

Swan Lake

National Wildlife Refuge

Draft Comprehensive Conservation Plan

Table of Contents

Chapter 1: Introduction and Background	1
Introduction	1
Refuge Purposes	1
Refuge Vision	1
Refuge Goals	1
Purpose and Need for Plan	2
The U.S. Fish and Wildlife Service	3
The National Wildlife Refuge System	3
Existing Partnerships	4
Legal and Policy Guidance	4
Chapter 2: The Planning Process	5
Meetings and Involvement	5
Summary of Issues, Concerns, and Opportunities	5
Preparation, Publishing, Finalization and Implementation of the CCP	8
Wilderness Review	8
Chapter 3: The Refuge Environment and Management	9
Introduction	9
Ecological Context	9
Hydrologic Units, Watersheds, and Ecoregions	9
Historic Vegetation	11
Land Use/Cover	11
Migratory Bird Conservation Initiatives	11
Missouri Comprehensive Wildlife Strategy	11
Region 3 Fish and Wildlife Conservation Priorities	12
Other Conservation and Recreation Lands in the Area	13
Socioeconomic Context	13
Population and Demographics	13
Employment	13
Income and Education	13
Demand and Supply for Wildlife-Dependent Recreation	13
Climate	15
Geology and Soils	15
Water and Hydrology	15
Refuge Habitats and Wildlife	16
Bottomland Forest	16
Emergent Wetland	20
Open Water	20
Agricultural Fields	20

Native Prairie	20
Wet Meadow	20
Shrub Swamp	20
Old Field	20
Wildlife	20
Birds	20
Mammals	20
Amphibians and Reptiles	21
Fish and Other Aquatic Species	21
Invertebrates	21
Threatened and Endangered Species	21
State-listed Species	21
Federally Listed Threatened/Endangered/Candidate Species	21
Threats to Resources	21
Invasive Species	21
Exotic/Pest Species	21
Siltation	22
Contaminants	22
Climate Change Impacts	22
Observed Climate Trends	23
Scenarios of Future Climate	23
Midwest Key Issues:	23
1. Reduction in Lake and River Levels	23
2. Agricultural Shifts	24
3. Changes in Semi-natural and Natural Ecosystems	24
Administrative Facilities	25
Cultural Resources and Historic Preservation	25
Visitation	26
Current Management	26
Habitat Management	26
Wetland Management	26
Moist Soil Units	26
Grasslands	26
Forests	26
Cropland	26
Monitoring	28
Bald Eagle	28
Waterfowl	28
Shorebirds, Marsh Birds and Other Waterbirds	28
Vegetation	28
Public Use	28
Hunting	28
Fishing	28
Wildlife Observation, and Photography	30
Environmental Education and Interpretation	30
Non Wildlife-dependent Recreation	30
Species Management	30
Animal Species	30
Plant Species	30

Archaeological and Cultural Resources	30
Other Management Areas	30
Research Natural Area	30
Farm Service Agency Conservation Easements and Fee Title Tracts	30
Chapter 4: Management Goals and Objectives	33
Goal A: Habitat	33
Goal 2: Wildlife	40
Goal 3: People	41
Chapter 5: Plan Implementation	47
Introduction	47
New and Existing Projects	47
Staffing	47
Partnership Opportunities	47
Step-down Management Plans	47
Monitoring and Evaluation	48
Plan Review and Revision	48
Appendix A: Environmental Assessment	49
Appendix B: Glossary	101
Appendix C: Species List	103
Appendix D: Regional Conservation Priority Species for the Lower Missouri River Ecosystem	121
Appendix E: Swan Lake NWR Priority Refuge Operations and Maintenance Costs	125
Appendix F: References and Literature Cited	129
Appendix G: Compliance Requirements	133
Appendix H: Mailing List	139
Appendix I: Draft Compatibility Determinations	141
Appendix J: Appropriate Use Determinations	175
Appendix K: List of Preparers and Contributors	189

Swan Lake

National Wildlife Refuge

Draft Comprehensive Conservation Plan

Lists of Figures and Tables

Figure 1: Location of Swan Lake NWR	2
Figure 2: Watersheds and Habitats, Swan Lake NWR	10
Figure 3: Conservation Lands in the Area of Swan Lake NWR	14
Figure 4: Lower Grand River Watershed, Swan Lake NWR	17
Figure 5: Watershed Comparison, Swan Lake NWR	18
Figure 6: Current Land Cover, Swan Lake NWR	19
Figure 7: Management Units, Swan Lake NWR	27
Figure 8: Current Visitor Services Facilities, Swan Lake NWR	29
Figure 9: Yellow Creek Research Natural Area	31
Figure 10: FSA Parcels Managed by Swan Lake NWR	32
Figure 11: Potential Water Movement and Likely Associated Vegetation, Swan Lake NWR	34
Figure 12: 15-Year Desired Land Cover, Swan Lake NWR	36
Figure 13: Future Visitor Facilities, Swan Lake NWR	42
Table 1: Current Land Cover and Potential Natural Vegetation in Grand River Watershed and Sub-basins	12
Table 2: Maximum Adult Audiences Within 30, 60, and 90 Miles of Swan Lake NWR for Four Activities	15
Table 3: Swan Lake NWR Soil Types by Acreage	16
Table 4: Current and Proposed Staffing Under the CCP	47
Table 5: Step-down Management Plan Schedule	48

Chapter 1: Introduction and Background

Introduction

Located in Chariton County near the town of Sumner, Swan Lake National Wildlife Refuge (NWR) bounds more than 11,000 acres of bottomland forest, grasslands, and wetlands within the Grand River floodplain of north central Missouri. Franklin D. Roosevelt established the Refuge in 1937 through Executive Order. In 1938, Company 1727 of the Civilian Conservation Corps (CCC) began work on levees to impound the waters flowing into the Refuge from Elk Creek, Turkey Creek, and Tough Branch. The CCC completed its work in 1942 and left behind several thousand acres of freshwater marsh and open water within Silver Lake and Swan Lake, the Refuge namesake. This change to the landscape caught the attention of migrating waterbirds, especially Canada Geese, which shifted their wintering grounds north to the Refuge with a steady annual increase that peaked at more than 180,000 birds in 1977. Fewer geese winter on the Refuge today, but its mixture of habitats are home to a diverse wildlife community that attracts hunters, anglers, and wildlife watchers.

Refuge Purposes

“Refuge purposes” is a term that refers to the purposes specified in or derived from one or more legal authorities used for establishing, authorizing, or expanding a national wildlife refuge, national wildlife refuge unit, or national wildlife refuge sub-unit. Below are the purposes of Swan Lake NWR and their sources:

- “as a refuge and breeding ground for migratory birds and other wildlife” Executive Order 7563, dated Feb. 27, 1937)
- “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- “... particular value in carrying out the national migratory bird management program.” 16



Waterfowl on Swan Lake NWR. Photo credit: USFWS

U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

Refuge Vision

The Refuge vision is a concise, descriptive statement of what the planning unit should be, or what we hope to do, based primarily upon the mission of the National Wildlife Refuge System (Refuge System) and specific Refuge purposes, and other mandates. We established the following vision statement for Swan Lake NWR:

Diverse and abundant wildlife flourishes within a mosaic of grass, trees, and wetlands recalling an earlier era when the Grand River meandered across its broad, open floodplain. Visitors enjoy recreation dependent on wildlife and show their appreciation by supporting conservation and Swan Lake National Wildlife Refuge.

Refuge Goals

Considering the purposes of the Refuge and our vision for the future, we have established the following goals for Swan Lake NWR:

Figure 1: Location of Swan Lake NWR



Habitat: Wetlands, grasslands, and bottomland forests providing habitat for migratory birds, threatened and endangered species, and other wildlife within the Grand River floodplain.

Wildlife: Diverse wildlife teeming within native habitats of the Grand River floodplain.

People: Visitors enjoy wildlife-dependent recreation and understand the natural and cultural resources of the Refuge and its role in their conservation.

Purpose and Need for Plan

This Comprehensive Conservation Plan (CCP) identifies the role Swan Lake NWR will play in supporting the mission of the National Wildlife Refuge System and provides primary management guidance for the Refuge. The Plan articulates management goals for the next 15 years and defines objectives and strategies that will achieve those goals. Several legislative mandates within the National Wildlife Refuge System Improvement Act of 1997 have guided the development of this Plan. These mandates include:

- Wildlife has first priority in the management of refuges.
- Wildlife-dependent recreation activities of hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation are the priority public uses of the

NWRS. These uses will be facilitated when they do not interfere with a refuge’s purposes or the mission of the NWRS.

- Other uses of the refuge will only be allowed when they are determined to be appropriate and compatible with the refuge purposes and mission of the NWRS.

Following the recommendations of this CCP will enhance management of Swan Lake NWR by:

- Providing a clear statement of direction for future management of the Refuge.
- Giving Refuge neighbors, visitors, and the public an understanding of the U.S. Fish and Wildlife Service’s management actions on and around the Refuge.
- Ensuring that the Refuge’s management actions and programs are consistent with the mandates of the NWRS.
- Ensuring that Refuge management considers federal, state, and county plans.
- Establishing long-term Refuge management continuity.
- Providing a basis for the development of budget requests for Refuge operations, maintenance, and capital improvement needs.

The U.S. Fish and Wildlife Service

Swan Lake NWR is administered by the U.S. Fish and Wildlife Service (Service). The Service is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife populations and their habitats. It oversees the enforcement of federal wildlife laws, management and protection of migratory bird populations, restoration of nationally significant fisheries, administration of the Endangered Species Act, and the restoration of wildlife habitat such as wetlands. The Service also manages the Refuge System.

The National Wildlife Refuge System

Refuge lands are part of the National Wildlife Refuge System, which was founded in 1903 when President Theodore Roosevelt designated Pelican Island in Florida as a sanctuary for Brown Pelicans. Today, the System is a network of about 545 refuges and wetland management districts covering about 95 million acres of public lands and waters. Most of these lands are in Alaska, with approximately 16 million acres located in the lower 48 states and several island territories.

The National Wildlife Refuge System is the world's largest collection of lands specifically managed for fish and wildlife. Overall, it provides habitat for more than 5,000 species of birds, mammals, fish, amphibians, reptiles, and insects. As a result of international treaties for migratory bird conservation and other legislation, such as the Migratory Bird Conservation Act of 1929, many refuges have been established to protect migratory waterfowl and their migratory flyways.

Refuges also play a crucial role in preserving endangered and threatened species. Among the most notable is Aransas NWR in Texas, which provides winter habitat for the highly endangered Whooping Crane. Likewise, the Florida Panther Refuge protects one of the nation's most endan-



Swan Lake NWR offers wildlife viewing opportunities. Photo credit: USFWS

gered predators. Refuges also provide unique recreational and educational opportunities for people.

When human activities are compatible with wildlife and habitat conservation, refuges are places where people can enjoy wildlife-dependent recreation such as hunting, fishing, wildlife observation, photography, environmental education, and environmental interpretation. Many refuges have a visitor center, wildlife trails, an automobile tour, and environmental education programs. Nationwide, approximately 30 million people visited national wildlife refuges in 2004.

The National Wildlife Refuge System Improvement Act of 1997 established several important mandates aimed at making the management of national wildlife refuges more cohesive. The preparation of comprehensive conservation plans (CCPs) is one of those mandates. The legislation directs the Secretary of the Interior to ensure that the mission of the National Wildlife Refuge System and purposes of the individual refuges are carried out. It also requires the Secretary to maintain the biological integrity, diversity, and environmental health of the National Wildlife Refuge System.

The goals of the National Wildlife Refuge System are to:

- 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 under-represented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Existing Partnerships

Working with others via intra- and interagency partnerships is important in accomplishing the mission of the Service as well as assisting Swan Lake NWR in meeting its primary objective of providing a resting and feeding area for migratory birds and other wildlife. Partnerships with other federal and state agencies and with a diversity of other public and private organizations are increasingly important. Other agencies can provide invaluable assistance in research and maintenance. Private groups and non-profit organizations greatly enhance public involvement in the Refuge, building enthusiasm and support for its mission.

Besides the partnerships that the Service holds on a national level, Swan Lake NWR maintains informal partnerships with several organizations:

- Friends of Swan Lake NWR
- Missouri Department of Conservation
- Missouri Department of Natural Resources
- Missouri Department of Transportation
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S Environmental Protection Agency
- Farm Service Agency
- Ducks Unlimited

Legal and Policy Guidance

In addition to the legislation establishing the Refuge and the National Wildlife Refuge System Improvement Act of 1997, other federal laws, executive orders, and regulations govern the administration of Swan Lake NWR. See Appendix G for a list of the guiding legislation and executive orders.

Chapter 2: The Planning Process

Meetings and Involvement

The comprehensive conservation planning process began with the CCP planning team holding a “kick-off” meeting in October 2006. Members of the planning team, which includes Refuge staff and Service planners, identified a list of issues and concerns associated with management of Swan Lake NWR. These preliminary issues and concerns were based on staff knowledge of the area and discussions with citizens in the community.

The CCP planning team then invited Refuge neighbors, organizations, local government agencies, and local staff of national and state government agencies, schools, and interested citizens to share their thoughts in an open house meeting on January 11, 2007, at the Refuge Visitor Center. More than 75 people attended the open house. We received 70 responses with dozens of individual comments by the close of the scoping period on February 22, 2007. Following the public comment period, an additional meeting was held in the Fish and Wildlife Service Regional Office to review the public comments and identify concerns from subject specialists.

A Biological Program Review, which is an evaluation of the relevance and direction of the biological program through the collective inputs of professionals among the various fields of ecology and wildlife sciences, began with a 2-day meeting on February 21 and 22 of 2007. The Regional Refuge Biologist facilitated the event, which was attended by 16 individuals with various state, federal, and academic affiliations. Information was presented on the Refuge, the general ecology of the region, establishing legislation and policy directives, current issues facing the Refuge, prior program accomplishments, a report on the current biological inventory and monitoring program, and a draft vision for the future.

The meeting was punctuated with field trips to specific sites to stimulate discussion and demonstrate issues of concern. The group discussed management alternatives and potential strategies, identified potential biological program priorities, discussed the draft goals and objectives for the vari-



Sign repair at Swan Lake NWR. Photo credit: USFWS

ous program components and other ideas for the future of the program.

Summary of Issues, Concerns, and Opportunities

Issues play an important role in planning. Issues focus the planning effort on the most important topics and provide a base for considering alternative approaches to management and evaluating the consequences of managing under these alternative approaches. The issues, concerns, and opportunities expressed during the first phase of planning have been sorted and summarized into a number of issue statements along with fuller explanations that include background information and comments.

Issue Statement: The decline in Canada Goose use of the Refuge in recent decades has decreased the quality of goose hunting, drawn fewer hunters and wildlife watchers, and changed the cultural identity of the local communities.

Background: Beginning in the 1950s, use of the Refuge by wintering Canada Geese steadily increased until it peaked in 1977 at 181,000 birds. The large numbers of geese produced a spectacle

that annually attracted hunters and wildlife watchers to this rural area and prompted the nearby town of Sumner, Missouri, to adopt the slogan “Wild Goose Capital of the World” and to erect a 40-foot Canada Goose statue known as “Maxi.”

The decades following the peak saw a steady decline in the number of geese wintering on the Refuge. This diminished the annual spectacle, which drew fewer visitors and affected the prosperity and notoriety of the local communities. One popular belief is that a reduction in the amount of agriculture on Refuge lands is responsible for lower goose use of the area and that farming more acres would increase goose numbers. This view is not supported by studies of the Canada Goose population that show a variety of factors interact to affect their distribution. These include increased availability of habitats across the landscape, fall and winter weather conditions, and variations in hunting pressure along the migratory flyway.

Issue Statement: The Refuge attracts high numbers of waterfowl and other wildlife, making it appealing as a sanctuary as well as for those interested in hunting and other wildlife-dependent recreation.

Background: Despite lower numbers of wintering Canada Geese, the Refuge still harbors abundant wildlife, notably ducks and white-tailed deer. Although goose hunting has been allowed for years, duck hunting has never been permitted at the Refuge. There is an increasing interest in allowing duck hunting on the Refuge in part to offset the decline in the quality of goose hunting. Others would prefer there be less or no hunting on the Refuge and instead support maintaining the Refuge as a sanctuary for waterfowl and other wildlife.

Issue Statement: Accumulation of sediment over several decades has decreased the depth and water holding capacity of Silver Lake and affected water quality.

Background: Silver Lake serves as a reservoir that supplies water for management of wetland units across the Refuge. It also provides fishing opportunities. The average volume of Silver Lake has decreased by about 25 percent from 1983 to present. Through the years, sediment carried from the 64,000-acre watershed by Turkey Creek and Elk Creek accumulated in Silver Lake, decreasing the depth and water holding capacity of the basin and reducing its water clarity. If this continues it would threaten wetland management across the Refuge. It also decreases the quality of the habitat for sport fish. Although changes in land use practices within the watershed in recent years are believed to have

slowed the sedimentation rate, there are no measurements to support this.

