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Wildlife observation and photography pose minimal impacts on the purposes for which national wildlife refuges were established. Access is typically by individuals or small groups on foot or using snowshoes or skis along established trails. Access by motorized vehicles and bicycles is limited to established trails, public roads, and parking lots. Damage to vegetation from walking is minimal and temporary. There is some temporary disturbance to wildlife due to the presence of humans, such as flushing a nesting bird. The most likely impact to wildlife, related to the refuge purposes, would occur during spring and fall migrations, but the sporadic and limited use by the public should not create unreasonable impacts. Winter activities pose no impacts to waterfowl and little impact to vegetation. The winter disturbance to resident wildlife is also temporary and minor. Visitors typically use established foot trails with little impact on vegetation. Any unreasonable harassment would be grounds for law enforcement or for refuge management to restrict access or close an area to these uses.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Certain modes of access such as motorized vehicles and bicycles will be limited to designated trails, public roads, and parking lots.
2. Camping, overnight use, and fires are prohibited.
3. No photo or viewing blinds may be left overnight.
4. Harassment of wildlife and excessive damage to vegetation are prohibited.

Justification:

This use has been determined compatible, because wildlife viewing and photography will not materially interfere with or detract from refuge purposes. The level of use for wildlife observation and photography is moderate. The associated disturbance to wildlife is temporary and minor. Wildlife observation and photography are priority public uses and inculcate visitors with an appreciation for wildlife and an enthusiasm for nature and the outdoors. These uses also help fulfill the mission of the Refuge System.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Interpretation and Environmental Education

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

Is the use a proposed new use or an existing use?

Interpretation and environmental education are existing uses of the refuge.

Is the use a priority public use?

Interpretation and environmental education are priority wildlife-dependent recreation uses under the National Wildlife Refuge System Improvement Act of 1997.

Where would the use be conducted?

The use would occur in all areas of the refuge open to the public and selected closed sites as warranted by the specific situation and staff judgment. Areas for environmental education lesson and interpretive tours are scheduled and planned to avoid interference with wildlife management goals.

When would the use be conducted?

This use occurs year round.

How would the use be conducted?

Environmental education activities are provided by the refuge staff, volunteers, teachers, or leaders of the visiting group. All environmental education visits are curriculum based, and activities help students meet state educational standards. Interpretation includes staff-led or

volunteer-led services such as interpretive walks, talks, tours, and roving interpretation plus non-staffed services such as exhibits, signs, and brochures.

Why is this use being proposed?

These uses are being proposed to continue and build on successful environmental education and interpretation programs already in place at the refuge. These uses are priority wildlife-dependent recreational uses of the Refuge System.

Availability of Resources:

What resources are needed to properly and safely administer use?

Staff time from a visitor services specialist is needed to properly and safely administer these uses.

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

Existing refuge resources are adequate to maintain current level of environmental education and interpretive services. Increases or decreases in available resources require correlated changes in the interpretation and environmental education programs.

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Environmental education and interpretation are priority public uses listed in the National Wildlife Refuge System Improvement Act of 1997. By providing for these uses on the refuge, the participant's knowledge and appreciation of fish and wildlife ecology are enhanced, leading to increased public awareness of the ways healthy wildlife populations and natural habitats benefit present and future generations. Increased public awareness of natural and cultural environments contributes to the achievement of the refuge's purposes and the mission of the Refuge System.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Environmental education and interpretation activities will be reviewed annually to ensure the quality of their contributions to visitors and students and that the associated impacts to fish, wildlife, plants, and their habitats are not detracting from biological management of the refuge.

Justification:

This use has been determined compatible. Environmental education and interpretation will not materially interfere with or detract from the refuge purposes. The level of use for environmental education and interpretation is moderate. The associated disturbance to wildlife is temporary and minor. Environmental education and interpretation are priority public uses that promote visitor understanding of, and increased appreciation for, America's natural and cultural resources. All activities and programming are designed to provide safe, informative, enjoyable, and accessible interpretive opportunities, products, and facilities. These uses also aid in the development a sense of environmental stewardship leading to actions and attitudes that reflect interest and respect for wildlife resources, cultural resources, and the environment. These uses also help fulfill the mission of the Refuge System.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2028

Compatibility Determination

Use: Gathering of Mushrooms

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

Allow general public access in open areas of the refuge to gather mushrooms.

Is the use a proposed new use or an existing use?

Gathering is an existing use of the refuge.

Is the use a priority public use?

Gathering is not a priority use of the Refuge System.

Where would the use be conducted?

Access for gathering mushrooms is allowed in all areas of the refuge open to the public, including the Northwest, Wildflower, Rail, West Chute, Island, Horseshoe, and Yellowlegs Units. Refuge kiosk maps, brochure map, and other handouts show the areas open to mushroom gathering (see also figure 4-5 in chapter 4 of the CCP for a map depicting future visitor services at Boyer Chute NWR).

Entry to any or all portions of the refuge may be suspended by refuge management in the case of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. Any closures would be accompanied by appropriate signage and notifications.

When would the use be conducted?

Mushroom gathering is allowed during daylight hours and within areas open to the public whenever the mushrooms are present. The actual season of mushroom growth varies from year-to-year depending on temperatures and moisture.

How would the use be conducted?

Refuge resources to facilitate gathering include refuge roads and hiking trails. Allowable forms of access to the refuge include hiking, snowshoeing, cross-country skiing, biking, and motorized vehicles. Horses, all-terrain vehicles, off-road vehicles, snowmobiles, and jet skis are not allowed on the refuge. Spot checks of gatherers are made to assess the harvest success and compliance with the rules.

Why is this use being proposed?

Access for gathering is a non-priority, wildlife-dependent recreational use of the Refuge System. However, refuge resources can support this activity, which also provides enjoyment of natural scenery and a diversity of wildlife not usually available on adjacent private lands. Access for mushroom gathering is a high priority for many refuge visitors.

Availability of Resources:**What resources are needed to properly and safely administer use?**

The primary means of visitor access to the refuge for gathering is public and refuge roads. Once on refuge roads, visitors may also use existing parking lots and hiking trails. Visitor services, facility maintenance, and law enforcement staff are needed to provide and maintain safe facilities and security to the public.

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

The refuge has been open to this non-priority public use for many years during which time the Service has provided the facilities and staff for this use. Gathering can occur in tandem with other public use such as hiking, wildlife observation, photography, and auto touring. This use requires the same services and infrastructure as other public uses on the refuge. The refuge has adequate roads, parking lots, and trails to accommodate mushroom gathering by the public.

Anticipated Impacts of the Use:**How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?**

The opportunity for mushroom gathering leads to the public enjoyment of outdoor activities and nature. Gathering is a great way to introduce people to the refuge and to the values of local natural resources. Although gathering is a non-priority public use, it offers participants exposure to the Refuge System and its mission. This activity also accompanies and supports a number of priority public uses including wildlife observation and photography, and it provides practical and applied environmental education.

Gathering poses no substantial adverse impacts on the purposes for which the refuge was established. Some wildlife and habitat disturbance may occur during mushroom gathering, but the impacts are minimal, limited by designated areas and seasonal restrictions, and do not detract from the refuge purposes and the mission of the Refuge System.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Mushroom gathering is only allowed in refuge areas and units of the refuge open to the public. Refuge staff will monitor this activity to ensure that gathering is done in modest quantities for personal consumption only.
2. Only day-use activities are permitted on Boyer Chute NWR.
3. Certain modes of access including motorized vehicles and bicycles will be limited to designated trails, public roads, and parking lots.
4. Camping, overnight use, and fires are prohibited.
5. Harassment of wildlife and excessive damage to vegetation are prohibited.