Issue Statement: There are diverse and sometimes conflicting expectations regarding the presence, variety, and abundance of Refuge wildlife.

Background: Many people made specific suggestions regarding management of Refuge habitats or wildlife populations. Suggestions included:

- increasing the number of pheasants, quail, or deer
- decreasing the numbers of deer or predators
- reintroducing Prairie Chickens
- managing more intensively for waterfowl
- managing less intensively for waterfowl

Developing guidance regarding Refuge habitat and population management that considers public input, Refuge purposes, the mission of the National Wildlife Refuge System, and other Service policies is one outcome of the comprehensive conservation planning process.

Issue Statement: Slow water movement out of the Grand River Watershed during high water events increases duration of flooding on the Refuge and surrounding private lands.

Background: The nearly 12-mile Garden of Eden levee south of the Refuge protects 3,500 acres of land from flooding during high water events. The levee also narrows the outlet of the Grand River Watershed from 5 miles to about one-half mile. Floodwaters that accumulate across thousands of acres must funnel through this narrowed outlet. This slows water movement and aggravates flood severity and duration within the watershed. Severe flooding often damages Refuge roads and facilities, impedes management capabilities, and in some cases degrades wildlife habitat. Sluggish drainage



Flooding is a significant issue facing Swan Lake NWR. Photo credit: USFWS

also affects lands adjoining the Refuge, especially if Refuge pools are at or near capacity when flooding begins.

Issue Statement: Refuge waters could be managed to create more favorable fishing opportunities.

Background: Although fishing occurs on Refuge waters, there has been little emphasis on improving the quality of the sport fishery. A 2007 fisheries survey of Silver Lake, where most fishing occurs, reported it as shallow, turbid, and lacking deep water habitat and structure, none of which indicate a quality sport fishery. Wind action across the shallow basin churns sediment and reduces water clarity, hampering the growth of aquatic plants that would otherwise serve as fish habitat. Only four of 14 species captured during the survey were sport fish, but these four species – white crappie, freshwater drum, flathead catfish, and channel catfish – accounted for nearly half of the total fish sampled. A number of people commented that Silver Lake should be made deeper to improve fish habitat. Others suggested removing rough fish and stocking game fish.

Issue Statement: There are threats to the ecological integrity of Refuge ecosystems and opportunities for restoration and enhancement of native habitats and rare species.

Background: Service policy supports maintaining and, where appropriate, restoring biological integrity, diversity, and environmental health. There are a number of threats to these elements, including the introduction and spread of invasive plants, declining water quality, and flooding. There are also opportunities to restore drainage pathways and native habitat. This includes habitat restoration that would benefit the eastern massasauga rattlesnake, a candidate for federal listing under the Endangered Species Act, which is found on the Refuge.

Issue Statement: There is demand for wildlife-dependent recreation opportunities, other public uses, and facilities beyond what is presently available.

Background: Service policy encourages national wildlife refuges to provide opportunities for six wildlife dependent public uses: hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. Additionally, Swan Lake NWR provides visitors opportunities for gathering berries, mushrooms, or shed antlers. Zoning of these uses in both duration and extent helps avoid conflicts between user groups. A number of comments supported increasing the duration, available area, or amount of facilities for one or more of the existing uses. Others suggested allowing additional



Swan Lake NWR. Photo credit: FWS

uses. Any use permitted on the Refuge must be found compatible in accordance with Service policy.

Issue Statement: The amount of maintenance, management, and visitor services needs exceeds existing capacity to fulfill these needs.

Background: The Refuge staff is responsible for maintaining 26 miles of roads and levees, 20 water control structures, managing more than 800 acres of moist soil, assisting with the implementation of three hunts as well as other aspects of Refuge administration and management. Refuge maintenance, management, and programming have declined in recent years as the number of staff fell from a high of seven to two. This is compounded by aging infrastructure and increased demand for visitor services. A number of people commented that more staff is needed.

Issue Statement: Widely scattered parcels and easements beyond the Refuge boundary provide management challenges and opportunities.

Background: Refuge staff members are responsible for managing 46 easements and outlying fee title parcels scattered across 15 Missouri counties. Some of the properties have potential for habitat restoration and wildlife-dependent recreation opportunities that would help fulfill Refuge purposes and support the mission of the National Wildlife Refuge System. But few staff and long distances mean these properties currently receive little attention.

Issue Statement: There is interest in maintaining the remnant bottomland forest community within the Yellow Creek Research Natural Area.

Background: The Yellow Creek Research Natural Area encompasses 1,000 acres of bottomland forest along Yellow Creek. According to guidance, Research Natural Areas are not to be actively managed so as to serve as a reference point for comparison with other bottomland forest areas. Log jams

within Yellow Creek impede flow during high water events, causing flooding that affects the bottomland forest within the Research Natural Area.

Preparation, Publishing, Finalization and Implementation of the CCP

The Swan Lake NWR CCP and Environmental Assessment (EA) were prepared by the staff of Swan Lake NWR and the U.S. Fish and Wildlife Service Regional Office with help from Mangi Environmental. The CCP/EA will be published in two phases and in accordance with the National Environmental Policy Act (NEPA). The Draft EA (Appendix A) presents a range of alternatives for future management and identifies the preferred alternative, which is also the Draft CCP. A public review period of at least 30 days, which will include a public meeting, will follow release of the draft plan.

Verbal and written comments received by the Service will be incorporated where appropriate and perhaps result in modifications to the preferred alternative or in the selection of one of the other alternatives. The alternative that is ultimately selected will become the basis of the ensuing Final CCP. This document then, becomes the basis for guiding management on the Refuge over the coming 15-year period. It will guide the development of more detailed step-down management plans for specific resource areas, and it will underpin the annual budgeting process through Service-wide allocation databases. Most importantly, it lays out the general approach to managing habitat, wildlife, and people at the Swan Lake NWR that will direct day-to-day decision-making and actions.

Wilderness Review

As part of the CCP process, lands within Swan Lake NWR were reviewed for wilderness suitability. No lands were considered suitable for Congressional designation as wilderness as defined by the Wilderness Act of 1964. Swan Lake NWR does not contain 5,000 contiguous acres of roadless, natural lands, nor does the Refuge possess any units of sufficient size to make their preservation practicable as wilderness. Refuge lands and waters have been substantially altered by humans, especially by agriculture, drain construction, and road-building. Extensive modification of natural habitats and manipulation of natural processes has occurred. Adopting a “hands-off” approach to management at the Refuge would not facilitate the restoration of a pristine or pre-settlement condition, which is the goal of wilderness designation.

Chapter 3: The Refuge Environment and Management

Introduction

Swan Lake NWR includes more than 11,000 acres of bottomland forest, grasslands, wetlands, and open water within Chariton County in north-central Missouri. Management responsibilities also include 57 smaller parcels totaling more than 2,000 acres scattered across 15 Missouri counties.

Ecological Context

Hydrologic Units, Watersheds, and Ecoregions

In the 1990s the Service adopted an ecosystem approach to management. This shift demanded a spatial framework, some type of mapped unit, which could be identified as an ecosystem. The Service chose to define its ecosystems based largely on hydrologic units as mapped by the U.S. Geological Service (USFWS, 1995). The U.S. Fish and Wildlife Service referred to these hydrologic units as watersheds although the definitions and application of the two terms are different. A watershed is an area delineated by topography such that all surface drainage within the area converges to a single point, usually the point where the collected waters leave the watershed. The hydrologic units that form the basis of the Service's ecosystem units in many cases do not follow the same boundaries as topographic watersheds.

The Service's 53 ecosystem units each typically cover thousands of square miles. However, the hydrologic units, or watersheds as they have come to be known, form a nested hierarchy meaning that smaller watersheds combine to form larger watersheds. Working from a narrow to a broad extent, the Refuge is within the Lower Grand River Watershed which is within the Grand River Watershed which is within the Lower Missouri River Watershed, which the Service recognizes as the Lower Missouri River Ecosystem.

Ecoregions are a different concept also used as a basis for describing ecosystems. Ecoregion boundaries are based on a number of components includ-

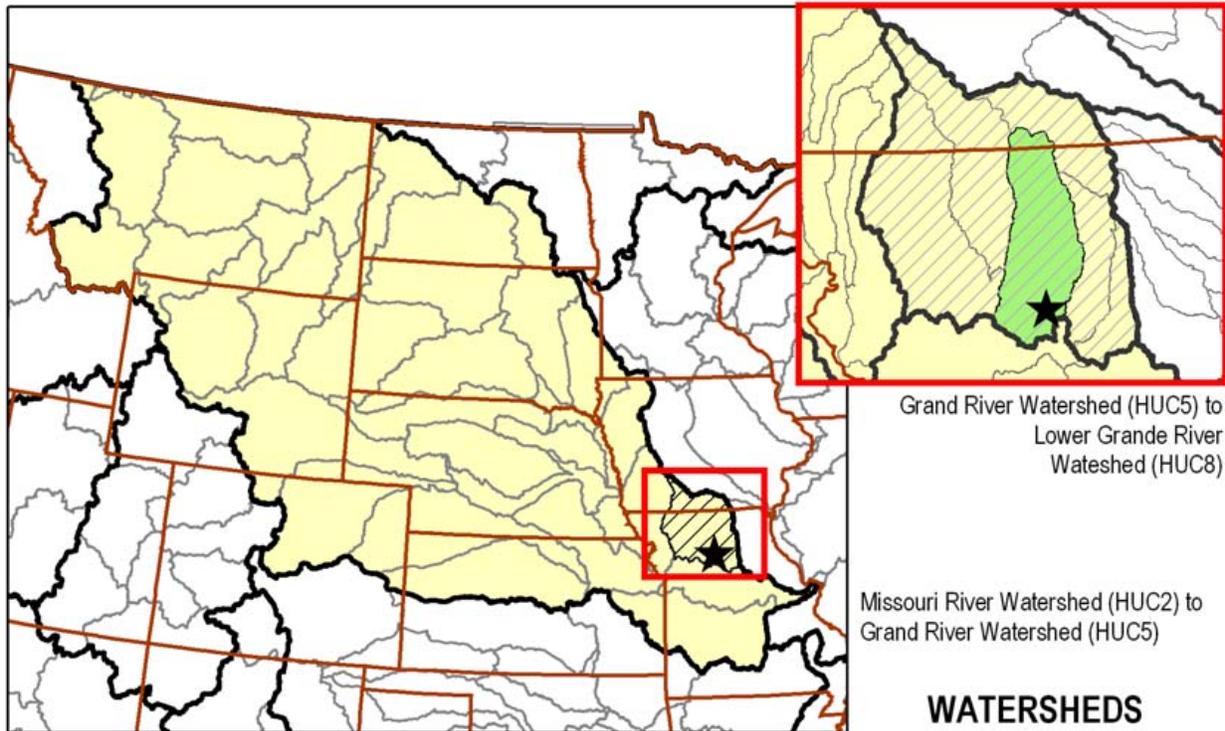


Great Egret at Swan Lake NWR. Photo credit: USFWS

ing climate, geology, physiography, soils, and land cover. The intent of ecoregions is to depict areas within which the mosaic of these components is different than that of adjacent areas. An interagency effort derived a common set of ecological units for Missouri based on the National Hierarchical Framework of Ecological Units (Cleland et al. 1997). Ecoregion boundaries do not coincide with watershed boundaries, but like watersheds ecoregions occur within a nested hierarchy. Working from a narrow to a broad extent, the Refuge is within the Missouri-Grand River Alluvial Plain Land Type Association which is within the Missouri River Alluvial Plain Subsection which is in the Central Dissected Till Plains Section.

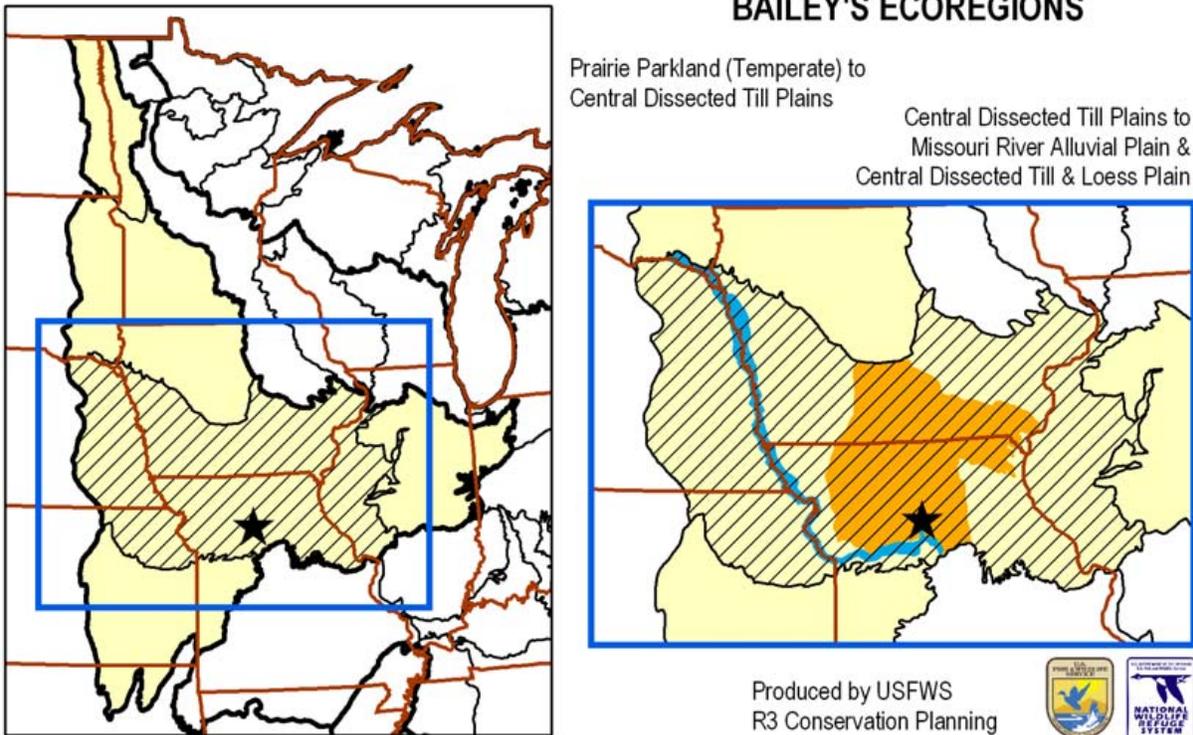
Watershed boundaries are helpful in determining the source of surface water flowing into the Refuge and assessing factors that affect water quantity and quality. Ecoregion boundaries are helpful in discovering relationships with other areas that have similar habitats and other features (see Figure 2 on page 10).

Figure 2: Watersheds and Habitats, Swan Lake NWR



★ : Swan Lake National Wildlife Refuge

BAILEY'S ECOREGIONS



Historic Vegetation

The following description of historic vegetation within the Grand River watershed is excerpted from the Grand River Inventory and Assessment (MDC undated).

The presettlement Grand River Watershed was characterized by long narrow prairies generally oriented north-south and divided by timbered ridge tops and stream valleys (Schroeder 1982). Only in the southwest part of the basin did prairies open up to wide expanses averaging 1 or 2 miles across.

Schroeder (1982) describes the riparian areas common to the watershed:

“In addition to the upland prairies, bottomland prairies occurred regularly on the flood plains of streams, sometimes becoming so extensive that timber was restricted to the river bank and rougher valley slopes.

“Large areas of the broad flood plains of streams in the Grand-Chariton region supported a `luxuriant growth of coarse wild grass' (Watkins et al. 1921). Sometimes these wet prairies occupied the entire bottomland, except for a timber strip fringing the banks of streams. Clay or gumbo soils prevented good drainage, and marshes and ponds abounded.

“Survey notes reveal a complex pattern of small lakes or ponds, wet prairie, intensively meandering creeks with and without river bank timber, and dense timber only along the Grand River channel in northwest Chariton County in what is now the Swan Lake area. There was nothing but wet prairie at the present Swan Lake site.”

Land Use/Cover

The Grand River Watershed extends across more than 5 million acres and was once covered by a mosaic of prairies and forests. Extensive land use conversion over the past century produced the current landscape dominated by agriculture. Table 1 on page 12 shows the distribution of current land cover as well as the potential natural vegetation based on county soil survey data for the Grand River Watershed and several of its sub-basins.

Migratory Bird Conservation Initiatives

Several migratory bird conservation plans have been published over the last decade that can be used to help guide management decisions on refuges. Bird conservation planning efforts have evolved from a largely local, site-based orientation to a more regional, even inter-continental, landscape-oriented perspective. Several transnational migratory bird conservation initiatives have emerged to help guide

the planning and implementation process. The regional plans relevant to Swan Lake NWR are:

- Partners in Flight Bird Conservation Plan – Dissected Till Plains
- Upper Mississippi River and Great Lakes Region Joint Venture of the North American Waterfowl Management Plan
- The Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan
- The Upper Mississippi Valley/Great Lakes Regional Waterbird Conservation Plan

Each of the bird conservation initiatives has a process for designating priority species, modeled to a large extent on the Partners in Flight method of computing scores based on independent assessments of global relative abundance, breeding and wintering distribution, and vulnerability to threats, area importance, and population trends. These scores are often used by agencies in developing lists of priority bird species. The Service based its 2001 list of Non-game Birds of Conservation Concern primarily on the Partners in Flight shorebird and waterbird status assessment scores.

Missouri Comprehensive Wildlife Strategy

Congress asked each state to develop a comprehensive wildlife strategy or, as they have become known, wildlife action plan. These plans examine the health of wildlife and prescribe actions to conserve wildlife and vital habitat before they become more rare and more costly to protect. Using wildlife information gathered over the past 30 years, Missouri's comprehensive wildlife strategy promotes management and benefits all wildlife, rather than targeting single species. The strategy identifies 33 Conservation Opportunity Areas in which management strategies will conserve both wildlife populations and the natural systems on which they depend. For each Conservation Opportunity Area, a team of partners developed a common vision of issues and actions. Swan Lake NWR is part of the Lower Grand River Conservation Opportunity Area, which also includes Fountain Grove Conservation Area, Yellow Creek Conservation Area, Little Compton Lake Conservation Area, Floyd Memorial Conservation Area, Sumner Access, and Pershing State Park. This network of lands and partners is working to fulfill the following strategies:

- Restore riverine habitat abundance and diversity for native plants and animals.
- Restore bottomland forests and woodlands to provide habitat for native plants and animals, with emphasis on species of conservation concern.

Table 1: Current Land Cover and Potential Natural Vegetation in Grand River Watershed and Sub-basins

Potential Natural Vegetation	Current Land Cover	Grand River Watershed	Lower Grand River Watershed	Yellow Creek Watershed	Turkey Creek Watershed
Prairie	Pasture/Hay	1,479,521			
Prairie	Cropland	1,148,901			
Forest	Pasture/Hay	891,699			
Forest	Forest	402,278			
Forest	Wetland	347,450			
Forest	Cropland	215,917			
Forest	Pasture/Hay		459,825		
Prairie	Pasture/Hay		278,183		
Prairie	Cropland		268,057		
Forest	Forest		142,800		
Forest	Cropland		111,289		
Forest	Pasture/Hay			152,029	
Forest	Forest			31,593	
Prairie	Pasture/Hay			20,330	
Prairie	Cropland			19,794	
Forest	Cropland			17,542	
Prairie	Cropland				21,572
Prairie	Pasture/Hay				11,867
Forest	Pasture/Hay				11,401
Forest	Cropland				5,023
Prairie	Wetland				2,433

- Manage wetlands and wet prairie habitats to benefit resident and migratory wildlife.
- Expand wet prairie habitat to allow the connection of eastern massasauga populations at Pershig State Park and Swan Lake NWR.
- Control populations of problematic exotic and invasive plants.
- Educate landowners about the importance of conservation practice.
- All federally listed threatened and endangered species and proposed and candidate species that occur in the Region.
- Migratory bird species derived from Service wide and international conservation planning efforts.
- Rare and declining terrestrial and aquatic plants and animals that represent an abbreviation of the Endangered Species program’s preliminary draft “Species of Concern” list for the Region.

Region 3 Fish and Wildlife Conservation Priorities

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

Appendix D lists Regional Resource Conservation Priority species relevant to the Refuge.



Swan Lake NWR. Photo credit: USFWS

Other Conservation and Recreation Lands in the Area

The state of Missouri and other federal agencies own and manage lands and recreation access sites within a 50-mile radius of the Refuge (Figure 3 on page 14). There are more than 100 state areas that include public access sites, fish and wildlife areas, including recreation areas, forests, historic sites, and nature preserves. The federal areas include several units of the Big Muddy National Fish and Wildlife Refuge along the Missouri River. Local governments also own and manage community parks in the area. Conservation easements and lands enrolled in the Natural Resources Conservation Service's Wetland Reserve Program contribute thousands of acres to long-term conservation efforts.

Socioeconomic Context

Swan Lake NWR is located in Chariton County. The county is less racially and ethnically diverse than the state of Missouri as a whole. The population in the county has a lower average income and a lower percentage of high school and college graduates than the state's population as a whole.

Population and Demographics

Based on U.S. Census Bureau data, the population estimate for Chariton County was 8,046 in 2006. The population decreased 4.6 percent from 2000 while the population of the state grew 4.4 percent during the same period. The county population was 95.9 percent white in 2006; the state population was 85.1 percent white. In Missouri, 5.1 percent of the people 5 years and older speak a language other than English at home; in Chariton County it is 2.2 percent. The county population is projected to be 6,492 in 2025, a 19.3 percent decrease from 2006. The largest community in Chariton County is Salisbury with a 2006 population of 1,614.

Employment

There were 5,073 jobs in Chariton County in 2006. Farm employment accounted for more than 24.3 percent of the total jobs. Retail trade, local government, and construction are also notable sectors.

Income and Education

Per-capita income in the county was \$24,701 in 2005; in Missouri it was \$31,231. The median household income in 2004 was \$34,315; for Missouri \$40,885. In Chariton County, 11.4 percent of persons over 25 years of age hold a bachelor's degree or higher; in Missouri 21.6 percent of persons older than 25 years hold a bachelor's degree or higher.

Demand and Supply for Wildlife-Dependent Recreation

In order to estimate the potential market for visitors to the Refuge, we looked at 2007 consumer behavior data within approximately 30, 60, and 90 mile drives of the Refuge. The data were organized by zip code areas. We used the three driving distances because we thought this was an approximation of reasonable maximum drives to the Refuge for an outing by different groups. From experience we know, for example, that visitors come from the nearby local area to view wildlife in the evening. We also know that people seeking interesting varieties of bird species drive from all over Missouri and eastern Kansas and western Illinois to visit the Refuge. The 30-mile area extended beyond the communities of Chillicothe, Brookfield, and Carrollton. The 60-mile area included Cameron, Trenton, Kirksville, Moberly, Boonville, Lexington and a number of other communities. The 90-mile area included the Kansas City metropolitan area, Columbia, and Jefferson City.

The consumer behavior data that we used in the analysis is derived from Mediamark Research Inc. data. The company collects and analyzes data on consumer demographics, product and brand usage, and exposure to all forms of advertising media. The consumer behavior data were projected by Tetrad Computer Applications Inc. to new populations using Mosaic data. Mosaic is a methodology that classifies neighborhoods into segments based on their demographic and socioeconomic composition. The basic assumption in the analysis is that people in demographically similar neighborhoods will tend to have similar consumption, ownership, and lifestyle preferences. Because of the assumptions made in the analysis, the data should be considered as relative indicators of potential, not actual participation.

Figure 3: Conservation Lands in the Area of Swan Lake NWR

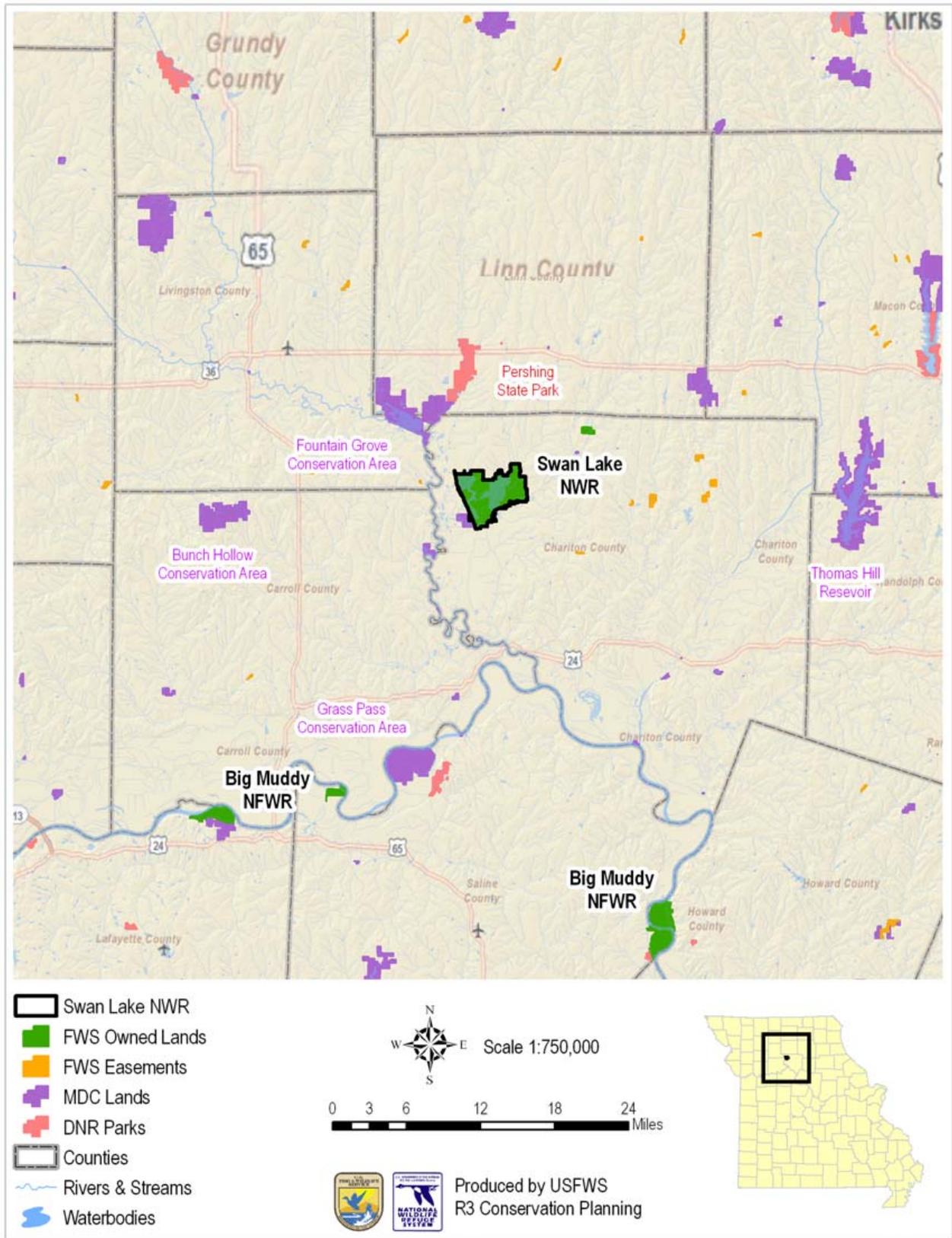


Table 2: Maximum Adult Audiences Within 30, 60, and 90 Miles of Swan Lake NWR for Four Activities

Approximate Driving Distance to Refuge	Total Population	Birdwatching	Fishing	Hunting with shotgun	Contribute to environmental organization
30 miles	108,198	5,143	18,014	5,798	5,009
60 miles	535,531	26,933	84,471	26,939	15,691
90 miles	2,444,707	112,026	331,819	93,772	43,064

We looked at potential participants in birdwatching, fishing, and hunting with shotgun. In order to estimate the general environmental orientation of the population, we also looked at the number of people who might contribute to an environmental organization.

The consumer behavior data apply to persons more than 18 years old. Table 2 displays the consumer behavior numbers for each of the three distances to the Refuge. The projections represent the maximum audience that we might expect to make a trip to the Refuge for approximate drives of half-hour, 1 hour, and 1 and a half hours. Actual visitors will be fewer because the estimate is a maximum, and we expect only a fraction of these people will travel to the Refuge.

We also considered the maximum number of students that might potentially participate in environmental education offered by the Refuge by looking at the school populations in Chariton County and in neighboring Carroll, Livingston, and Linn Counties. For Chariton County the school enrollment in preschool through grade 12 was 1,729 according to the 2000 census. For Carroll, Livingston, and Linn Counties the equivalent enrollments were 2,099, 2,961, and 2,852 respectively. The projected school age (5-19) population for the four counties for 2030 is 7,756.

Climate

The climate of north-central Missouri is characterized by hot, humid summers and mild winters. Spring weather is turbulent and thunderstorms and tornados are fairly common. Average monthly temperatures range from 15 degrees Fahrenheit in January to 80 degrees Fahrenheit in July. Average annual precipitation is 38.27 inches, with the heaviest amounts usually occurring during the months of May, June, and September.

Geology and Soils

The Refuge lies in the glacial till plain of north-central Missouri. Underlying bedrock is primarily shale and coal with occasional limestone. The topog-

raphy is relatively flat with elevations ranging from 653.91 feet to 741.56 feet.

Soil types of the Refuge are listed in Table 3 on page 16.

Water and Hydrology

The Refuge presently contains three major impoundments containing a combined total of about 4,300 acres and many smaller moist soil units. The largest impoundment, Silver Lake, contains 2,387 acres at full pool and is fed by a drainage area of 110 square miles (70 square miles from Turkey Creek plus 40 square miles from Elk Creek, see Figure 4 on page 17). Silver Lake waters can be drained to South Pool, Swan Lake, or other moist soil units on the Refuge. Additional local drainage adds 13 square miles to the drainage area of South Pool (918 acres at full pool) and approximately 5 square miles to the drainage of Swan Lake (987 acres at full pool).

Flooding is a frequent occurrence at many locations within the Grand River Watershed. The Refuge is subject to flooding from local intermittent streams, the Grand River, and Yellow Creek. Two broad factors affect flood intensity and duration within any watershed: precipitation characteristics and the physical characteristics of the basin or watershed. Precipitation characteristics describe the supply of water to a basin and include the amount, duration, intensity, and distribution. The watershed shape, topography, and soils are determined by geologic factors and are in many cases literally set in stone. Land use is the primary basin characteristic controlled by humans. Modifications to the landscape by practices such as deforestation, mining, and farming, as well as structures such as dams, levees, bridges, channels, and pavement all affect runoff and flooding. There are many such modifications within the Grand River Watershed that both speed and impede surface runoff. All of these factors interact and contribute to flood frequency and duration within the watershed (see Figure 5 on page 18).

Two modifications that are prevalent are channelization and levee construction. Channelization

Table 3: Swan Lake NWR Soil Types by Acreage

Soil Type	Acreage	Percent
Carlow silty clay, 0 to 2 percent slopes, rarely flooded	0	0.0%
Shannondale silt loam, 0 to 2 percent slopes	10	0.1%
Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded	10	0.1%
Gifford silty clay loam, 2 to 9 percent slopes, eroded, rarely flooded	35	0.3%
Grundy silt loam, 2 to 5 percent slopes	38	0.3%
Speed silt loam, 0 to 2 percent slopes, occasionally flooded	151	1.4%
Lagonda silt loam, 2 to 5 percent slopes, eroded	168	1.5%
Blackoar silt loam, 0 to 2 percent slopes, occasionally flooded	217	2.0%
Triplett silt loam, 0 to 2 percent slopes, rarely flooded	367	3.3%
Dockery silt loam, 0 to 2 percent slopes, frequently flooded	419	3.8%
Tice silt loam, 0 to 2 percent slopes, frequently flooded	440	4.0%
Tina silt loam, 0 to 2 percent slopes, rarely flooded	797	7.2%
Carlow silty clay, 0 to 2 percent slopes, occasionally flooded	1125	10.2%
Water	3137	28.5%
Tuskeego silty clay loam, 0 to 2 percent slopes, occasionally flooded	4110	37.3%
	11,025	100.0%

includes straightening natural stream meanders, clearing the banks, and widening and deepening the channel (Funk and Ruhr 1971). This results in a loss of stream habitat, increased bank erosion, and lower ground water levels (Funk and Ruhr 1971). Levee construction separates the stream from its floodplain. Flood water can no longer spread out and is concentrated within the channel, causing further streambank erosion. Many landowners consider channelization and levee construction legitimate stream management practices. Several streams within the basin have been channelized for over one-half their length. A substantial portion of the streams in the basin are confined by levees.

Refuge Habitats and Wildlife

All wildlife requires some combination of food, water, cover, and space. Together these elements are commonly referred to as habitat. Cover types, also referred to as habitat types, are one method of describing habitat. Cover types are discrete areas delineated by differences in dominant vegetative cover. Although cover typing does not fully describe all of the components of habitat it is a useful concept to assist in management. Cover types are derived from aerial photographs that show the variation of Refuge habitats. The boundaries of each cover type are digitally outlined forming a mosaic of polygons that are individually labeled. The resulting map

seen in Figure 6 on page 19 depicts the existing cover types found on the Refuge.

The cover types shown in Figure 6 were developed based on the National Vegetation Classification System (NVCS), the Federal Standard for vegetative classification. A number of the NVCS categories were combined to form the eight cover types depicted.

Bottomland Forest

There are more than 3,100 acres of bottomland forest on the Refuge with the largest contiguous block found within the Research Natural Area along Yellow Creek. This cover type consists of bottomland closed-canopy hardwood forest generally occurring on wet soil and in floodplains. It is dominated by pin oak, silver maple, swamp white oak, and shagbark hickory with green ash, elm, black willow, river birch, and honey locust. The understory varies from open areas dominated with sedges and woodland forbs to denser areas with a shrub layer composed of Missouri gooseberry (*Ribes missouriense*), Western snowberry (*Symphoricarpos occidentalis*), and common pricklyash (*Zanthoxylum americanum*). These areas are subject to seasonal flooding.