Justification:

Mushroom gathering is a non-priority recreational use of the Refuge System. This use has been determined compatible at Boyer Chute NWR, because gathering will not materially interfere with or detract from refuge purposes. This activity facilitates the public appreciation of nature and the outdoors, and provides opportunities to learn about the U.S. Fish and Wildlife Service. It also reinforces and enhances the public's understanding of the natural environment and of the need for fish and wildlife conservation

The level of gathering activity is moderated through designated areas and seasons; the associated disturbance to wildlife is temporary and minor.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2023

Compatibility Determination

Use: Research Programs

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

Research is the planned, organized, and systematic gathering of data to discover or verify facts. In principle, research conducted on the refuge by universities, cooperative units, nonprofit organizations, and other research entities furthers refuge management and serves the purposes, vision, and goals of the refuge. The refuge hosts research from a variety of research institutions, including various universities and private research groups. All research activities, whether conducted by governmental agencies, public research entities, universities, private research groups, or any other entity, shall be required to obtain special use permits from the refuge. Approved refuge special use permits will contain conditions under which researchers must operate to help minimize negative impacts to refuge resources. Refuge staff will oversee all research activities. Priority consideration will be given to projects that are fish and wildlife management-oriented and that provide needed information for refuge operation and management.

Is the use a proposed new use or an existing use?

Research programs are an existing use of the refuge.

Is the use a priority public use?

Research programs are not a priority public use of the Refuge System.

Availability of Resources:

What resources are needed to properly and safely administer use?

Needed resources include the administration of associated special use permits and oversight by refuge staff.

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

Yes

Anticipated Impacts of the Use:

How does the use affect refuge purposes, the Refuge System mission, and refuge goals and/or objectives?

Disturbance is expected with some research activities, especially where researchers are entering sensitive habitats and/or working with species of concern. Researcher disturbance would include altering wildlife behavior, temporarily displacing wildlife, collecting soil and plant samples, or trapping and handling wildlife. However, most of these effects would be short-term, and only the minimum number of samples (e.g., water, soils, vegetative litter, plants, and wildlife) required for identification, experimentation, and statistical analysis would be permitted; captured and marked wildlife would be released. It is possible that direct or indirect mortality could result as a by-product of research activities. Mist netting, for example, can cause mortality directly through the capture method, in trap predation, and indirectly through capture injury or stress caused to the organism. Overall, allowing well designed and properly reviewed research is likely to have very little impact on refuge wildlife populations. The refuge does not anticipate adverse impacts on non-target species or other resources from research activities as these activities are typically geared towards benefiting refuge management of trust resources.

Negative impacts to public use activities are not expected, and no adverse socioeconomic impacts are anticipated. The proposed use will cause only minor and short-term disturbances to some wildlife and little or no disturbance to refuge visitors. The continuance of research projects is an important management tool that can have considerable beneficial effects on refuge lands and waters. Research findings will assist refuge staff in providing quality wildlife and habitat management and enhance the primary purposes for which this refuge was acquired. Furthermore, research can allow refuge staff to meet management goals at a modest cost to the refuge. This use should not result in short-term or long-term impacts that adversely affect the purpose for this refuge or the mission of the Refuge System. The cumulative impacts are minor, as evidenced by the durability of the terrain, the resiliency of vegetation, and the number and diversity of wildlife that remains in the area throughout years of high public use.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

All research conducted on the refuge must further the purposes of the refuge and the mission of the Refuge System. All research will adhere to established refuge policy on research and policy on collecting specimens (Directors Order Number 109). To ensure that research activities are compatible, the refuge requires that a special use permit be obtained before any research activity may occur. Research proposals and/or research special use permit applications must be submitted in advance of the activity to allow for review by refuge staff to ensure minimal impacts to the resources, staff, and programs of the refuge. Each special use permit may contain conditions under which the research will be conducted. Each special use permit holder will submit annual reports or updates to the refuge on research activities, progress, findings, and other information. Further, each special use permit holder will provide copies of findings, final reports, publications, and/or other documentation at the end of each project. The refuge may deny permits for research proposals that are determined not to serve the purposes of the refuge and the mission of the Refuge System. The refuge will also deny permits for research proposals that are determined to negatively impact resources, or that materially interfere with or detract from the purposes of the refuge. All research activities are subject to the conditions of their special use permits.

Justification:

There is a continuing need for research for the conservation of federal trust and focal species that occur on Boyer Chute NWR. The Service encourages scientific research to further the understanding of refuge natural resources. Many research needs, if undertaken, would support refuge conservation and management efforts. Some of these research needs are to meet the objectives found in various plans and federal mandates. Priority will be given to research projects that can be applied to current wildlife management or conservation issues, thereby contributing to adaptive refuge management practices and management decisions that are based on the best available science. There will be no notable, permanent negative impacts to any refuge wildlife. This use will not diminish the primary purpose for the refuge and will help meet the mission of the Refuge System by sustaining natural resources for the benefit of the American public and conserving fish, wildlife, and plants on these lands. Scientific research on Boyer Chute NWR is consistent with the refuge and Refuge System objectives and thus compatible.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2023

Compatibility Determination

Use: Wood Cutting

Refuge Name: Boyer Chute National Wildlife Refuge

Establishing and Acquisition Authorities:

The Fish and Wildlife Act of 1956 (U.S.C. 742a–742j)

Refuge Purposes:

Boyer Chute National Wildlife Refuge was authorized in August of 1992, opened to the public via MOU in September of 1995, and was established in September of 1997:

“ . . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . ” 16 U.S.C. 742f(a)(4) (The Fish and Wildlife Act of 1956)

“ . . . 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 . . . ” 16 U.S.C. 742f(b)(1) (The Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

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.

Description of Use:

This compatibility determination is for the removal of fallen trees by private individuals and applies to all wood removal activities regardless of the ultimate use of the wood (e.g., firewood, pulp, etc.). Differences in the scope of the activities and the necessary equipment will occur depending on the amount and type of wood available for removal. This activity will only occur if the Service has determined that a management need exists to remove wood from the refuge consistent with Boyer Chute NWR's CCP or other management purposes.

Wood cutting is not a priority public use of the Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997. Wood removal may occur within former homesites, along existing windbreaks/shelter belts, and in other areas of the refuge where trees are dying or otherwise undesirable. Harvest sites will vary in size from a portion of an acre up to several hundred acres depending on the site and management objectives. Wood removal activities may be authorized throughout the year. Most often, wood removal activities occur during the winter months when frozen ground facilitates access and affords protection to underlying soils and vegetation. The main application of this use is the collection of firewood along refuge roads by individuals for personal use. Large trees fall along the roads and must be cleaned up by the staff. Allowing the public access to this wood saves time and money for the refuge.

The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Equipment used for harvest may range from chainsaws and axes to traditional logging equipment such as feller bunchers and log skidders. Access may be pickup truck, farm tractor, or larger traditional logging equipment.

Is the use a proposed new use or an existing use?

Wood cutting is an existing use of the refuge.

Is the use a priority public use?

Wood cutting is not a priority public use of the Refuge System.

Availability of Resources:

What resources are needed to properly and safely administer use?

A staff member will be responsible for writing special use permits when needed. Law enforcement during regular patrols will check for violations regarding refuge wood harvest.