Figure 4: Lower Grand River Watershed, Swan Lake NWR

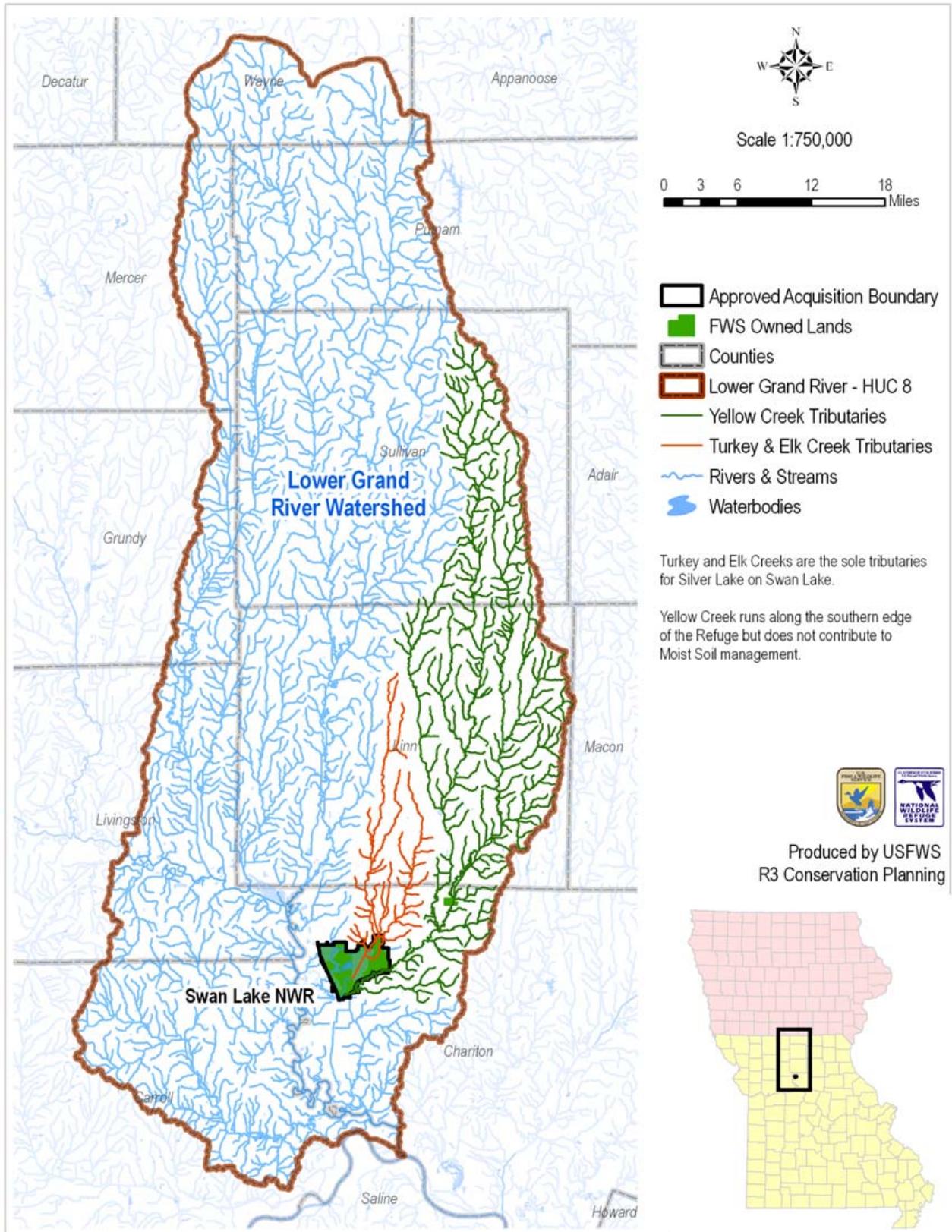


Figure 5: Watershed Comparison, Swan Lake NWR

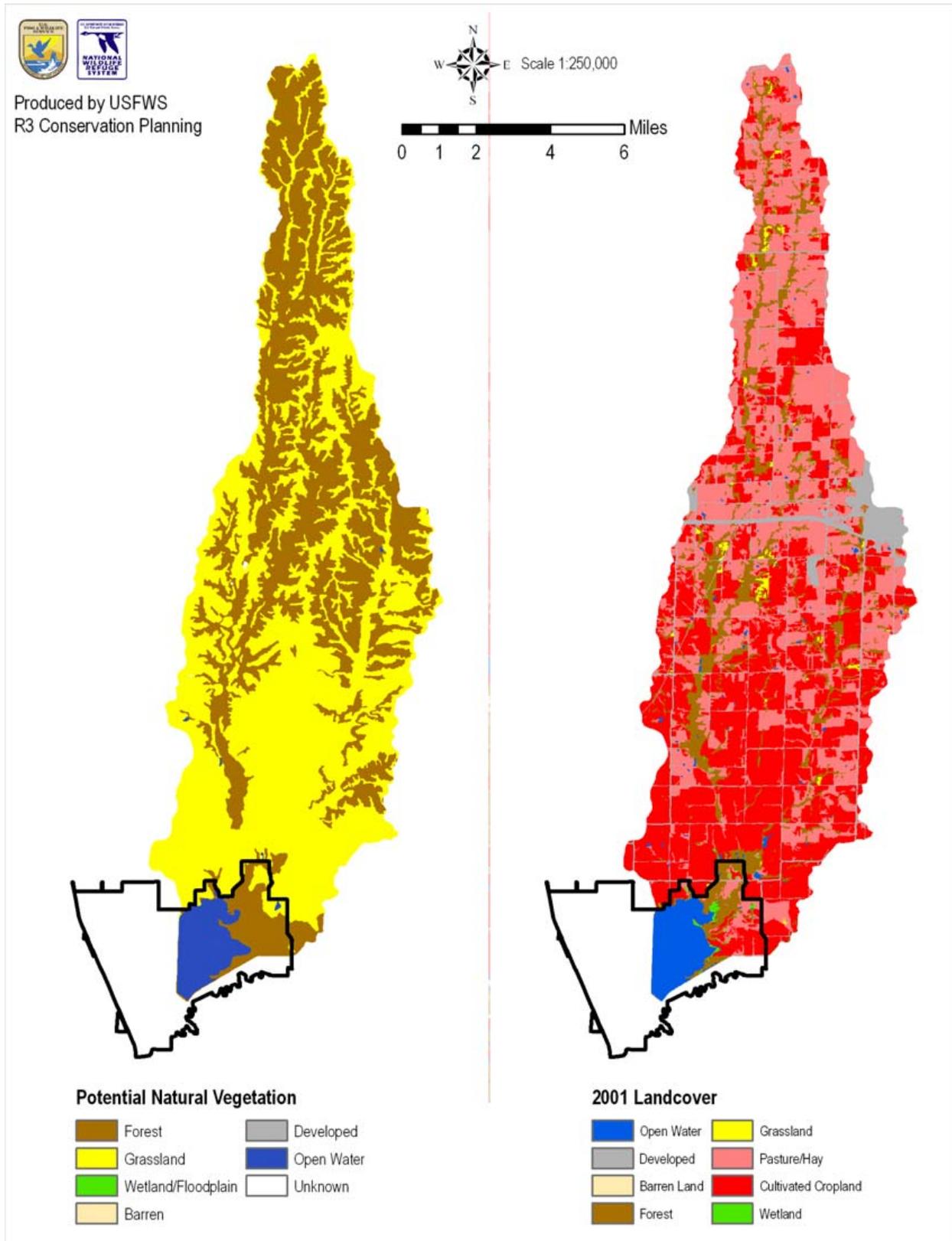
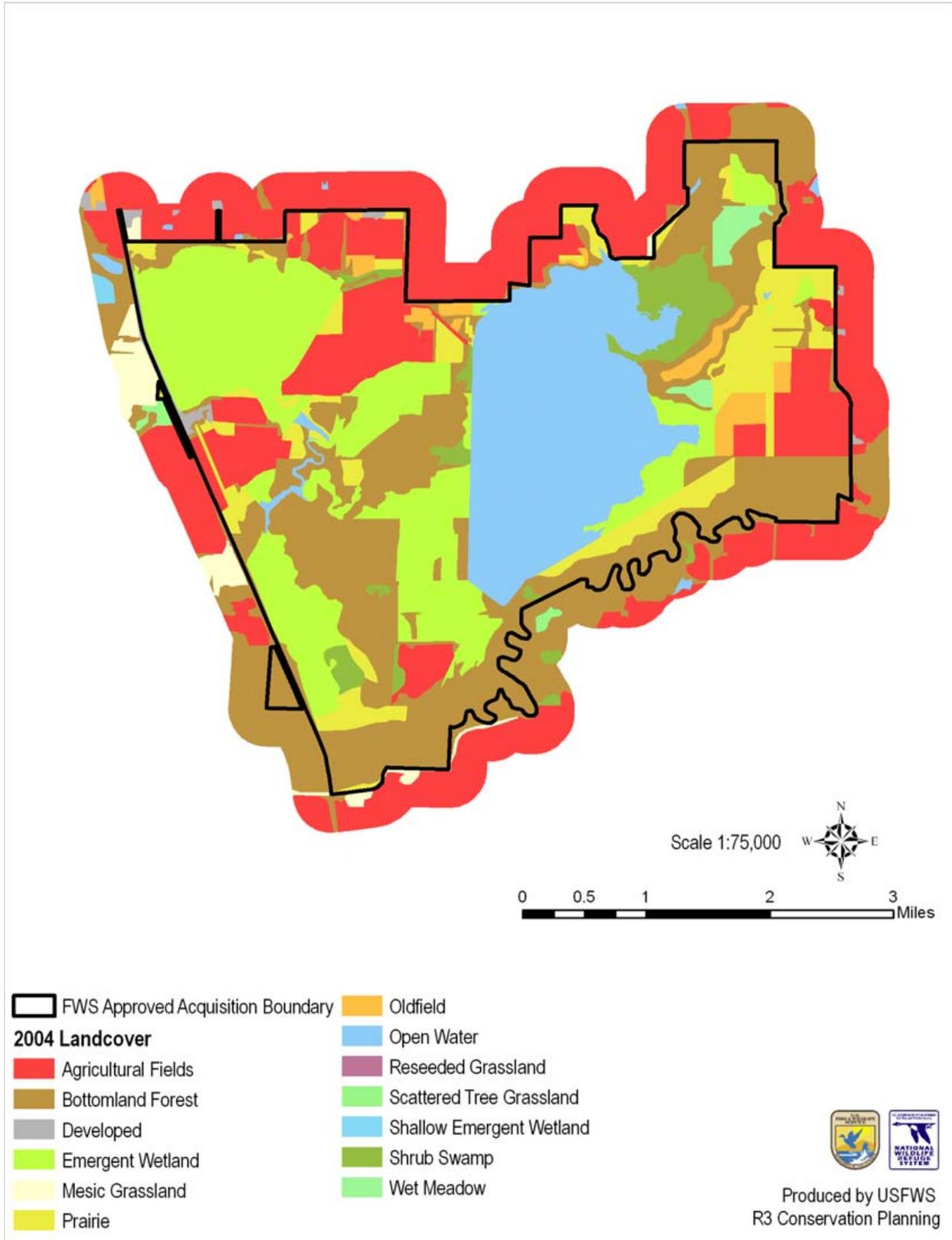


Figure 6: Current Land Cover, Swan Lake NWR



Emergent Wetland

There are over 2,000 acres of emergent wetland habitat on the Refuge. Emergent wetlands, commonly referred to as marshes and sloughs, are characterized by erect, rooted water plants that are present for most of the growing season in most years. These wetlands normally contain standing water, though at times they will dry up. Common perennial plants found in emergent wetlands include cattail, bulrushes, arrowheads, and sedges. Presently more than 800 acres of this habitat are managed using moist soil practices in which water levels are manipulated to create optimum wetland habitat conditions for migratory birds.

Open Water

Silver Lake contains nearly all of the more than 2,100 acres of open water on the Refuge. This cover type is defined as having less than 4 percent visible vegetation, which is either floating or submerged.

Agricultural Fields

There are 1,365 acres of agricultural fields on the Refuge. These are cultivated areas that consist of a variety of grasses and forbs or row crops such as wheat, corn or annual/perennial mixtures mowed for hay. Some of these areas are subject to occasional flooding.

Native Prairie

The Refuge contains approximately 1,000 acres of native prairie. These areas were either rarely or never cultivated in the past. Flooding and surface water is often present during much of the year. Native prairie sites are grassy fields dominated by reed canary grass, sedges and native grasses with a small number of scattered shrubs and small trees.

Wet Meadow

Wet meadow habitat occurs on about 110 acres of the Refuge. It is a type of wetland that commonly occurs in poorly drained areas such as shallow lake basins, low-lying farmland, and the land between shallow marshes and upland areas. Wet meadows often resemble grasslands, but are typically drier than other marshes except during periods of seasonal high water. For most of the year wet meadows are without standing water, though the high water table allows the soil to remain saturated. A variety of water-loving grasses, sedges, rushes, and wetland wildflowers proliferate in the highly fertile soil of wet meadows.

Shrub Swamp

There are approximately 410 acres of shrub swamp habitat on the Refuge, most of which occurs along the perimeter of open water and emergent

wetland habitats. Shrub swamp is dominated by deciduous woody vegetation less than 20 feet in height. Dominant species are mostly buttonbush (*Cephalanthus occidentalis*) and willow *Salix* spp. with an underlying mix of sedges and grasses and/or emergent vegetation, depending on water depth. The shrub layer varies from mostly open (25 percent) to closed (80 percent) and may contain scattered trees.

Old Field

The 240 acres of old field habitat occurs on disturbed soils and is dominated by reed canary, smooth brome, quack grass and weedy herbaceous species. These areas are usually drier than those of wet meadow habitat and were once regularly cultivated for crops but now are left fallow. They are subject to occasional flooding.

Wildlife

Birds

A variety of birds are year-around residents of Swan Lake NWR, including many waterfowl. During the spring and fall migrations, there is a great diversity of migrants due to its location between two major migratory bird corridors, the Central Flyway and the Mississippi Flyway. It is not uncommon for the Refuge to host up to 100,000 ducks, comprised mostly of dabblers, during the fall migration. The Eastern Prairie Population (EPP) of Canada Geese used Swan Lake NWR as their main wintering grounds until the late 1980s. In recent years winter distribution of the EPP flock has shifted farther north, but thousands of geese still winter on the Refuge. Wintering waterfowl also attract Bald Eagles. The Refuge also provides habitat for thousands of migratory shorebirds and is designated as a regionally important site under the Western Hemisphere Shorebird Reserve Network. The shallow water wetlands and moist soil units on the Refuge provide critical habitat for many species of waterfowl, shore birds, and marsh birds while the grasslands, forested wetlands, and farmland provide habitat for a variety of passerine birds. A complete list of bird species and a general guide to their seasonal occurrence and status on the Refuge can be found in Appendix C.

Mammals

There are 46 mammals documented as occurring on the Refuge. The mammals include the federally listed endangered Indiana bat as well as the white-tailed deer, a species popular for hunting and wildlife viewing. The presence of a reproductively active female Indiana bat was documented in 2003. The bats appear to be finding summer roosts within the



Eastern massasauga rattlesnake. Photo credit: USFWS

bottomland forest of the Yellow Creek Research Natural Area. Seven mammal species: plains pocket gopher, Franklin's ground squirrel, Eastern chipmunk, hispid cotton rat, Norway rat, Eastern spotted skunk, and gray fox are known to have occurred but have not been documented in recent years. A complete list of mammal species that occur on the Refuge can be found in Appendix C.

Amphibians and Reptiles

A variety of salamanders, toads, turtles, lizards, frogs, and snakes inhabit the Refuge including the eastern massasauga rattlesnake, a candidate for listing under the Endangered Species Act. Candidate species are 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, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Swan Lake NWR is one of only three sites left in the state of Missouri where the rattlesnakes are known to be present.

Fish and Other Aquatic Species

A 2007 fisheries survey of Silver Lake found 15 species including white crappie, freshwater drum, flathead catfish, and shortnose gar. Flood events dramatically affect the number and composition of the Silver Lake fishery. An earlier survey of Silver Lake conducted in 1996 identified 16 fish species, but only 9 of these were reported again in the 2007 survey. No fisheries surveys have been conducted on other Refuge waters.

Eleven mussel species have been documented within Refuge waters including the Flat Floater

(*Anodonta suborbiculata*), a species listed as imperiled within Missouri.

Invertebrates

No comprehensive survey of invertebrates has been completed on the Refuge, but 20 species of butterflies and 24 species of dragonflies are documented as occurring on the Refuge. A list of these species is included in Appendix C.

Threatened and Endangered Species

State-listed Species

A number of species of concern within the state of Missouri are documented within the Refuge including: Least Bittern, Sora, Common Moorhen, and Franklin's ground squirrel.