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

Yes

Anticipated Impacts of the Use:

In permitting this type of activity, the potential exists to directly impact nesting birds both on the ground and in the trees. These impacts are easily avoided by careful timing of the activity. Wood cutting will be done, if at all possible, during the winter months when birds are not nesting. Access for removing wood may impact habitat by rutting soils, destroying ground cover, creating weed seedbeds, and increasing runoff and sedimentation in nearby wetlands. These impacts can again be avoided by careful timing of the activity. Allowing access during the winter months when the ground is frozen will avoid these impacts.

Public Review and Comment:

This compatibility determination was made available for public review as part of the DeSoto and Boyer Chute Refuges Environmental Assessment and Draft Comprehensive Conservation Plan from September 19 to November 8, 2013. Comments received and agency responses are included in the final version of the DeSoto and Boyer Chute Refuges Comprehensive Conservation Plan.

Determination:

☐ Use is Not Compatible

☒ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. If at all possible, wood cutting will take place during winter months to avoid nesting birds and soil disturbance.
2. A special use permit will be issued so that site-specific impacts can be reduced or eliminated and Service management goals are met.

Justification:

Impacts to the habitat as a result of access to the refuge for wood removal purposes are potentially substantial, but can be avoided. Access to and from these areas will need to be carefully controlled (via special use permit) to avoid impacts such as rutting and increased sedimentation in area wetlands. Areas that do not have roads will be protected by issuing special use permits only during winter months when the ground is frozen. Individuals participating in the wood harvest program will be under special use permit, and site-specific stipulations will ensure resource protection and achievement of management goals.

Signature: Refuge Manager

/Tom Cox/ 12/06/2013
(Signature and Date)

Concurrence: Regional Chief

/Charlie Blair/ 12/12/2013
(Signature and Date)

Mandatory 10-year or 15-year Re-Evaluation Date: 2023

Appendix H: List of Preparers and Contributors

Preparers

The following individuals were members of the core planning team, instrumental in the development of this document, and/or made major contributions throughout the planning process.

DeSoto and Boyer Chute National Wildlife Refuges Staff

- Tom Cox – Refuge Manager
- Mindy Sheets – Deputy Refuge Manager
- Kenneth Block – Visitor Services Manager
- Michael Ellis – Wildlife Refuge Specialist
- Ashley Danielson – Visitor Services Specialist
- Matt Freis – Biological Technician (active through December 2010)

U.S. Fish and Wildlife Service, Midwest Regional Office, Division of Conservation Planning

- Jared Bowman – Refuge Planner/Wildlife Biologist
- Mark Hogeboom – Writer/Editor

Contributors

Guidance, contributions, and support of the comprehensive conservation plan were also made by the following individuals:

- Luke Wallace – Biologist (U.S. Army Corps of Engineers)
- Don Doty – Wetland Restoration Specialist (U.S. Department of Agriculture's Natural Resource Conservation Service)
- Scott Peterson – District Supervisor, SW District (Iowa Department of Natural Resources)
- Tom Welstead – District Manager, Norfolk District (Nebraska Game and Parks Commission)
- Jim Becic – Environmental Coordinator (Papio–Missouri Natural Resources District)
- John McCarty, Ph.D. – Professor (University of Nebraska, Omaha)
- Matt Sprenger – Refuge Supervisor, Area 2 (USFWS, Midwest Regional Office, National Wildlife Refuge System)

- Kevin Foerster – Refuge Supervisor (USFWS, Upper Mississippi River National Wildlife and Fish Refuge)
- Bob Russell – Wildlife Biologist (USFWS, Midwest Regional Office, Division of Migratory Birds)
- Pat Heglund – Regional Chief, Division of Biological Resources (USFWS, Midwest Regional Office, NWRS)
- Maggie O'Connell – Regional Chief, Division of Visitor Services (USFWS, Midwest Regional Office, NWRS)
- Josh Eash – Regional Hydrologist (USFWS, Midwest Regional Office, NWRS)
- Rick Speer – Assistant Refuge Supervisor (USFWS, Midwest Regional Office, NWRS)
- James Myster – Regional Archaeologist (USFWS, Midwest Regional Office, NWRS)
- Kathy Carlyle – Biologist (USFWS, Midwest Division of Biological Resources, NWRS)
- Tom Larson – Chief, Division of Conservation Planning (USFWS, Midwest Regional Office, NWRS)
- Mary Balogh – Biologist/GIS Specialist, Division of Conservation Planning (USFWS, Midwest Regional Office, NWRS)
- Gabe DeAlessio – Biologist/GIS Specialist, Division of Conservation Planning (USFWS, Midwest Regional Office, NWRS)
- Vince Capeder – Survey Technician (USFWS, Midwest Regional Office, NWRS)
- Brian Newman – Hydrologist (USFWS, Midwest Regional Office, NWRS)

A special thank you for the support provided by all of the staff at DeSoto and Boyer Chute Refuges, all personnel in the Midwest Region's Division of Conservation Planning, and all members of the public who participated in the planning process.

Appendix I: Communications List

The following groups and individuals were contacted throughout the planning process:

Federal Officials – Iowa

- Senator Chuck Grassley
- Senator Tom Harkin
- Congressman Tom Latham (District 3)
- Congressman Steve King (District 4)

Federal Officials – Nebraska

- Senator Deb Fischer
- Senator Mike Johanns
- Congressman Jeff Fortenberry (District 1)
- Congressman Lee Terry (District 2)

State Officials – Iowa

- Governor Terry Branstad
- Lieutenant Governor Kimberly Reynolds

State Officials – Nebraska

- Governor Dave Heineman
- Lieutenant Governor Rick Sheehy

Native American Tribes

- Flandreau Santee Sioux Tribe
- Iowa Tribe of Kansas and Nebraska
- Iowa Tribe of Oklahoma
- Kickapoo Tribe in Kansas
- Omaha Tribe of Nebraska
- Otoe–Missouria Tribe of Oklahoma
- Ponca Tribe of Nebraska
- Prairie Band Potawatomi Nation
- Sac & Fox Nation of Oklahoma

- Sac & Fox Tribe of Missouri
- Sac & Fox Tribe of the Mississippi
- Santee Sioux Tribe of Nebraska
- Sisseton–Wahpeton Oyate
- Three Affiliated Tribes
- Winnebago Tribe of Nebraska
- Yankton Sioux Tribe

U.S. Fish and Wildlife Service Offices

- Divisions of Conservation Planning, Regions 1–8
- Big Muddy NWR (Missouri)
- Squaw Creek NWR (Missouri)
- Nebraska Ecological Services Field Office
- Rock Island Ecological Services Field Office (Illinois)
- Columbia Ecological Services Field Office (Missouri)
- Columbia Fisheries Office (Missouri)
- Gavins Point National Fish Hatchery (South Dakota)

Federal Agencies

- U.S. Army Corps of Engineers, Omaha District
- National Park Service, Midwest Office
- National Park Service, Lewis and Clark National Historic Trail
- USDA, Natural Resources Conservation District, Iowa State Office
- USDA, Natural Resources Conservation District, West Pottawattamie County District
- USDA, Natural Resources Conservation District, Nebraska State Office
- USDA, Natural Resources Conservation District, Blair Service Center
- U.S. Geological Survey
- U.S. Environmental Protection Agency, Midwest Region

State Agencies

- Iowa Department of Natural Resources
- Iowa Department of Natural Resources, Wilson Island State Recreation Area
- Iowa Department of Public Safety

- Iowa Department of Economic Development
- State Historical Society of Iowa
- Nebraska Game and Parks Commission
- Nebraska Game and Parks Commission, Lewis and Clark Bicentennial Commission
- Nebraska Game and Parks Commission, Fort Atkinson State Historical Park
- Nebraska Department of Environmental Quality
- Nebraska State Historical Society
- Nebraska State Patrol
- Nebraska Division of Travel and Tourism
- Papio–Missouri River Natural Resources District (Nebraska)

Counties (Washington, Nebraska; Harrison and Pottawattamie, Iowa)

- Washington County Historical Society
- Washington County Board of Supervisors
- Washington County Sheriff's Office
- Washington County Planning and Zoning
- Harrison County Board of Supervisors
- Harrison County Sheriff's Office
- Harrison County Conservation Board
- Harrison–Pottawattamie Drainage District
- Pottawattamie County Conservation Board
- Pottawattamie County Conservation Board, Hitchcock Nature Center
- Pottawattamie County Office of Planning and Development
- Pottawattamie County Board of Supervisors
- Pottawattamie County Sheriff's Office
- Historical Society of Pottawattamie County

Cities (Missouri Valley, Iowa; Blair, Nebraska; Fort Calhoun, Nebraska; Omaha, Nebraska)

- Missouri Valley Mayor's Office
- Missouri Valley Chamber of Commerce
- Missouri Valley Fire Department
- Blair Mayor's Office
- Blair Chamber of Commerce

- Fort Calhoun City Council
- Fort Calhoun Planning Commission
- Fort Calhoun Drainage District
- Omaha Chamber of Commerce

Schools

- University of Nebraska – Omaha
- University of Nebraska – Lincoln
- Northwestern University, Environmental Policy and Culture Program
- Blair Community Schools
- Fort Calhoun Community Schools
- Missouri Valley Schools
- Edison Schools
- CAM Schools

Public Libraries

- Omaha Public Library
- Council Bluffs Public Library
- Missouri Valley Public Library
- Blair Public Library

Organizations – National, Regional, and Local

- Humane Society of the United States
- The Wilderness Society
- National Trappers Association
- Wilderness Watch
- Public Employees for Environmental Responsibility (PEER) Refuge Keeper
- The Conservation Fund
- National Wildlife Federation
- National Wildlife Refuge Association
- Advisory Council on Historic Preservation
- Sierra Club, Midwest Office
- Sierra Club, Nebraska Chapter

- National Audubon Society
- National Audubon Society, Omaha Chapter
- Environmental Defense Fund
- The Nature Conservancy
- The Nature Conservancy, Nebraska Field Office
- The Nature Conservancy, Iowa Loess Hills Program Office
- Animal Protection Institute
- Defenders of Wildlife
- Ducks Unlimited
- Isaak Walton League of America
- Missouri Valley Waterfowlers Association
- Duck Callers Association of Nebraska
- Fontenelle Nature Association
- Nebraska Wildlife Federation
- Friends of Boyer Chute and DeSoto National Wildlife Refuges

Media

- Blair Enterprise Publishing, Inc.
- Columbus Telegram
- Daily Fremont Tribune
- Douglas County Post-Gazette
- Gretna Breeze
- Home & Away Magazine
- Iowa Travel & Tourism
- KFAB Radio
- KVNO Radio
- Logan Herald Observer
- Missouri Valley Times
- Nebraska Public Radio Network
- Nebraska Game and Parks Commission
- Nonpareil Newspaper
- Omaha Events – American City Calendar
- Omaha World Herald

- Rustler Sentinel

Businesses and Individuals

- Henry Doorly Zoo
- Durham Western Heritage Museum
- Rockford Farms, Inc.
- All refuge neighbors
- All individuals who submitted comments, participated in open houses, attended planning meetings, or otherwise participated in the planning process

Appendix J: Research Conducted on the Refuges

DeSoto National Wildlife Refuge

- Becker, T. A. (1997). *A Survey of Frogs and Toads and Other Herpetofauna at Schramm Park State Recreation Area, Mahoney State Park, and DeSoto National Wildlife Refuge*. M.A. thesis, University of Nebraska, Omaha.
- Berkeley, L. I. (2004). *The Postfledgling Ecology of Dickcissels (Spiza americana)*. M.S. thesis, University of Nebraska, Omaha.
- Brand, C. J. (1984). *Avian Cholera in the Central and Mississippi Flyways during 1979–80*. *Journal of Wildlife Management* 48: 399–406.
- Brotherton, T. S. (1984). *The Pollination Ecology of Asclepias incarnata L. subsp. incarnata*. M.A. thesis, University of Nebraska, Omaha.
- Dunlap, D. G. and Kruse, K.C. (1976). *Frogs of the Rana pipiens Complex in the Northern and Central Plains States*. *Southwestern Naturalist* 20: 559–571.
- Engberg, S. E. (2004). *Landscape and Habitat Effects on Grassland Birds*. M.A. thesis, University of Nebraska, Omaha.
- Frederick, R. B. (1979). *Resource Utilization and Behavior of Migrating Snow Geese at DeSoto NWR*. M.S. Thesis, Iowa State University, Ames.
- Frederick, R. B.; Clark, W. R.; and Klaas, E. E. (1987). *Behavior, Energetics, and Management of Refuging Waterfowl: A Simulation Model*. *Wildlife Monographs* 96: 1–35.
- Frederick, R. B. and Johnson, R. R. (1983). *Ross' Geese Increasing in Central North America*. *Condor* 85: 257–258.
- Frederick, R. B. and Klaas, E. E. (1982). *Resource Use and Behavior of Migrating Snow Geese*. *Journal of Wildlife Management* 46: 601–614.
- Frederick, R. B. and Klaas, E. E. (1984). *A Method for Sampling Waste Corn*. *Journal of Wildlife Management* 48: 298–303.
- Gilsdorf, J. M. (2002). *Effectiveness of Frightening Devices for Reducing Deer Damage in Cornfields*. University of Nebraska, Lincoln.
- Gilsdorf, J. M.; Hygnstrom, S. E.; VerCauteren, K. C.; Blankenship, E. E.; and Engeman, R. M. (2004). *Propane Exploders and Electronic Guards were Ineffective at Reducing Deer Damage in Cornfields*. *Wildlife Society Bulletin* 32: 524–531.
- Gilsdorf, J. M., Hygnstrom, S. E.; VerCauteren, K. C.; Clements, G. M.; Blankenship, E. E.; and Engeman, R. M. (2004). *Evaluation of a Deer-activated Bio-acoustic Frightening Device for Reducing Deer Damage in Cornfields*. *Wildlife Society Bulletin* 32: 515–523.