Federally Listed Threatened/Endangered/Candidate Species

Presently, two species listed as federally endangered, Interior Least Tern and Indiana bat, have been documented as occurring on the Refuge. The Interior Least Tern uses the Refuge as migratory stop-over habitat and the Indiana bat uses the bottomland hardwoods of the Yellow Creek Research Natural Area as breeding habitat. The Refuge is also one of the few places where the eastern massasauga rattlesnake, a candidate for federal listing, is known to occur.

Threats to Resources

Invasive Species

Exotic/Pest Species

Some exotic (also known as non-native or alien) plants greatly alter the plant communities of natural areas while others more commonly affect already disturbed or agricultural areas. Left unchecked, noxious plant species can seriously degrade the productivity and wildlife value of invaded habitats.

Fortunately, most Refuge wetlands are relatively free of noxious plants. Those in the area possessing the greatest potential for serious impacts include reed canary grass. Monitoring will be necessary to assure prompt action is taken to control these plants before they become a problem in the future.

On upland sites and agricultural communities, the most troublesome noxious plant is *Sericia Lespedeza*. Owing to its hardiness, growth and reproductive mechanisms, this introduced species is difficult to control and located in various areas of the Refuge. Currently little is known of what areas are infested, monitoring will need to be completed to determine the extent of infestation on the Refuge.

Siltation

With its 7,900-square-mile watershed extending into Iowa, the Grand River has been a constant source of floodwater and debris entering Swan Lake NWR. Hundreds of levees have increased velocity and frequency of flooding, impacting Refuge water management, facilities, and habitat. This alteration of hydrology is of major concern.

Contaminants

A Contaminant Assessment Process (CAP) was conducted for this Refuge in 1993 and updated in 2005. A CAP is an information gathering process and initial assessment of a national wildlife refuge in relation to environmental contaminants.

The Refuge is surrounded by an agricultural landscape. Agricultural runoff flows into the streams of the Grand River Watershed, four of which flow through or adjacent to the Refuge. This agricultural runoff contains whatever residue from pesticides and fertilizers that have been used on the fields in the watershed.

Pesticide re-deposition is a phenomenon that has been documented throughout the Midwest, including Missouri. Pesticides become airborne through volatilization and wind erosion of particles both during and after the application process. Once airborne, the pesticide can be carried by wind and deposited onto unintended areas by dry (gas and particle) and wet (fog and precipitation by rain and snow) depositional processes. These deposited residues can revolatilize, re-enter the atmosphere, and be transported and redeposited downwind repeatedly until they are transformed and accumulated, usually in areas with cooler climates. For example, atrazine, a commonly used herbicide, is frequently found in rivers, streams, and groundwater. It is also often found in air and rain. The U.S. Geological Survey found that atrazine was detected in rain at nearly every location tested. Atrazine in air or rain can travel long distances from application sites. The effects of nonpoint source pollution and pesticide re-deposition on the resident and migratory communities of the Swan Lake NWR have not been determined.

The 1993 Swan Lake NWR Contaminants Survey documented potential contamination problems from dieldrin, chlordane, copper, chromium, manganese, and zinc on the Refuge. The major source of these compounds was speculated to be agricultural runoff from the area surrounding the Refuge. It was recommended that if there was concern that populations of fish and wildlife using the Refuge were decreasing or did not seem healthy, there should be further investigations into the abovementioned compounds.

Since that 1993 CAP survey, there may have been changes in agricultural practices in the watershed. Confined animal facility operations have become more prevalent in the watershed. The effects of these changes should be monitored. Eutrophication from increased nutrients from nonpoint source pollution has become a cause for concern on many natural areas throughout the nation (Molitor, 2006).

Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors.

The increase of carbon dioxide (CO₂) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact that refuges can affect in a small way. The U.S. Department of Energy's "Carbon Sequestration Research and Development" defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, and desert – are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric CO₂. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Conserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges and management areas. The actions proposed in this CCP would conserve or restore land and habitat, and would thus retain existing carbon sequestration on the WMA. This in turn contributes positively to efforts to mitigate human-induced global climate change.

One Service activity in particular – prescribed burning – releases CO₂ directly to the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly germinates and sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air (Boutton et al. 2006). Overall, there should be little or no net change in the amount of carbon sequestered at

Swan Lake NWR from any of the proposed management alternatives.

Several impacts of climate change have been identified that may need to be considered and addressed in the future:

- Habitat available for cold water fish such as trout and salmon in lakes and streams could be reduced.
- Forests may change, with some species shifting their range northward or dying out, and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat due to stronger and more frequent droughts.
- Changes in the timing of migration and nesting could put some birds out of sync with the life cycles of their prey species.
- Animal and insect species historically found farther south may colonize new areas to the north as winter climatic conditions moderate.

The managers and resource specialists responsible for the WMA need to be aware of the possibility of change due to global warming. When feasible, documenting long-term vegetation, species, and hydrologic changes should become a part of research and monitoring programs on the WMA. Adjustments in land management direction may be necessary over the course of time to adapt to a changing climate.

The following paragraphs are excerpts from the 2000 report: *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change*, produced by the National Assessment Synthesis Team, an advisory committee chartered under the Federal Advisory Committee Act to help the US Global Change Research Program fulfill its mandate under the Global Change Research Act of 1990. These excerpts are from the section of the report focused upon the eight-state Midwest Region.

Observed Climate Trends

Over the 20th century, the northern portion of the Midwest, including the upper Great Lakes, has warmed by almost 4 degrees Fahrenheit (2 degrees Celsius), while the southern portion, along the Ohio River valley, has cooled by about 1 degree Fahrenheit (0.5 degrees Celsius). Annual precipitation has increased, with many of the changes quite substantial, including as much as 10 to 20 percent increases over the 20th century. Much of the precipitation has resulted from an increased rise in the number of days with heavy and very heavy precipitation events.

There have been moderate to very large increases in the number of days with excessive moisture in the eastern portion of the Great Lakes basin.

Scenarios of Future Climate

During the 21st century, models project that temperatures will increase throughout the Midwest, and at a greater rate than has been observed in the 20th century. Even over the northern portion of the region, where warming has been the largest, an accelerated warming trend is projected for the 21st century, with temperatures increasing by 5 to 10 degrees Fahrenheit (3 to 6 degrees Celsius). The average minimum temperature is likely to increase as much as 1 to 2 degrees Fahrenheit (0.5 to 1 degree Celsius) more than the maximum temperature. Precipitation is likely to continue its upward trend, at a slightly accelerated rate; 10 to 30 percent increases are projected across much of the region. Despite the increases in precipitation, increases in temperature and other meteorological factors are likely to lead to a substantial increase in evaporation, causing a soil moisture deficit, reduction in lake and river levels, and more drought-like conditions in much of the region. In addition, increases in the proportion of precipitation coming from heavy and extreme precipitation are very likely.

Midwest Key Issues:

1. Reduction in Lake and River Levels

Water levels, supply, quality, and water-based transportation and recreation are all climate-sensitive issues affecting the region. Despite the projected increase in precipitation, increased evaporation due to higher summer air temperatures is likely to lead to reduced levels in the Great Lakes. Of 12 models used to assess this question, 11 suggest significant decreases in lake levels while one suggests a small increase. The total range of the 11 models' projections is less than a 1-foot increase to more than a 5-foot decrease. A 5-foot (1.5-meter) reduction would lead to a 20 to 40 percent reduction in outflow to the St. Lawrence Seaway. Lower lake levels cause reduced hydropower generation downstream, with reductions of up to 15 percent by 2050. An increase in demand for water across the region at the same time as net flows decrease is of particular concern. There is a possibility of increased national and international tension related to increased pressure for water diversions from the Lakes as demands for water increase. For smaller lakes and rivers, reduced flows are likely to cause water quality issues to become more acute. In addition, the projected

increase in very heavy precipitation events will likely lead to increased flash flooding and worsen agricultural and other non-point source pollution as more frequent heavy rains wash pollutants into rivers and lakes. Lower water levels are likely to make water-based transportation more difficult with increases in the costs of navigation of 5 to 40 percent. Some of this increase will likely be offset as reduced ice cover extends the navigation season. Shoreline damage due to high lake levels is likely to decrease 40 to 80 percent due to reduced water levels.

Adaptations: A reduction in lake and river levels would require adaptations such as re-engineering of ship docks and locks for transportation and recreation. If flows decrease while demand increases, international commissions focusing on Great Lakes water issues are likely to become even more important in the future. Improved forecasts and warnings of extreme precipitation events could help reduce some related impacts.

2. Agricultural Shifts

Agriculture is of vital importance to this region, the nation, and the world. It has exhibited a capacity to adapt to moderate differences in growing season climate, and it is likely that agriculture would be able to continue to adapt. With an increase in the length of the growing season, double cropping, the practice of planting a second crop after the first is harvested, is likely to become more prevalent. The CO₂ fertilization effect is likely to enhance plant growth and contribute to generally higher yields. The largest increases are projected to occur in the northern areas of the region, where crop yields are currently temperature limited. However, yields are not likely to increase in all parts of the region. For example, in the southern portions of Indiana and Illinois, corn yields are likely to decline, with 10-20 percent decreases projected in some locations. Consumers are likely to pay lower prices due to generally increased yields, while most producers are likely to suffer reduced profits due to declining prices. Increased use of pesticides and herbicides are very likely to be required and to present new challenges.

Adaptations: Plant breeding programs can use skilled climate predictions to aid in breeding new varieties for the new growing conditions. Farmers can then choose varieties that are better attuned to the expected climate. It is likely that plant breeders will need to use all the tools of plant breeding, including genetic engineering, in adapting to climate change. Changing

planting and harvest dates and planting densities, and using integrated pest management, conservation tillage, and new farm technologies are additional options. There is also the potential for shifting or expanding the area where certain crops are grown if climate conditions become more favorable. Weather conditions during the growing season are the primary factor in year-to-year differences in corn and soybean yields. Droughts and floods result in large yield reductions; severe droughts, like the drought of 1988, cause yield reductions of over 30 percent. Reliable seasonal forecasts are likely to help farmers adjust their practices from year to year to respond to such events.

3. Changes in Semi-natural and Natural Ecosystems

The Upper Midwest has a unique combination of soil and climate that allows for abundant coniferous tree growth. Higher temperatures and increased evaporation will likely reduce boreal forest acreage, and make current forestlands more susceptible to pests and diseases. It is likely that the southern transition zone of the boreal forest will be susceptible to expansion of temperate forests, which in turn will have to compete with other land use pressures. However, warmer weather (coupled with beneficial effects of increased CO₂), are likely to lead to an increase in tree growth rates on marginal forestlands that are currently temperature-limited. Most climate models indicate that higher air temperatures will cause greater evaporation and hence reduced soil moisture, a situation conducive to forest fires. As the 21st century progresses, there will be an increased likelihood of greater environmental stress on both deciduous and coniferous trees, making them susceptible to disease and pest infestation, likely resulting in increased tree mortality.

As water temperatures in lakes increase, major changes in freshwater ecosystems will very likely occur, such as a shift from cold water fish species, such as trout, to warmer water species, such as bass and catfish. Warmer water is also likely to create an environment more susceptible to invasions by non-native species. Runoff of excess nutrients (such as nitrogen and phosphorus from fertilizer) into lakes and rivers is likely to increase due to the increase in heavy precipitation events. This, coupled with warmer lake temperatures, is likely to stimulate the growth of algae, depleting the water of oxygen to the detriment of other living things. Declining lake levels are likely to cause large impacts to the current distribution of wetlands. There is some chance that some wetlands could gradually

migrate, but in areas where their migration is limited by the topography, they would disappear. Changes in bird populations and other native wildlife have already been linked to increasing temperatures and more changes are likely in the future. Wildlife populations are particularly susceptible to climate extremes due to the effects of drought on their food sources.

Administrative Facilities

Administrative facilities consist of roads and developed sites for administration of the Refuge and public use activities. The administrative area of the Refuge currently consists of a maintenance shop, carpentry shop, three cold storage buildings for vehicle and equipment parking and a couple of out-buildings for storage, the Refuge Visitor Center/Headquarters building, Refuge quarters and a public toilet.

There are 13 pit blinds located on the Refuge available for goose hunters, a short nature trail, boat ramp, 5 small fishing platforms, a kiosk and viewing area on the main entrance road overlooking Swan Lake, and approximately 20 miles of auto tour route. There is also the old hunting headquarters site which was previously occupied by MDC personnel. That site consists of two buildings, one is closed and no longer used, the other is a half-finished garage/storage area where goose draws and hunter check-in are conducted during the hunting season. There are also two vault toilets at the site which still belong to MDC.

Cultural Resources and Historic Preservation

North-central Missouri contains archeological evidence for the earliest suspected human presence in the Americas, the Early Man cultural period prior to 12,000 B.C.; and extending through the PaleoIndian, Archaic, Woodland, Mississippian, and historic Western cultures. Although a complete cultural survey of the Refuge has not been performed, earlier partial surveys have located 30 historical and archeological sites.

Section 106 of the National Historic Preservation Act provides the framework for federal review and consideration of cultural resources during federal project planning and execution. The implementing regulations for the Section 106 process (36 CFR Part 800) have been promulgated by the Advisory Council on Historic Preservation (ACHP). The Secretary of the Interior maintains the National Register of Historic Places (NRHP) and sets forth significance criteria (36 CFR Part 60) for inclusion in the register. Cultural resources may be consid-



Swan Lake NWR Visitor Center. Photo credit: FWS

ered “historic properties” for the purpose of consideration by a federal undertaking if they meet NRHP criteria. The implementing regulations at 36 CFR 800.16(v) define an undertaking as “a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency.” Historic properties are those that are formally placed in the NRHP by the Secretary of the Interior, and those that meet the criteria and are determined eligible for inclusion.

Like all federal agencies, the Service must abide by Section 106 of the NHPA. Cultural resources 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 archeological permits, and for Indian tribal involvement. The Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of the several cultural resources laws. The Refuge Manager assists the RHPO by informing the RHPO (early in the process) about Service undertakings, by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

Swan Lake NWR follows these procedures to protect the public’s interest in preserving any cultural legacy that may potentially occur on the Refuge. Whenever construction work is undertaken that involves any excavation with heavy earth-moving equipment like tractors, graders, and bulldoz-

ers, the Refuge contracts with a qualified archaeologist/cultural resources expert to conduct an archaeological survey of the subject property. The results of this survey are submitted to the RHPO as well as the Missouri State Historic Preservation Officer (SHPO). The SHPO reviews the surveys and determines whether cultural resources will be impacted, that is whether any properties listed in or eligible for listing in the NRHP will be affected. If cultural resources are actually encountered during construction activities, the Refuge is to notify the SHPO immediately.

Visitation

Swan Lake NWR is open Refuge-wide sunrise to sunset from March through October, amounting to about 240 days a year. There are three entrances to the Refuge including the main entrance, north entrance and the west entrance. The Refuge is open to goose hunting during the goose season, which is usually mid November through the end of February. The Visitor Center is opened during weekdays and occasionally opened during special events and staffed by the local Audubon group.

The Refuge annual visitation was estimated at approximately 25,000 in 2008. The number of visitors per year is obtained through estimates derived in large part from traffic counters at the three Refuge entrances.

We do not have an accurate breakdown of visitor numbers per activity but we believe the largest segment of our visitors come for wildlife viewing, followed by fishing, education, and hunting.

Current Management

Habitat Management

Current habitat management activities consist of water level manipulation, farming, moist soil man-



Environmental education program. Photo credit: USFWS

agement, prescribed burning, mowing, and deer population control through public hunting programs. (Figure 7)

Wetland Management

Most wetland management activities on the Refuge are carried out through moist soil management described in the following section. Other wetlands are typically held in emergent marsh with natural fluctuations of water through natural flooding and drought cycles.

Moist Soil Units

Approximately 800 acres are under moist soil management to produce food for migrating waterfowl and shorebirds. Moist soil units are developed to impound water through construction of dikes and water control structures. Moist soil management entails manipulating water levels to encourage the growth of plants occurring naturally in the seed bank. The plants produce seeds that are high energy food for migrating waterfowl.

Flooding of moist soil units begins in September and proceeds in stages. Progressive flooding concentrates feeding waterfowl, more fully utilizing moist soil foods. Draining begins in March to exposes mud flats and attract migrating shorebirds that feed on invertebrates. The moist soil units remain dry throughout the growing season to produce food for the following year. Periodically, the units are disturbed to disturb the soil and retard invasion of woody vegetation.

Grasslands

The Refuge's 19 management units include a total of 920 acres of grassland. These units are burned every 3-5 years to reduce the amount of woody vegetation and organic matter (litter) and encourage growth of grass and forbs.