- Hansen, M. D. (1972). *The Seasonal Diversity of Microorganisms in Channelized and Unchannelized Portions of the Missouri River*. M.A. thesis, University of South Dakota, Vermillion.
- Haugen, A. O. (1975). *Reproductive Performance of White-Tailed Deer in Iowa*. Journal of Mammalogy 56: 151–159.
- Huggins, D. G. (1968). *Limnology of DeSoto Bend Lake*. M.S. thesis, Iowa State University, Ames.
- Huggins, D. G. (1971). *Scaphiopus bombifrons Cope, a Species New to Iowa*. Journal of Herpetology 5: 216.
- Klug, P. (2005). *The Effects of Local Grassland Habitat and Surrounding Landscape Composition on the Predators of Grassland Bird Nests*. M.S. thesis, University of Nebraska, Omaha.
- Johnson, M. R. (1979). *The Limnological Characteristics and Management of Four Western Iowa Oxbow Lakes (including DeSoto)*. M.S. thesis, Iowa State University, Ames.
- Lovallo, M. J. and Vercauteren, K. C. (1994). *An Evaluation of Electronic Versus Hand-Held Compasses for Telemetry Studies*. Wildlife Society Bulletin 22: 662–667.
- Mellott, L. (1983). *A Survey of Small Mammal Species at DeSoto NWR*.
- Miller, W. J.; Haugen, A. O.; and Roslien, D. J. (1965). *Natural Variation in the Blood Proteins of White-tailed Deer*. Journal of Wildlife Management 29: 717–723.
- Prevett, J. P. and MacInnes, C. D. (1972). *The Number of Ross' geese in Central North America*. Condor 74: 431–438.
- Van Dyke, F.; Van Kley, S. E.; Page, C. E.; and Van Beek, J. G. (2004). *Restoration Efforts for Plant and Bird Communities in Tallgrass Prairies Using Prescribed Burning and Mowing*. Restoration Ecology 12-4: 575–585.
- Van Dyke, F.; Schmeling, J. D.; Starkenburg, S.; Yoo, S. H.; and Stewart, P.W. (2007). *Responses of Plant and Bird Communities to Prescribed Burning in Tallgrass Prairies*. Biodiversity and Conservation 16: 827–839.
- VerCauteren, K. C.; Gilsdorf, J. M.; Hygnstrom, S. E.; Fioranelli, P. B.; Wilson, J. A.; and Barras, S. (2006). *Green and Blue Lasers are Ineffective for Dispersing Deer at Night*. Wildlife Society Bulletin 34: 371–374.
- VerCauteren, K. C. and Hygnstrom, S. E. (1998). *Effects of Agricultural Activities and Hunting on Home Ranges of Female White-tailed Deer*. Journal of Wildlife Management 62: 280–285.
- ZooknRider, N. L. (2006). *The Cumulative Effects of Using Transgenic Herbicide-tolerant (Ht) Soybeans on Plant and Butterfly Diversity in Marginal Field Habitat*. M.S. thesis, University of Nebraska, Omaha.

Boyer Chute National Wildlife Refuge

- Berkeley, L. (2004). *The Postfledging Ecology of Dickcissels (Spiza americana)*. M.S. Thesis, Department of Biology, University of Nebraska at Omaha.
- Clements, G.; Hygnstrom, S.; and VerCauteren, K. (2003–Present). *White-tailed Deer at Boyer Chute National Wildlife Refuge: Home Range, Movements, and Survival of Male Deer in the Missouri River Valley*. University of Nebraska at Lincoln and USDA/APHIS National Wildlife Research Center: Fort Collins, Colorado.
- Delucchi, C. (2008–2009). *Survey of Native Fields at Boyer Chute NWR (Fire Effects Monitoring)*. Department of Biology, Dana College: Blair, Nebraska.
- Engberg, S. (2004). *Landscape and Habitat Effects on Grassland Birds*. M.S. Thesis, Department of Biology, University of Nebraska at Omaha.
- Hesse, L. W. (1994). "The Morphometry, Macroinvertebrates, and Ichthyofauna of the Restored Boyer Chute: Missouri River, Nebraska." *Final report for Contract DACW45-94-D-0036, and Summary Report (1996)*. U.S. Army Corps of Engineers, Project Development Branch, Omaha District.
- Klug, P. (2005). *The Effects of Local Grassland Habitat and Surrounding Landscape Composition on the Predators of Grassland Bird Nests*. M.S. Thesis, Department of Biology, University of Nebraska at Omaha.
- Latella, I. (2004). *Herpetological Survey of Boyer Chute National Wildlife Refuge*. Department of Biology, Dana College: Blair, Nebraska.
- McCarty, J. and Wolfenbarger, L. (2002–Present). *Study of Grassland Bird Ecology: Grassland Bird Community Survey/Census, Reproductive Success Monitoring, Vegetation Structure and Insect Biomass Sampling*. Department of Biology, University of Nebraska at Omaha.
- O'Connell, K. A. and Ferraro, D. M. (2008). *A Herpetological Survey of Boyer Chute National Wildlife Refuge: Washington County, Nebraska*. School of Natural Resources, University of Nebraska at Lincoln.
- Schwarz, M. and Lydick, C. (2007). *Laboratory and Field Evaluation of Atrazine and Selenium Exposure and Effects to Pallid Sturgeon (Scaphirhynchus albus): Implications for Recovery Actions within the Platte River Section of Recovery Priority Management Area 4 and Boyer Chute National Wildlife Refuge*. Nebraska Ecological Services Field Office: Grand Island, Nebraska.
- Sexton, N. R.; Dietsch, A. M.; Don Carlos, A. W.; Koontz, L.; Solomon, A. N.; and Miller, H. M. (2011). *National Wildlife Refuge Visitor Survey 2010/2011: Individual Refuge Results for DeSoto National Wildlife Refuge*. U. S. Geological Survey Data Series 643.
- Simmons, K.; McCarty, J.; and Wolfenbarger, L. (2005–2007). *Impacts of Visitors to Natural Areas on Forest Birds*. Department of Biology, University of Nebraska at Omaha.

Toll, G. (2000). *Grassland Breeding Bird Study of Boyer Chute National Wildlife Refuge: Non-game Bird Survey*. USFWS, Region 3: Minneapolis, Minnesota.

ZooknRider, N. (2006). *The Cumulative Effects of Using Transgenic Herbicide-Tolerant (Ht) Soybeans on Plant and Butterfly Diversity in Marginal Field Habitat*. M.S. Thesis, Department of Biology, University of Nebraska at Omaha.

Appendix K: Response to Comments on the EA and Draft CCP

In this appendix:

[Biological Management](#)
[Visitor Services](#)
[Planning Process](#)
[Planning Document Structure and Content](#)

The Environmental Assessment and Draft Comprehensive Conservation Plan (EA/Draft CCP) was released to stakeholders and the public with a Notice of Availability (NOA) in the *Federal Register*, through local media outlets, and with mail and e-mail communications on September 20, 2013. The 30-day review and comment period was interrupted by the federal government shutdown from October 1–16, 2013, and was therefore extended for an additional three weeks, ending November 8, 2013. Following the federal government shutdown the public open houses originally scheduled for October 2 (DeSoto NWR) and October 3 (Fort Calhoun Library) were rescheduled to November 5 (Fort Calhoun Library) and November 7 (DeSoto NWR). Ten individuals or groups submitted comments containing over 25 individual comment topics. Some comments were received from members of the general public, but comments were also submitted by the Izaak Walton League of America, Missouri Valley Waterfowlers, Safari Club International, and the Rocky Mountain Region of the U.S. Fish and Wildlife Service.

Comments both supported and opposed a number of management actions proposed in the environmental assessment's range of alternatives. The comments spanned a wide variety of subjects including thoughts on a diversity of refuge habitats and wildlife; mixed reviews on the future of the refuge agriculture program; questions regarding the use of management tools like prescribed fire and chemicals; concerns about the control of invasive species; interest in land acquisition, floodplain conservation, and water rights; both pro and con reviews of public uses like hunting, mushroom gathering, and allowing leashed dogs; a number of questions and thoughts on overall public access and the development of visitor infrastructure; and a few comments on the refuge planning process. Overall, public comments were positive, constructive, and supportive of the proposed future direction of management on the refuges.

Each comment was carefully considered and, where appropriate, changes were made to the CCP in response to the thoughts and concerns expressed. The full range of comment submissions is represented in the sections below, but similar or duplicate comments were grouped or eliminated to reduce redundancy. Comments are grouped by subject, and a response has been provided to each by staff from the refuges.

The refuges thank all of the individuals who submitted comments and feedback during the CCP process.

Biological Management

Comment 1: Agriculture

Maintain agricultural acres around seasonally flooded wetlands so that they can provide supplemental migratory habitat and attract larger concentrations of migratory waterfowl.

No farming should occur on the refuges.

Maintaining farming on managed lands would provide income from rent and would help retain wildlife and migratory birds.

Response: Limited agricultural practices will be used to further native habitat goals. Agriculture as a management tool is valuable for the preparation of seed beds and the ability to set back succession. Crops will be planted by refuge staff and will be non-GMO (non-genetically modified organism) with no pesticide or herbicide treatment. Crops will provide supplemental food for wildlife, and no crops will be harvested for profit.

Comment 2: Wetland Habitat

How many acres of wetlands will be created on DeSoto NWR? Are there plans to create wetlands on the west (Nebraska) side of the Missouri River at DeSoto NWR?

I am glad to see waterfowl numbers increasing on DeSoto NWR, keep restoring wetlands and pumping water to create new waterfowl habitat.

Response: Under the preferred alternative, up to 1,900 acres of wetlands may occur seasonally on DeSoto and Boyer Chute Refuges during wet periods and high water events. Three wetland sites on the West Side Unit of DeSoto NWR are included in the Final CCP (see figure 4-2, Future Land Cover) and these areas will be considered for improvements in the habitat step-down management plan. The preferred alternative (D) of the EA calls for aggressive wetland restoration and management on the refuges to provide a diversity of bottomland habitats that have largely disappeared from the Missouri River floodplain.

Comment 3: Forest Habitat

The preferred alternative (D) may be a little aggressive in creating forest habitat.

Response: Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes. The forest habitat objective in Alternative D of the EA reflects what we believe was historically forested habitat along the Missouri River floodplain. In addition, there are many natural resource benefits to providing forested buffers along waterways including wildlife habitat, soil stabilization during rain and flood events, canopy interception of rain, thermal protection of water surfaces, and carbon sequestration.

Comment 4: Grassland Habitat

The grassland objectives for the 'no action' (alternative A) and the proposed action (alternative D) as expressed in Table 3-3 do not identify that grassland management priority is reduced.

Response: Table 3-3 of the EA and Draft CCP provides a direct comparison of the objectives across all four alternatives. The grassland objective (1.3) for Alternative A maintains a combined 5,950 acres of grasslands, and Alternative D proposes a combined 3,850 acres. The 35 percent decrease in grassland acres illustrates the shift from grassland habitats to other habitat types on the refuges.

Comment 5: Prescribed Fire Program

Prescribed fire should not be used on the refuges because of the air pollution created, human health concerns, and cost to management.

Response: Chapter 4 of the EA and Draft CCP contains an evaluation of the effects of prescribed fire on air quality (pages 126–127). Prescribed fire is an important mechanism, both historically and presently, for maintaining healthy and diverse prairies and grasslands. All tools for habitat management and restoration involve trade-offs. The adverse impacts and cost of herbicide use and heavy machinery required to maintain this habitat type without burning would exceed the adverse impacts of prescribed fire.

Comment 6: Invasive Species Control Methods

The Service should not use chemical methods (i.e., Glyphosate) for controlling invasive plant species.

We encourage the use of aggressive control measures to constrain the spread of invasive plant and animals species, especially Asian carp and zebra mussels.

Response: As indicated in the EA and Draft CCP (page 150) the refuges use a variety of methods to control invasive species including herbicides. The type of invasive species in combination with site conditions help determine control methods. In general, the refuges minimize the use of herbicides, and their use and application must follow the Service's pesticide use policies. The refuges also maintain active partnerships with the Iowa Department of Natural Resources, Nebraska Game & Parks, and the Columbia (Missouri) Fisheries Office to find new and successful ways to control invasive species that affect the refuges. The use of chemical controls for non-native and invasive species is only used in situations where other means are not available or practical.

Comment 7: Management of DeSoto Lake

More detail should be included about changes to DeSoto Lake over the next 15 years under Alternative B (i.e., geomorphology changes due to sedimentation and degree of sustainability under present Corps management).

There is too much latitude provided for management of DeSoto Lake under the proposed action (alternative D); instead, one management condition should be specified.

The expected impacts to the abundance and distribution of sport fish in DeSoto Lake from its managed connectivity to the Missouri River should be further explained. Are the expected impacts justified? What are the expected benefits to endemic riverine fishes? How will success be measured?

Response: The best available science was used to model a range of future conditions in DeSoto Lake under Alternative B, including high resolution LiDAR data and extrapolated seasonal flow conditions based on U.S. Army Corps of Engineers (Corps) management of the Missouri River. The future sedimentation rate within DeSoto Lake has a high degree of variability based on factors such as the design of the inlet and outlet water control structures, refuge management of flows, erosion and runoff in the surrounding watershed, and Missouri River sediment loads.

The preferred alternative (D) of the EA proposes to increase management options and flexibility for DeSoto Lake. In general, refuges strive to maintain a broad diversity of management options to ensure resiliency and adaptive management capacity.

Off-channel aquatic habitats such as backwaters, side-channels, and ephemeral wetlands are historically and scientifically validated management options for benefiting endemic riverine fish species. The success of changes to lake management will be measured through monitoring and surveys coordinated with partner agencies and organizations. Minimal impacts to DeSoto Lake's sport fishery are expected as connectivity is increased to the Missouri River. A number of fish species are expected to benefit from improved spawning habitat and a larger prey species population.

Comment 8: Waterfowl

What is DeSoto NWR's 15-year goal for waterfowl numbers?

We support restoring the habitat needed to attract and maintain migrating waterfowl populations as both refuges historically did.

Three million waterfowl use days may be too excessive. Waterfowl migration patterns are moving west and avoiding eastern Nebraska due to once pasture areas now having central pivot irrigation and growing crops, which in turn provides feeding areas.

Response: The refuges worked with state partners to draft the waterfowl objectives and believe a target of three million annual waterfowl use days is achievable.

Comment 9: Marshbirds

There isn't much of a population of marshbirds on Boyer Chute NWR.

Response: In the past, the availability of required habitats was a limiting factor for marshbird populations at Boyer Chute NWR. The preferred alternative (D) of the EA proposes to restore drained wetlands and provide the additional habitats required by these birds.

Comment 10: Water Rights

A water rights section should be added that includes a brief description of Nebraska and Iowa water law and administration, a concise description of each state's permitting requirements, and the water rights held by both refuges.

Response: A water rights section has been added to the Final CCP (see the Water Resources section, chapter 3).

Comment 11: Levees

Changes to the levee system on DeSoto NWR are not evaluated across the alternatives, and there is no discussion of levee modifications to reconnect the floodplain to the river.

Response: The levee system was discussed during the planning process on multiple occasions, and it was decided that no changes would be proposed under any alternative. The levee system on the refuge impacts a large geographic area, much of which spans non-Service lands. If changes are proposed to the levee system in the future, the changes will be discussed collaboratively in the levee district and fully evaluated for benefits and adverse impacts not only to the refuge, but on the entire impact area.