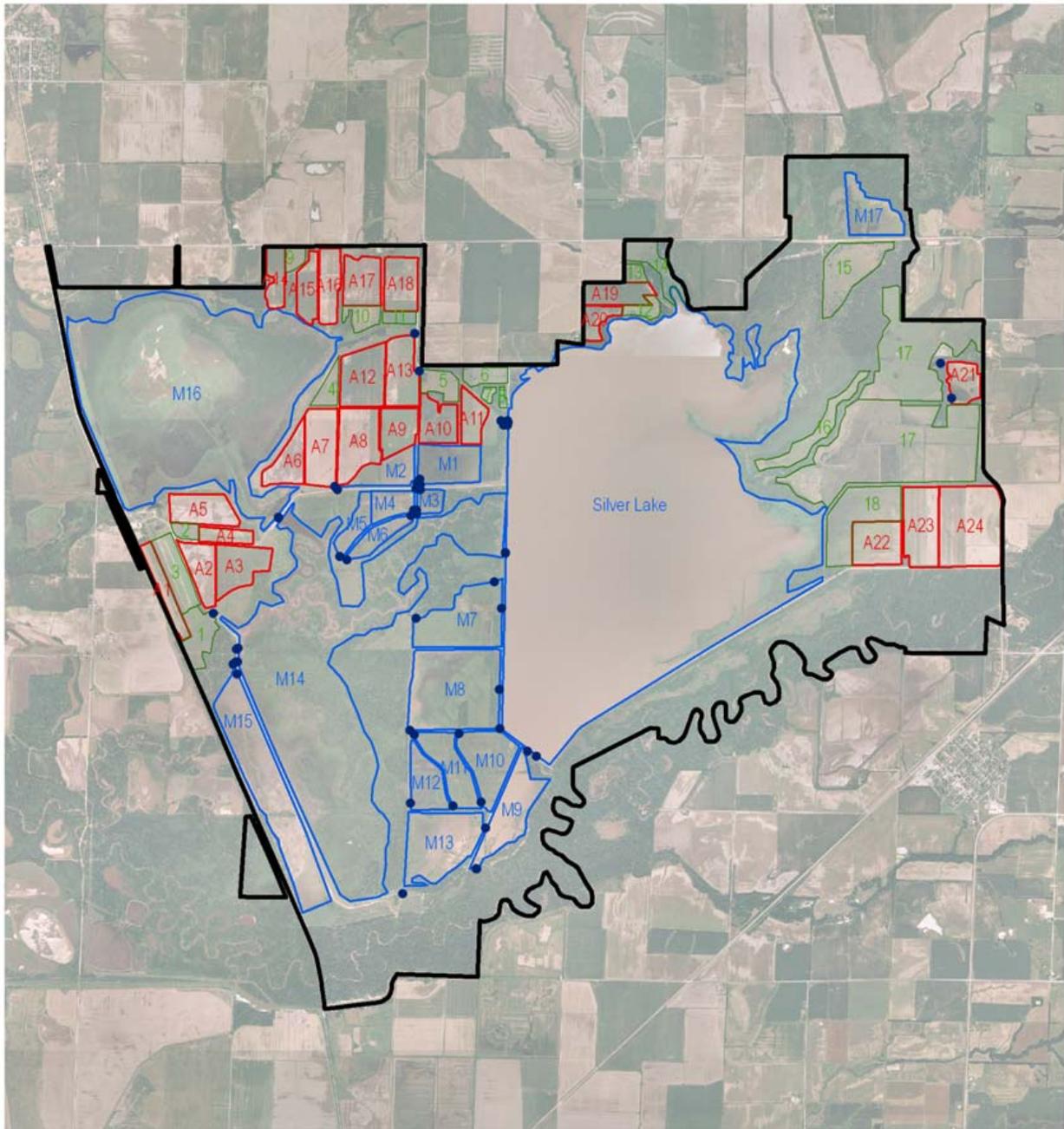
Forests

Presently, the forests on the Refuge are not actively managed.

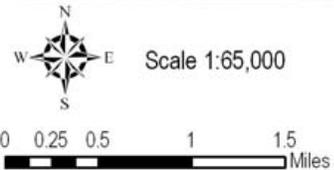
Cropland

The Refuge crops 1,365 acres through cooperative farming agreements, an arrangement where local farmers plant and harvest the crops but must leave a portion of the crop as food for wildlife. The location of the portion left is determined by the Refuge. Crops, usually corn, soybeans, wheat, clover, or buckwheat, are planted in the spring and harvested anywhere from mid-September to the end of October, but may occur later if conditions are too wet in the fall to allow harvesting. Winter wheat is generally planted in October and left through the winter and harvested in June or July. On some areas, clover is frost seeded in February. Frost seeding

Figure 7: Management Units, Swan Lake NWR



-  Swan Lake NWR Approved Acquisition Boundary
-  Grassland Management Unit
-  Agricultural Management Unit
-  Wetland Management Unit
-  Water Control Structure



Produced by USFWS
R3 Conservation Planning





*Cooperative farming is a management tool on Swan Lake NWR.
Photo credit: USFWS*

entails broadcast seeding clover over existing winter wheat and allowing the freeze thaw action to work the seed into the ground. The clover fixes nitrogen into the soil and is either ploughed under in the fall or left through the winter.

The Refuge encourages the use of no-till farming, also known as conservation tillage. This method is practiced on about half of the sites annually. It is a way of growing crops from year to year without disturbing the soil through tillage. In no-till farming the soil is left intact and crop residues – stalks, stubble, leaves, and seed pods left after harvesting – are left in the fields. Despite the advantages to soils, no-till farming usually requires planting herbicide-resistant crop plants and then chemically weeding with herbicides. Herbicide-resistant crops are genetically modified organisms and their use on the Refuge is governed by regional policy.

Monitoring

Bald Eagle

Bald Eagles are monitored in conjunction with waterfowl counts.

Waterfowl

Waterfowl are monitored weekly in the spring and fall; however, it is difficult to get an accurate count of waterfowl use in the moist soil units during periods of heavy use because the birds are readily flushed from one unit to settle in an adjacent unit as the observer moves through the area.

Shorebirds, Marsh Birds and Other Waterbirds

Spring and fall shorebird surveys are conducted by Refuge staff. Marsh birds and other waterbirds are typically counted during shorebird surveys. Although there is much variation and many missing species in these counts due to the secretive nature of

many of these birds, documentation of species occurrence is still considered important.

Vegetation

Vegetation surveys are usually conducted in late August or early September. Species variety is noted in the moist soil units as well as the presence of invasive plants.

Public Use

The National Wildlife Refuge System Improvement Act established six priority uses of the Refuge System. These priority uses all depend on the presence of, or expectation of the presence, of wildlife, and are thus called wildlife-dependent uses. These uses are hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Swan Lake NWR provides opportunities in all of the six priority uses of the Refuge System.

Hunting

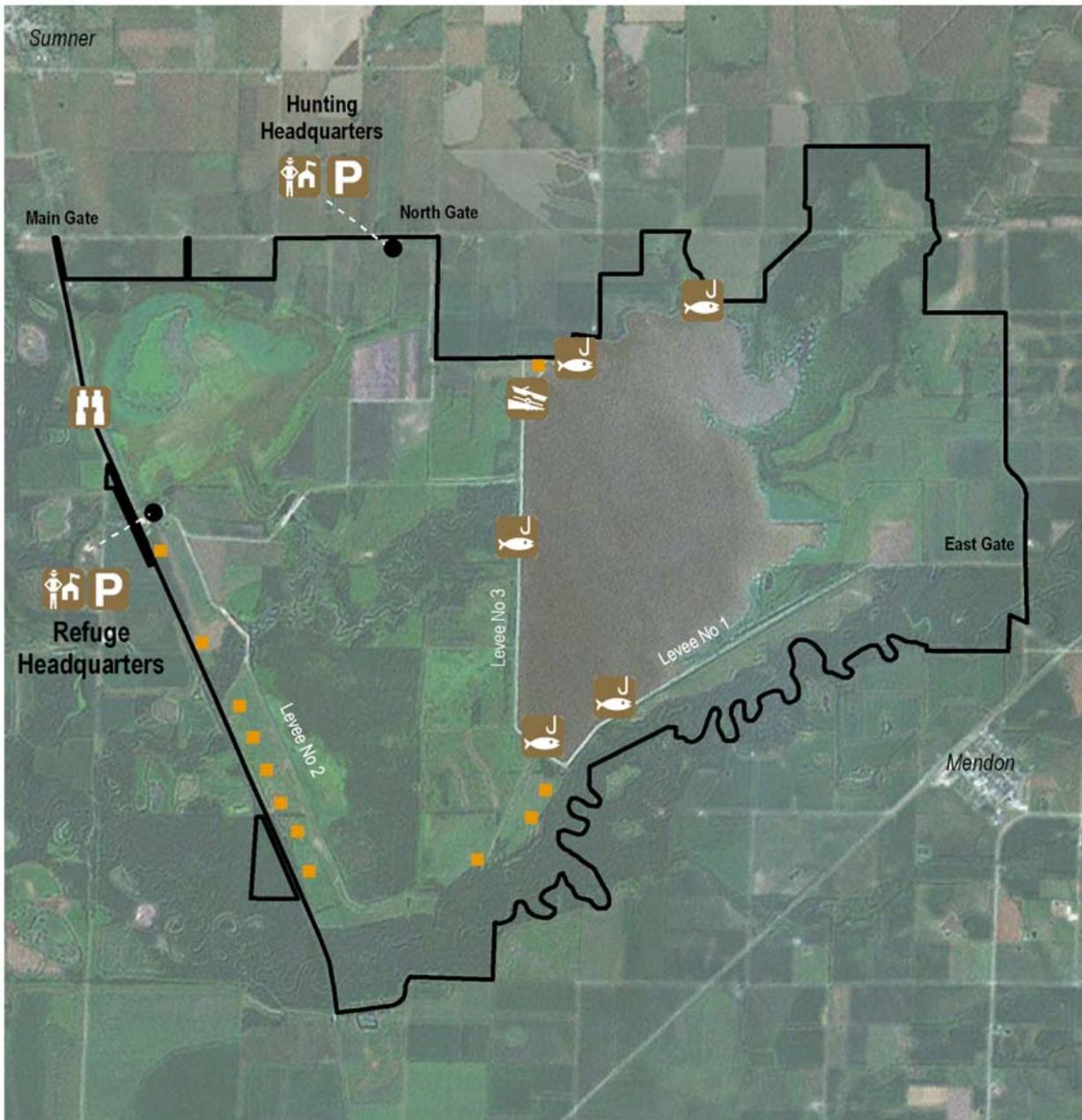
Currently goose and white-tailed deer hunting are permitted on the Refuge. The goose hunting season typically begins in November and ends in January. It occurs at 21 designated units allocated to hunters with a daily drawing on each day of the hunt (see Figure 8). No fees are charged for the goose hunt program. At the conclusion of the regular goose season a special season established through the Service's Conservation Order to reduce Snow Goose numbers begins and continues until March 1.

There are three white-tailed deer hunts. Two of the hunts are considered managed hunts and are listed as such in the Missouri Department of Conservation hunting season regulations and usually occur on successive weekends in November and December. One of the public hunts is a youth hunt open to modern firearms and the other hunt is a regular public hunt open to muzzleloaders only. The Refuge also offers a hunt for disabled hunters that is not part of the MDC managed deer hunt program.

Fishing

The Refuge has a boat ramp and three paved bank fishing platforms on Silver Lake (Figure 8). Fishing activity also includes archery fishing and trotlines. The most common species in the Refuge are channel catfish, bullhead, carp, buffalo, and crappie. Fishing platforms are universally accessible. No special permit is required for fishing on the Refuge, and all state and Refuge regulations apply. The Refuge is open to fishing from March 1 until October 15 with the exception of the area of the Refuge that is accessed by the Taylor Point Road, which allows fishing access along Elk Creek and the north shore of Silver Lake.

Figure 8: Current Visitor Services Facilities, Swan Lake NWR



- | | |
|-----------------------------------|----------------|
| FWS Approved Acquisition Boundary | Piers |
| Facility | Spotting Scope |
| Boat Launch | Hunting Blind |
| Parking Lot | |

Produced by USFWS
R3 Conservation Planning



Scale 1:65,000
0 0.25 0.5 1 1.5 2 Miles

Wildlife Observation, and Photography

Opportunities for wildlife observation and photography are found along the Refuge roads, at the overlook, and along the nature trail (Figure 8). The benches provided at the fishing platforms on Silver Lake and the universally accessible hunting blind can also be used for wildlife observation.

From 10,000 to 80,000 Canada Geese, up to 150,000 Snow Geese, and over 100,000 ducks can commonly be seen. In addition, more than 240 other species of birds are found here. Appendix C includes the Refuge's bird checklist.

Environmental Education and Interpretation

The Refuge is located in a rural setting in North-central Missouri that requires long commutes from most schools. Nonetheless, the Refuge is an attractive environmental education opportunity because of its unique wildlife resources and its location near a state park that also attracts school groups. Self-guided interpretation is available at the Refuge visitor center and along a nearby trail.

Non Wildlife-dependent Recreation

Visitors are allowed to gather nuts, berries, and mushrooms as well as to collect shed antlers in accordance with Refuge regulations.

Species Management

Animal Species

High densities of species like white-tailed deer, beaver, and raccoons can severely affect habitat quality and/or other species. Our primary goal in managing these populations is to provide complex



Information kiosk on the Refuge. Photo credit: FWS

habitat structures to meet the nesting, feeding, and resting requirements of migratory birds, listed species, and other wildlife. We continue to monitor deer herd size and health and attempt to manage density through a public hunt. Beaver are trapped when a management problem is identified.

Plant Species

Invasive or pest plants can affect many habitat types found at the Refuge. Reed canary grass and American lotus can invade wetlands, and *Sericia lespedeza*, Johnson grass, black locust, and honey locust can invade grasslands. To reduce encroachment by these species, we use several management techniques, such as hand pulling individual plants, mowing, burning, water level manipulation, plowing, and chemical applications. The technique we select is influenced by management objectives, intensity of encroachment, best land use practices, cost, and timing of application.

Archaeological and Cultural Resources

Cultural resources are important parts of the nation's heritage. The Service is committed to protecting valuable evidence of human interactions with each other and the landscape. Protection is accomplished in conjunction with the Service's mandate to protect fish, wildlife, and plant resources.

Other Management Areas

Research Natural Area

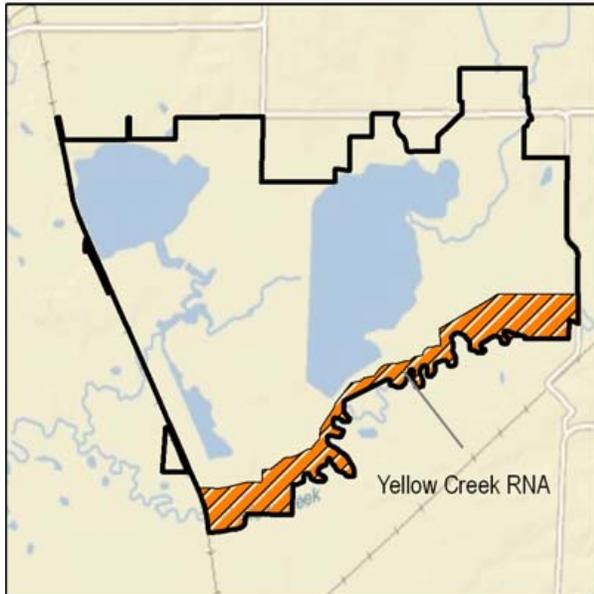
The 1,000-acre Yellow Creek Research Natural Area (Figure 9) was established in 1973 and includes mature bottomland hardwood forest. No management activities occur in the Research Natural Area. Research Natural Areas are part of a national network of reserved areas under various ownerships. Research Natural Areas are intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations.

In research natural areas, as in designated wilderness, natural processes are allowed to predominate without human intervention. Under certain circumstances, deliberate manipulation may be used to maintain the unique features for which the research natural area was established. Activities such as hiking, bird watching, hunting, fishing, wildlife observation, and photography are permissible, but not mandated, in research natural areas.

Farm Service Agency Conservation Easements and Fee Title Tracts

Swan Lake NWR manages 46 easements and outlying fee title tracts scattered across 15 Missouri counties (see Figure 10 on page 32). Little active

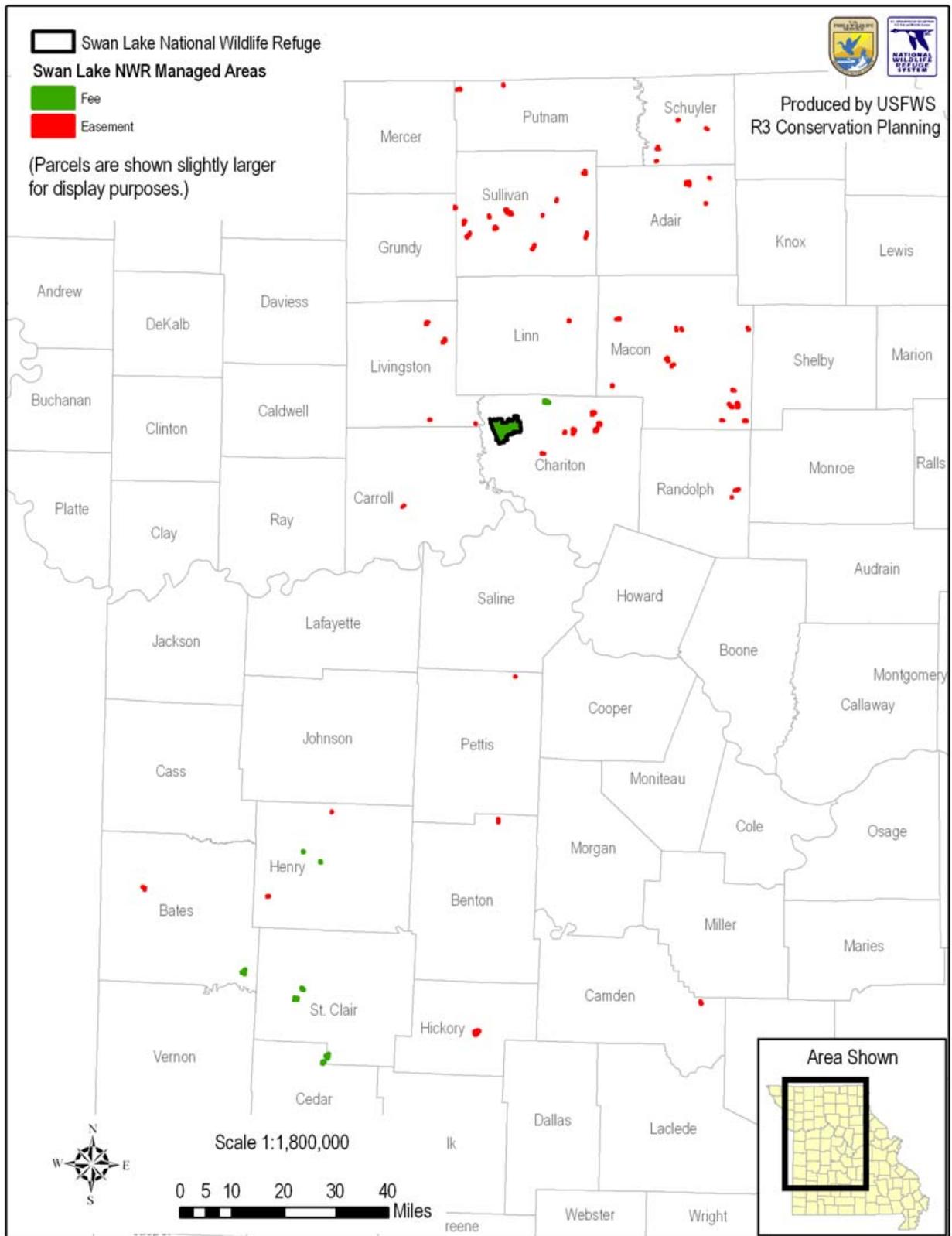
**Figure 9: Yellow Creek Research
Natural Area**



management occurs on these sites. The Farm Services Agency, formerly known as the Farm Services Administration, is an agency within the U.S. Department of Agriculture. The FSA makes loans to farmers and ranchers temporarily unable to obtain credit from commercial lending institutions. The FSA sometimes obtains title to real property when a borrower defaults on a loan secured by the property and holds such properties in inventory until sale or other disposal.

The Service is involved in the inventory disposal program because some FSA inventory properties contain or support significant fish and wildlife resources or have healthy restorable wetlands or other unique habitats. Some qualifying properties are transferred to the Service and become part of the National Wildlife Refuge System. Others are sold with restrictions known as conservation easements, which protect wetlands or other habitats. In most cases, the Service is responsible for the management and administration of properties with conservation easements.

Figure 10: FSA Parcels Managed by Swan Lake NWR



Chapter 4: Management Goals and Objectives

The Environmental Assessment in Appendix A describes and analyzes three management alternatives for Swan Lake NWR. The Service identifies one as its preferred alternative and it is described in the following chapter as the proposed future management direction that would guide activities on the Refuge for the next 15 years.

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

Finally, beneath each objective there is a list of strategies, the specific actions, tools, and techniques required to fulfill the objective. The strategies may be refined or amended as specific tasks are completed or new research and information come to light. Some strategies are linked to the duties of an employee position, which indicates that the strategy will be accomplished with the help of a new staff position. When a time in number of years is noted in an objective or strategy, it refers to the number of years from approval of this CCP. If no time is given, the objective is to be accomplished within the 15 years of the life of the Plan.

Goal A: Habitat

Wetlands, grasslands, and bottomland forests providing habitat for migratory birds, threatened and endangered species, and other wildlife within the Grand River floodplain.

Objective 1-1: Streams and Water Bodies

Over the long term (50 years), mimic components of historic hydrologic function along reaches of Elk Creek, Turkey Creek, Tough Branch, and Yellow Creek that are within the Refuge (Figure 11). Over the 15-year life of the Plan, allow for seasonal and annual variations in



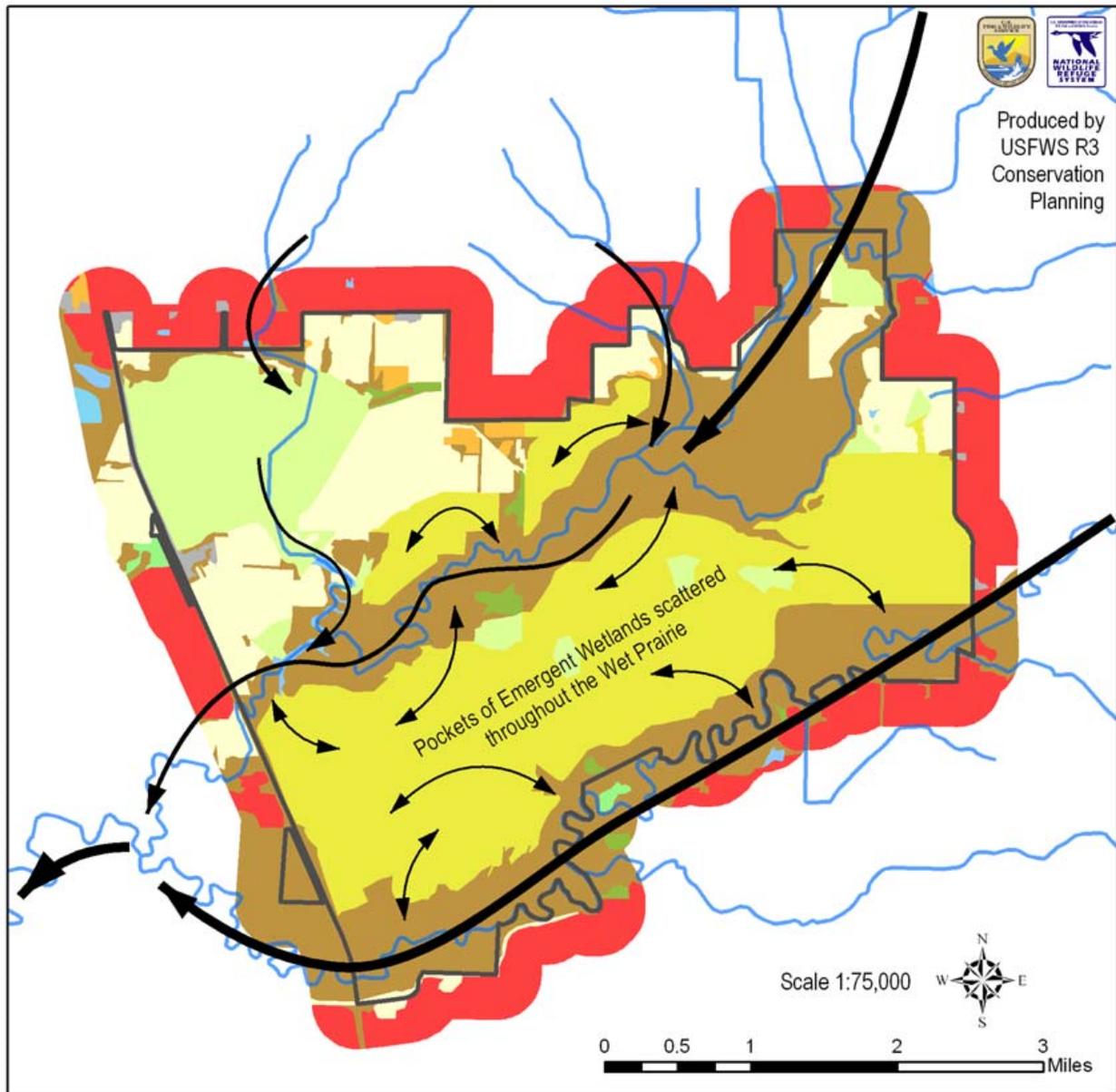
Bullfrog. Photo credit: FWS

water levels within the Swan Lake and Silver Lake basins to increase the amount and variety of native vegetation (see Objective 1-2 Emergent Wetland).

Rationale

Service policy calls for maintaining or, where feasible and consistent with Refuge purposes, restoring the composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment (U.S. Fish and Wildlife Service 2001). Alterations to hydrologic conditions – water movement, distribution, and quality – within the Grand River watershed over the past 150 years make it infeasible to fully restore historic hydrologic conditions, but it is possible to mimic some components of historic hydrology within the Refuge including seasonal and annual water level fluctuations and low impedance to water movement. Reintroducing these elements of historic hydrologic conditions is consistent with Service policy and would continue to meet the purposes of the Refuge by providing habitat for migratory birds and other wildlife. The near-term

Figure 11: Potential Water Movement and Likely Associated Vegetation, Swan Lake NWR



 Normal Streamflow
 Seasonal Flooding & Retreat

Wet prairie dominates the landscape and flooding occurs during high water events with lower areas remaining wet for longer periods of time.

Landcover based on NRCS SSURGO soils data and associated potential natural vegetation.

-  FWS Approved Acquisition Boundary
-  Potential Streamflow
- Potential Landcover**
-  Agricultural Fields
-  Bottomland Forest
-  Developed
-  Emergent Wetland
-  Native Upland Prairie
-  Oldfield
-  Open Water
-  Reseeded Grassland
-  Scattered Tree Grassland
-  Shallow Emergent Wetland
-  Shrub Swamp
-  Wet Meadow

Landcover based on NRCS SSURGO soils data and associated potential natural vegetation.

objective of increasing the amount and variety of vegetation within the impoundments also helps fulfill Refuge purposes. Presently (2009), the Silver Lake basin serves as a reservoir to provide source water for management activities across the Refuge, dedicating approximately one-fifth of total Refuge acres as open water that is largely devoid of aquatic vegetation and of little value to migratory birds for much of each year. Periodic dewatering of these basins would promote vegetative growth and increase their value as habitat.

Strategies

1. Conduct a hydrogeomorphic evaluation of the Refuge and surrounding area to assess historic hydrologic functions.
2. Monitor surface waters that impact Refuge hydrology (e.g. stage, stream flow, volume) including seasonal inflow variations within Elk Creek and Turkey Creek.
3. Monitor common invasive species pathways (e.g. streams, waterways, roads, trails) to aid in early detection of invasive species while continuing to treat known infestations as appropriate throughout the Refuge.
4. Conduct seasonal and annual drawdowns of the Swan Lake and Silver Lake basins and incorporate those drawdowns into the water management plan in conjunction with other water management on the Refuge.

Objective 1-2: Emergent Wetland

Within Wetland Management Units

Current (2010) amount about 1,700 acres

Over the life of the Plan, maintain at least 1,200 acres and up to 1,800 acres of emergent wetland habitat primarily within the Silver Lake, Swan Lake, and South Pool basins where bulrush and cattails comprise 25-50 percent of areal cover-



Swan Lake NWR. Photo credit: FWS

age and narrow-leaved cattail, bur reed, lotus, and arrowhead comprise less than 5 percent of areal coverage. Within 1 year of CCP approval, develop a water management regime that helps maintain the plant species mix described above.

Within Moist Soil Management Units

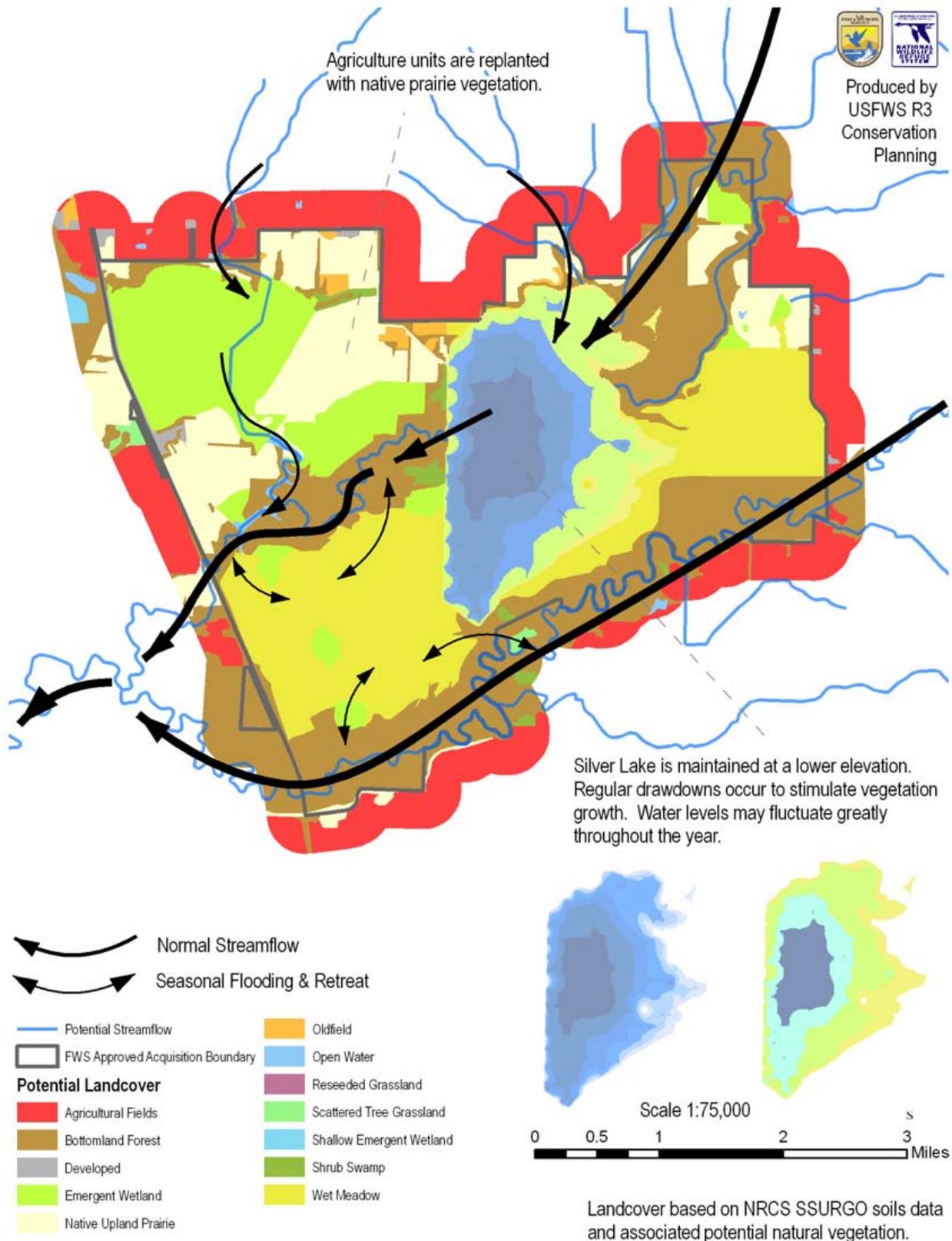
Current (2010) amount 13 units totaling about 800 acres

Over the life of the Plan, use moist soil techniques (as described in "Moist Soil Units" on page 26) to manage emergent wetlands at locations and an amount to be determined after the completion of an ongoing hydrogeomorphic evaluation. Manage moist soil areas to provide a diversity of native herbaceous plant foods such as wild millet (*Echinochloa* spp.); panic grass (*Panicum* spp.); smartweed (*Polygonum* spp.); sedges (*Cyperus* spp. and *Carex* spp.); and beggarticks (*Bidens* spp.), and ensure that up to 25 percent of the acreage is available as mud flat or shallow water (6 inches or less) unvegetated habitat in the spring and up to 10 percent of the acreage is available as mud flat or shallow water habitat with less than 50 percent cover in the fall for migrating shorebirds.

Rationale

The Upper Mississippi River and Great Lakes Region Joint Venture (UMRGLRJV) Waterfowl Habitat Conservation Strategy identifies two sets of habitat objectives: 1) Maintenance and Protection, that is the type and amount of habitat necessary to meet current waterfowl populations, and 2) Restoration and Enhancement, the amount and type of habitat necessary to meet waterfowl population goals. Emergent wetland managed using moist soil techniques fits within the Plan under the habitat categories Wet mudflat/moist soil plants and Shallow semi-permanent marsh, hemi-marsh. Within the portion of Missouri covered by the Joint Venture, the Plan identifies a need for more than 3,300 acres of Wet mudflat/moist soil plants and 197,551 acres of Shallow semi-permanent marsh, hemi-marsh habitat to meet existing waterfowl population levels. There is also a need for an additional 692 acres of wet mudflats/moist soil plant habitat and 840 acres of Shallow semi-permanent marsh, hemi-marsh to meet the target population goals. In addition, the Missouri Department of Conservation Wetland Management Plan (a step-down of the NAWMP) has an objective for state and federal refuges to provide habitat to support 29 million duck use days. Maintaining existing Wet mudflat/moist soil plant and Shallow semi-permanent, hemi marsh habitats on Swan Lake NWR contributes to meeting these larger conservation objectives as well as contributing to conservation objectives outlined in the United States

Figure 12: 15-Year Desired Land Cover, Swan Lake NWR



Shorebird Conservation Plan and the North American Waterbird Conservation Plan.