Comment 12: Floodplain Protection

Additional floodplain land should be put into conservation uses due to future flood risks.

We encourage the new management plan to consider levee setbacks whenever possible.

Response: Refuge management supports these ideas, and all future land acquisition planning will consider these factors.

Comment 13: Boyer Chute NWR Land Acquisition

Management should emphasize the full acquisition of Boyer Chute NWR's existing authorized boundary.

Expand the Boyer Chute NWR acquisition boundary to include adjacent uplands for the restoration of native prairie habitat.

Response: As funding and willing sellers allow, refuge management will continue its efforts to acquire the lands within Boyer Chute NWR's authorized boundary. At this time there are no plans to expand existing approved boundaries.

Visitor Services

Comment 14: Hunting

Hunting should be reduced or eliminated – other wildlife population controls should be employed.

We support additional hunting on the refuges for use as a conservation tool and for the provision of additional recreational opportunities. Hunting has been recognized by the Service as a priority use of the National Wildlife Refuge System.

I am in favor of public lands being made available to the public for hunting and fishing. This produces people who are concerned for and support conservation (i.e. ducks unlimited, pheasants forever, etc.)

Response: Hunting is a priority use of the National Wildlife Refuge System. The refuges administer hunt programs to achieve healthy local deer populations and to provide positive recreational experiences to the public.

Comment 15: Consumptive Uses of the Refuges

The refuges should not allow uses that incur take of animals or plants. Hunting, mushroom gathering, and wood cutting/harvesting should be prohibited on refuge lands.

Response: These uses have been approved through the refuge compatibility process documented in appendix G of the EA and Draft CCP and are considered to have either beneficial effects or negligible adverse effects. In some cases these consumptive uses aid management by reducing maintenance costs or assisting with wildlife population management.

Comment 16: New Trails

New trails should not be expanded beyond current conditions; resources to build and manage new trails would be better spent on wildlife management and habitat enhancement.

Response: New trails proposed in the preferred alternative (D) of the EA are intended to replace trails abandoned after the 2011 flood, and they will be planned and designed to minimize future maintenance costs. If there is a conflict between biological goals and public use, it is the refuges' responsibility to prioritize wildlife management and habitat enhancement.

Comment 17: Trails Damaged by Floods

Will the trails near the DeSoto NWR Visitor Center, the Bertrand Discovery Site, and Wood Duck area be restored? These were good wildlife observation trails.

Response: Some of the refuges' flood-damaged trails will not be rebuilt because they are located in flood prone areas or pose safety risks due to flood-caused tree mortality. All refuge trails continue to be assessed for their ability to provide a quality and safe visitor experiences while minimizing disturbance to wildlife.

Comment 18: Seasonal Closure of DeSoto Lake

Why is it necessary to close the west arm of DeSoto Lake for the migration season?

Response: DeSoto Lake has always closed during the migration season to reduce disturbance to migrating waterfowl and waterbirds during these critical periods.

Comment 19: Seasonal Closure of the South Gate

The South Gate should remain open year-round for public access.

Response: The South Gate has always remained closed during the migration to avoid disturbance during these critical periods.

Comment 20: New Boat Ramp on DeSoto Lake

The future location of the new boat ramp on the south end of DeSoto Lake is a prime bank fishing area and launch activities will be disruptive to anglers. Why not use existing boat launch areas?

Response: All boat ramps on DeSoto NWR were damaged during the 2011 flood and continue to be subject to periodic inundations. The objectives in the CCP seek to reduce impacts to infrastructure during floods and high water conditions. The new boat ramp is higher in elevation and will provide additional lake access while reducing the risk of infrastructure damage during floods. Bank fishing will still be available at the new ramp location, and should not be impacted by the ramp.

Comment 21: Bertrand Discovery Site Interpretation

The pond and overlook at the Bertrand Discovery Site are enjoyed by many visitors. We hope that there isn't a plan to fill in the pond and remove the observation platform.

Response: Much of the Bertrand Discovery Site was damaged during the 2011 flood and is in need of repair and improvement. The plan for interpreting the site has not yet been fully vetted or approved, and will be further evaluated through the visitor services step-down management plan. One of many options for the site's redevelopment is to fill in the excavation scar.

Comment 22: Refuge Roads

Heavily used gravel roads should be paved (i.e. DeSoto Refuge's Loop Road) to improve the habitat quality, reduce maintenance costs, and improve visitor satisfaction.

Response: The high cost of paving and the long-term maintenance of asphalt road surfaces are not justified for seasonally-used gravel roads.

Comment 23: General Refuge Access

Maximize public access to areas of both DeSoto and Boyer Chute Refuges west of the Missouri river.

Response: Public access to both refuges is being expanded under the preferred alternative (D). However, all changes to public access must be compatible with the purposes of the refuges and designed to support wildlife and habitat management. Access to DeSoto NWR's West Side Unit expands from a short mushroom collection season to three-season access (during non-migratory periods), and additional units of Boyer Chute NWR will be seasonally open to the public (see figures 4-4 and 4-5 of the Final CCP for additional information).

Comment 24: Refuge Access for Wildlife Observation and Photography

Under the proposed future management hunters can access approximately 95% of both refuges during the hunting season, whereas non-hunters are limited to 45% at DeSoto NWR and 80% at Boyer Chute NWR. Is it possible to allow non-hunters into closed zones for special events or limited seasons?

Response: While the majority of both refuges are open for controlled deer hunts, this is done so to regulate game species populations and has biological and management efficiency benefits. Management decisions to limit access to portions of the refuge, or

during specific seasons, are carefully evaluated by refuge staff in order to meet biological goals while providing the best visitor experiences possible.

Comment 25: Dogs on Refuges

Allowing leashed dogs could result in greater disturbance to wildlife and to other visitors, and it may be difficult to enforce leash regulations.

I am pleased to see allowing leashed dogs is a part of the proposed plan and urge early implementation of this point.

Response: Allowing leashed dogs on the refuges will increase management consistency with other national wildlife refuges throughout the Midwest Region of the Service. Refuge management does not anticipate that leashed dogs will increase the level of disturbance above that which occurs from regular refuge visitation.

Comment 26: Floodplain Development

Government agencies should not build within the Missouri River floodplain.

Response: Management under the preferred alternative (D) of the EA does not propose any new infrastructure in the floodplain. In fact, the preferred alternative actively reduces much of the current floodplain infrastructure including assets with a combined valued of over two million dollars.

Comment 27: Refuge Support

It is important for the refuges to work in cooperation with the Iowa Department of Natural Resources and the Nebraska Game and Parks Commission, and to look for additional support through partnerships, volunteers, and collaboration.

Response: The refuge will continue to expand and strengthen its relationships with these and other partners.

Planning Process

Comment 28: Comment Period Length

The public review period for the DeSoto and Boyer Chute Refuges' EA and Draft CCP should be extended because the federal government shutdown limited the resources available for review and comment.

Response: The review and comment period was extended by three weeks from October 18 to November 8, 2013 to account for the sixteen days lost during the federal government shutdown. The review period extension was announced using the same methods used to announce the original review period dates: a notice in the Federal Register (78 FR 64970), media releases, a website, and an announcement sent to the refuges' mailing list.

Comment 29: Public Scoping Outreach

Additional open houses should be held in other states during public review of the DeSoto and Boyer Chute Refuges' Environmental Assessment (EA) and Draft Comprehensive Conservation Plan (CCP).

Response: Resources available for review of the EA and Draft CCP are allocated as effectively as possible. Mailings and media releases are used to capture national and regional audiences, whereas open houses are held at the local level to engage the most frequent and invested visitors to the refuges. An open house was held on or adjacent to each of the refuges for public scoping (January/February, 2012) and again for public review of the EA and Draft CCP (September/October/November, 2013). According to a visitor survey conducted on DeSoto NWR (Sexton et al. 2011), most visitors to DeSoto NWR live within 50 miles of the refuge (63%) and 84% live in either Nebraska or Iowa.

Comment 30: Audience for Review of the EA and Draft CCP

Review of EA and Draft CCP should include a broader audience, including independent reviewers.

Response: The availability of the EA and Draft CCP is announced nationally through the Federal Register, regionally and locally through media releases, and an announcement is sent to the refuges' mailing list. Everyone is encouraged to review and comment on the draft document and the proposed management direction. The comments received by the refuges on the EA and Draft CCP came from individuals and groups both locally and nationally.

Planning Document Structure and Content

Comment 31: Combining the EA and Draft CCP

In the EA and Draft CCP why are the two documents integrated instead of separate documents as they have been in the past?

Response: Service policy 602 FW 3 (<http://www.fws.gov/policy/602fw3.html>) guides development of CCPs. The policy offers two options for structuring the associated documents, one separates the NEPA document from the Draft CCP and the other integrates the two. The DeSoto and Boyer Chute Refuges' EA and Draft CCP is an example of the integrated document, though the Service has produced CCPs in the separated form as well. Separating the two documents places greater emphasis on the Draft CCP, less emphasis on the environmental assessment, and increases duplication of content. Integrating the NEPA document with the content of the Draft CCP places greater emphasis on the alternatives, "the heart of the NEPA process" as noted in Council on Environmental Quality (CEQ) regulations (Code of Federal Regulations 1502.14), and less on a discrete Draft CCP.

Comment 32: Organization of Chapter 4

The information presented in Chapter 4 (Refuge Environment, Current Management, and Environmental Effects) should have less detail and more organizational structure.

The Refuge Environment and Current Management sections should be separate from the Environmental Impacts section.

Response: There is a larger volume of content in the Refuge Environment and Current Management chapter of this EA and Draft CCP, in part, because the document covers two refuges with very different establishment and management histories. Chapter 4 is organized to mirror the goal themes: habitat, wildlife, and people.

The environmental consequences can be organized by alternative or by resource. In the case of the DeSoto and Boyer Chute Refuges' EA and Draft CCP it has been organized by resource and deliberately placed in close proximity to the description of the environment and current management sections.

Comment 33: DeSoto NWR's 2001 CCP

The CCP should include the implementation status of the 2001 CCP.

Response: Important information from the 2001 DeSoto NWR CCP is included as appropriate throughout the revised CCP, including a summary in chapter 2 with habitat targets and highlights from the 2001 CCP's goals, objectives, and strategies. Furthermore, the management of DeSoto NWR under the no action alternative (A) of the EA is an articulation of the 2001 CCP's management direction. The quantity of material (25 goals, 43 objectives, and 212 strategies) and general nature of the 2001 CCP's management direction made direct tracking of goals, objectives, and strategies within the revised CCP impractical. Objectives and strategies from the 2001 CCP that identified specific targets (e.g., landcover acreages, deer populations, and staffing goals) were used in the development of the revised CCP. Finally, changes in the refuge's natural resources (e.g., greatly reduced snow goose populations) and relevant science and Service policies (e.g., guidance on farming, climate change, and focal species) rendered aspects of the previous CCP out-of-date.

Comment 34: Purpose and Need Statement

The Purpose and Need statements in Chapter 1 address administrative requirements (the mandate to prepare a CCP) rather than on the existing challenges and resource conditions (planning issues), though the planning issues constitute a more compelling need.

Response: The Purpose and Need statements in chapter 1 of the EA cite a number of reasons for this planning effort—only one of which is Service policy. The additional purposes and needs are as equally compelling and overlap the issues described in chapter 2, including two subsequent years of catastrophic flooding and the decision to complex DeSoto and Boyer Chute Refuges. Also cited are changing public values, new scientific information, new agency policies, the benefit of periodic re-evaluation of management direction, and the intent to “. . . select a management direction for the refuges that best achieves the refuges' purposes and vision; contributes to the mission of the Refuge System; is consistent with the principles of sound fish and wildlife management; and addresses relevant mandates, policy, and major issues developed during scoping.”

Comment 35: Connection Between Planning Issues and Alternatives

The EA should have a clearer and more specific connection between the planning issues and the components of each alternative.

Response: Although there are no direct issue references for the components of each alternative, all planning issues were reviewed and considered during the construction of the alternative management scenarios. The four alternatives represent a reasonable range of management options associated with the challenges and opportunities presented in the issue statements.

Comment 36: Narrative Description and Comparison of Alternatives

In Chapter 3 more detail should be included for the narrative description of each alternative, and a clearer contrast between the alternatives.

Response: Chapter 3 of the EA and Draft CCP provides a description of the alternatives in two formats: narrative and tabular. The narrative description is designed to be general in nature and more concise—providing a digestible overview of each alternative. The second representation of the alternatives found in table 3-3 of the EA provides a detailed, clearly articulated, side-by-side comparison of the objectives of the four alternatives. The redundancy of providing both formats is intended to offer audiences opportunities for both a brief, topical overview as well as a more detailed, in-depth analysis of the alternatives.

Comment 37: Environmental Consequence Table (3-4)

Table 3-4, Summary of Environmental Consequences across the Alternatives, is not helpful in evaluating the impacts of the alternatives.

Response: The Environmental Effects table (3-4) is designed to provide a concise summary of the numerous and complex effects of the management across the alternatives. Additional detail is found in the effects write-ups accompanying each resource in chapter 4.

Comment 38: Specificity of Goals and Objectives

The EA/Draft CCP should include more specificity and detail as to how the refuge goals will be achieved, identifying the metrics for the successful implementation of the CCP.

Individual objectives lack specifics and do not allow the reader to distinguish how proposed management is different from current management.

There should be more detail and a clearer differentiation between the ‘no action’ alternative (A) and the proposed action (alternative D).

Response: The term “goal” is defined in the glossary of the EA and Draft CCP as “a descriptive, open-ended, and often broad statement of desired future conditions that conveys purposes but does not define measurable units.” The goals in the EA and Draft CCP are consistent with this definition. The combination of objectives and strategies in the EA and Draft CCP (chapter 4 the Final CCP) are designed to be specific, measurable, attainable, results-oriented, and time-bound. Step-down management plans are obligated in situations where additional information is needed for management decisions and a finer resolution of management actions are to be prescribed.

The alternatives each offer a different way to meet the goals. Variation in amount, location, and type are common elements that provide the difference between alternatives. Table 3-3

in the EA and Draft CCP provides a direct, side-by-side comparison of all four alternatives. This table best illustrates the magnitude of change between Alternative A (no action) and Alternative D (proposed action).



DeSoto National Wildlife Refuge

1434 316th Lane

Missouri Valley, IA 51555-7033

<http://www.fws.gov/refuge/desoto>

Boyer Chute National Wildlife Refuge

3720 Rivers Way

Ft. Calhoun, NE 68023-4005

http://www.fws.gov/refuge/boyer_chute

U.S. Fish and Wildlife Service

<http://www.fws.gov>

Region 3, U.S. Fish and Wildlife Service

<http://www.fws.gov/midwest>