Strategies

1. Use water manipulation to encourage growth of desired species of emergent marsh plants while retarding the growth of undesirable species.
2. Ensure that up to 25 percent of the acreage of moist soil units is available as mud flat or shallow water (6 inches or less) unvegetated habitat in the spring and up to 10 percent of the acreage is available as mud flat or shallow water habitat with less than 50 percent cover in the fall for migrating shorebirds.
3. Periodically disturb areas under moist soil management through burning, disking, cropping, and seeding to retard succession of woody vegetation.
4. Consider other opportunities to install additional levees and water control structures to create other moist soil units.
5. Remove mature willow stands to create more emergent marsh along the perimeter of emergent marsh habitats.
6. If necessary, install water wells to ensure water availability to flood moist soil units when water is not available from the Silver Lake Pool. Explore the feasibility of placing a pump station on Swan Lake so in the years that Silver is in draw down, water can be used from Swan Lake Pool to flood moist soil.
7. Treat known infestations of invasive species as appropriate within emergent wetland habitat while continuing to monitor common invasive species pathways (e.g. streams, waterways, roads, trails) to aid in early detection of invasive species introductions.

Objective 1-3 Shrub Swamp

Current (2010) amount is about 400 acres.

Over the life of the Plan, maintain 300 to 500 acres of shrub swamp dominated by at least 50 percent areal coverage of buttonbush and willow.

Rationale

The Upper Mississippi River and Great Lakes Region Joint Venture (UMRGLRJV) produced four conservation strategies directed at shorebirds, landbirds, waterbirds, and waterfowl that identify habitat objectives necessary to maintain existing bird populations and additional habitat necessary to support target populations. The compiled habitat objec-

tives for all four conservation strategies are summarized in the UMRGLRJV Implementation Plan (2007). Shrub swamp fits within the Plan under the habitat category “Marsh” with associated forest/shrub. Within the portion of Missouri covered by the Joint Venture (approximately two-thirds of the state) the Plan identifies a need for nearly 17,000 acres of marsh with associated forest/shrub habitat to meet existing bird population levels and the need for an additional 3,367 acres to meet bird population goals. Maintaining existing shrub swamp habitat on the Refuge contributes to meeting this larger conservation objective.

Strategies

1. Use water manipulation to encourage growth of desired species while retarding the growth of undesirable species.
2. Look at past aerial photography to determine the changes in the amount of this habitat within the Refuge.
3. Encourage and allow overgrowth of shrub communities along riparian areas and in some cases along the toe of Refuge levees.
4. Treat known infestations of invasive species as appropriate within shrub swamp habitat while continuing to monitor common invasive species pathways (e.g. streams, waterways, roads, trails) to aid in early detection of invasive species introductions.

Objective 1-4 Wet Meadow

Current (2010) amount is about 100 acres.

Within 5 years of Plan approval, convert approximately 530 acres of existing cropland; food plots; areas of dense early successional forest largely comprised of willow; buttonbush, and silver maple; and areas dominated by reed canary grass to wet meadow comprised of sedges (e.g. *Cyperus* spp. and *Carex* spp.), prairie cordgrass (*Spartina pectinata*), and forbs (e.g. *Asclepias* spp., *Polygonum* spp., *Vernonia* spp., *Solidago* spp., *Bidens* spp., *Ambrosia* spp., *Rudbeckia* spp.).

Rationale

Service policy calls for maintaining or restoring Refuge habitats to historic conditions if doing so is feasible and does not conflict with Refuge purposes (U.S. Fish and Wildlife Service 2001). The primary purpose of the Refuge is to provide habitat for migratory birds. In addition to waterfowl, this includes many other water birds and migrant landbirds. Cropland and food plots are not native habitat, and although they attract wildlife, are not as diverse as native habitat. Properly managed wet

meadows can provide an important food source for migrating waterfowl. Wet meadows are a type of wetland that occurs where groundwater is at or near the surface most of the growing season following spring runoff. Wet meadows provide important ecological benefits including breeding and foraging habitat for birds and invertebrates and habitat for wetland plants. The single most important characteristic of a wet meadow is its hydrology. Seasonality and reliability of yearly water inflows and outflows largely determine the vegetational stability of wet meadows.

Strategies

1. Study the possibility of restoring sheet flow across the Refuge to create wet meadow habitat in support of the suite of species associated with wet meadow habitat.
2. Consider restoring wet meadow in the corridor that leads into Swan Lake.
3. Periodically disturb areas through burning, mowing, grazing, or other means to retard woody succession. Coordinate with Ecological Services regarding appropriate activities within habitat for eastern massasauga rattlesnake but, in general, avoid haying, grazing, mowing or other disturbance methods that may be harmful to the snake.
4. Treat known infestations of invasive species as appropriate within wet meadow habitat while continuing to monitor common invasive species pathways (e.g. streams, waterways, roads, trails) to aid in early detection of invasive species introductions.

Objective 1-5 Native Upland Prairie

Current (2010) amount is about 1,000 acres.

Within 10 years of Plan approval, convert approximately 835 acres of existing cropland or food plots to native prairie, and maintain a diverse floral community within converted and existing grasslands composed of at least 50 percent of native prairie plant species identified for this area.

Rationale

Service policy calls for maintaining or restoring Refuge habitats to historic conditions if doing so is feasible and does not conflict with Refuge purposes (U.S. Fish and Wildlife Service 2001). The primary purpose of the Refuge is to provide habitat for migratory birds. In addition to waterfowl, this includes many other water birds and migrant landbirds. Cropland and food plots are not native habitat, and although they attract wildlife, are not as diverse as native habitat. Short and tall grass prai-

ries were major habitat types in much of the Great Plains including part of Central Missouri. These habitat types were actively maintained and managed by Native Americans using fire as a management tool. Fire suppression and a major shift to agriculture have dramatically reduced the extent of this ecosystem type. Providing a representative example of this habitat type on the Refuge will serve a variety of species that prefer this habitat and provide the public with an important environmental education opportunity as to the importance of this habitat and its history in the area.

Strategies

1. Increase species diversity of existing grasslands to include forbs, etc.
2. Develop a fire management plan for the maintenance of this habitat type.
3. Implement a grazing program that introduces natural grazing regimes to native grasslands to maintain grassland quality and biological diversity.
4. Coordinate with Ecological Services regarding appropriate activities within habitat for eastern massasauga rattlesnake but, in general, avoid haying, grazing, mowing or other disturbance methods that may be harmful to the snake.
5. Treat known infestations of invasive species as appropriate within prairie habitat while continuing to monitor common invasive species pathways (e.g. streams, waterways, roads, trails) to aid in early detection of invasive species introductions.

Objective 1-6 Cropland

Current (2010) amount is about 1,400 acres.

Within 10 years of Plan approval, convert all cropland to other native habitats (see Objectives 1-2, 1-4 and 1-5).

Rationale

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (U. S. Fish and Wildlife Service 2001). Cropland is not native habitat, it requires intensive management, and although it attracts some types of wildlife, it provides little value to wildlife for much of the year. Cropland is also abundant outside of the Refuge and native habitats such as prairie and wet meadow are scarce. Some sites will continue to be cropped for several years until they are converted to other habitats. In those locations it is likely farming practices will include the use of herbicide-resistant

crop plants that are genetically modified to make them resistant to herbicides used to chemically weed the crops. Herbicide-resistant crops are genetically modified organisms and their use on the Refuge is governed by regional policy.

Objective 1-7 Bottomland Forest

Current (2010) amount about 3,100 acres.

Over the long term (100-200 years), maintain the existing amount of bottomland hardwood stands with a mosaic of age and structural classes distributed across a narrow elevation gradient with lower elevations dominated by black willow, silver maple, and river birch, mid elevations dominated by pin oak, swamp white oak, red maple, green ash, sycamore, and cottonwood, and upper elevations dominated by other oaks, hickory, and pecan. Within 10 years of Plan approval ensure that approximately 20 percent of stands are converting to red oak species and their associates based on regeneration surveys.

Rationale

Bottomland hardwood forests provide important riparian habitat buffer for many watercourses on the Refuge. This buffer helps improve water quality in Refuge streams and provides habitat for a variety of native wildlife. In addition, a number of bottomland forest-dependent migratory songbirds are declining as a result of insufficient or fragmented habitat. Conservation and management of suitable habitat are principal strategies for attaining more abundant populations of these birds.

Strategies

1. Complete a forest resources inventory to determine the quality and quantity of woodlands for wildlife.
2. Study the causes for the loss of bottomland forests understory that is adversely affecting woodland birds and other wildlife.
3. Levels of forest on the Refuge need to be inventoried for composition, recruitment, survival, and growth rates.
4. Within 3 to 5 years of Plan approval, determine high priority areas for invasive plant removal based on level of threat, potential for reinfestation, etc., targeting areas where treatment will be most effective with the aim of allowing no more than 10 percent to be affected by invasive species.
5. Treat known infestations of invasive species as appropriate within bottomland forest habitat while continuing to monitor common invasive

species pathways (e.g. streams, waterways, roads, trails) to aid in early detection of invasive species introductions.

Objective 1-8 Watershed Conservation

Within 5 years of Plan approval, quantify water needs and available water sources necessary to meet Refuge management objectives. Also, over the life of the Plan, maintain or improve water quality within Refuge source waters to meet Refuge management objectives and comply with current standards of the Environmental Protection Agency and Missouri Department of Natural Resources.

Rationale

At present annual water requirements and available water sources (other than the Silver Lake basin) are not well documented for the Refuge. Because the purpose of the Refuge is to provide habitat for migratory birds, many of which depend on water, quantifying water needs and sources is necessary to meet current and future Refuge management objectives. Service policy regarding Biological Integrity, Diversity, and Environmental Health (U.S. Fish and Wildlife Service 2001) acknowledges the importance of water quality. Working within and beyond the Refuge to maintain or improve water quality helps meet the purposes of the Refuge and the goals of the National Wildlife Refuge System.

Strategies

1. Work with the Service's Partners for Fish and Wildlife program and other agencies and organizations to improve erosion control within the Refuge watershed.
2. Evaluate Refuge water control structures to ensure that they are adequate to minimize flooding on neighboring lands.
3. Within 3 years of Plan approval, collect baseline information on stream flora, fauna, and hydrology to help identify opportunities for restoring habitat and natural flow patterns.
4. Monitor current stream vegetation, and explore options for restoring natural flows.
5. Continue to participate as a partner in the Lower Grand River Conservation Opportunity Area.

Objective 1-9 Outlying Fee Title Properties and Easements

Within 5 years of Plan approval, develop a strategy for ensuring that the condition and management of outlying fee title properties and easements are in compliance with Service direction.

Rationale

Beyond the core area of the Refuge proper, Refuge personnel are responsible for condition and management of 46 parcels and easements ranging in size from 10 acres to more than 200 acres at varying distances from the Refuge with some more than 100 miles from the Refuge headquarters.

Strategies

1. Annually contact landowners of all parcels.
2. Annually inspect easements.
3. Post boundaries of outlying parcels.
4. Survey/post all easement boundaries.
5. Consider priority public use opportunities on fee-owned easements.

Goal 2: Wildlife

Diverse wildlife teeming within native habitats of the Grand River floodplain.

Objective 2-1: Threatened and Endangered Species

Within 5 years of Plan approval, implement a monitoring program to track abundance, population trends, and/or habitat associations of selected species (of present interest is Indiana bat).

Rationale

Conserving a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered is one of the goals of the National Wildlife Refuge System. To evaluate whether management actions are having the predicted consequences, we need to monitor actual outcomes, most often using a representative sample of sites to ensure that, on average, the effects of a particular type of treatment match expectations. Information gained through monitoring helps us learn and adapt our management actions, increasing our effectiveness in meeting conservation objectives.

Strategies:

1. Working with the state of Missouri and the Indiana Bat Recovery Team, determine what role Swan Lake NWR plays in supporting viable populations of these species/subspecies.

From this information, the station can determine whether long-term monitoring is appropriate and what information with regard to future management is expected to be gained from such effort.

2. Follow Ecological Services guidelines when working in Refuge forested areas by not removing potential roost trees with loose exfoliating bark, primarily Shagbark Hickory, or dead or dying trees with a diameter (dbh) of 9 inches or greater.

Objective 2-2 Migratory and Resident Birds

Within 5 years of Plan approval, implement a monitoring program to track abundance, population trends, and/or habitat associations of migratory bird species with emphasis on waterfowl and shorebirds. Link monitoring to management information needs and to species or habitats of concern or special interest.

Rationale

Conserving a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered, is one of the goals of the National Wildlife Refuge System. Furthermore, one of the purposes of Refuge is to provide habitat for migratory birds. To evaluate whether management actions are having the predicted consequences, we need to monitor actual outcomes, most often using a representative sample of sites to ensure that, on average, the effects of a particular type of treatment match expectations. Information gained through monitoring that is clearly linked to our management actions helps us learn and adapt, increasing our effectiveness in meeting conservation objectives.

Strategies

1. Develop an Inventory and Monitoring Plan that links monitoring to management information needs and to species or habitats of concern or special interest.
2. Work in support of the Missouri Department of Conservation with regard to ensuring Refuge management can be as compatible as possible to the surrounding management efforts of resident birds in Missouri without compromising the mission of the Refuge to create a win/win situation.

Objective 2-3: Eastern Massasauga Rattlesnake

Within 10 years of Plan approval, provide habitat suitable to support a viable population of the eastern massasauga rattlesnake and potentially avoid listing the snake under the Endangered Species Act.

Rationale

Populations of the eastern massasauga rattlesnake are in decline range-wide and the species is a candidate for listing under the Endangered Species Act. According to a 1998 Service status assessment of the snake, Swan Lake NWR harbors one of three remaining populations in Missouri (Szymanski 1998). The assessment rates the Swan Lake NWR population as vulnerable, meaning its long-term viability is in question, and notes the primary threat as limited habitat. The Service completed an environmental assessment in 2005 that called for protecting the remaining core populations of the snake found on public lands including the one on the Refuge. Maintaining the eastern massasauga rattlesnake population on the Refuge helps maintain their numbers, improves the long-term prospects for the species, and potentially avoids listing the snake. A viable population is defined here as one that has less than a 5 percent chance of extinction over 25 years as predicted by current population models (Redmer and Szymanski, in process). Durbian and others (2008) recommend that to sustain a population of eastern massasauga rattlesnakes requires at least 250 acres of contiguous habitat that contains a mosaic of open (free of any canopy created by trees or brush) early successional lowlands and uplands and is within easy traveling distance (approximately 1,300 feet) of hibernation sites. This is approximately the amount of habitat currently available for eastern massasauga rattlesnakes on the Refuge.

Strategies

1. Work with the state of Missouri and Ecological Services to determine the best role for Swan Lake NWR in supporting a population of eastern massasauga rattlesnakes and clearly identify population objectives from which a monitoring program can be developed.
2. Working with the state of Missouri and Ecological Services and using data derived from a hydrogeomorphic analysis of the Refuge, determine what areas are suitable and desired in managing for critical habitat necessary to maintain a viable population of eastern massasauga rattlesnakes to help in recovering the species and potentially prevent its listing under the Endangered Species Act.
3. Limit managed grassland disturbances such as prescribed burning and mowing in grasslands where eastern massasauga rattlesnakes are present to periods during their hibernation period (November 16 through March 31). Additionally, late fall or early spring prescribed fires should not occur when either the soil temperature at 4 inches depth reaches 43

degrees Fahrenheit or the high ambient daily temperature reaches 50 degrees Fahrenheit for three consecutive days.

4. Increase the amount of contiguous habitat for eastern massasauga rattlesnakes on the Refuge.
5. Coordinate with Ecological Services on management activities (such as prescribed burning, mowing, haying, construction activities, etc.) occurring within massasauga habitat.

Goal 3: People

Visitors enjoy wildlife-dependent recreation and understand the natural and cultural resources of the Refuge and its role in their conservation.

Objective 3-1: Welcoming and Orienting Visitors

Within 10 years of Plan approval, provide a staffed point of contact during normal working hours year-round on business days and seasonally on holidays and weekends to accommodate up to 50,000 visitors annually.

Rationale

Welcoming and orienting Refuge visitors contributes to several of the criteria defining a quality wildlife-dependent recreation program (U.S. Fish and Wildlife Service 2006a). Maintaining a staffed point of contact during periods of highest visitation is an effective way to help welcome and orient the largest volume of visitors.

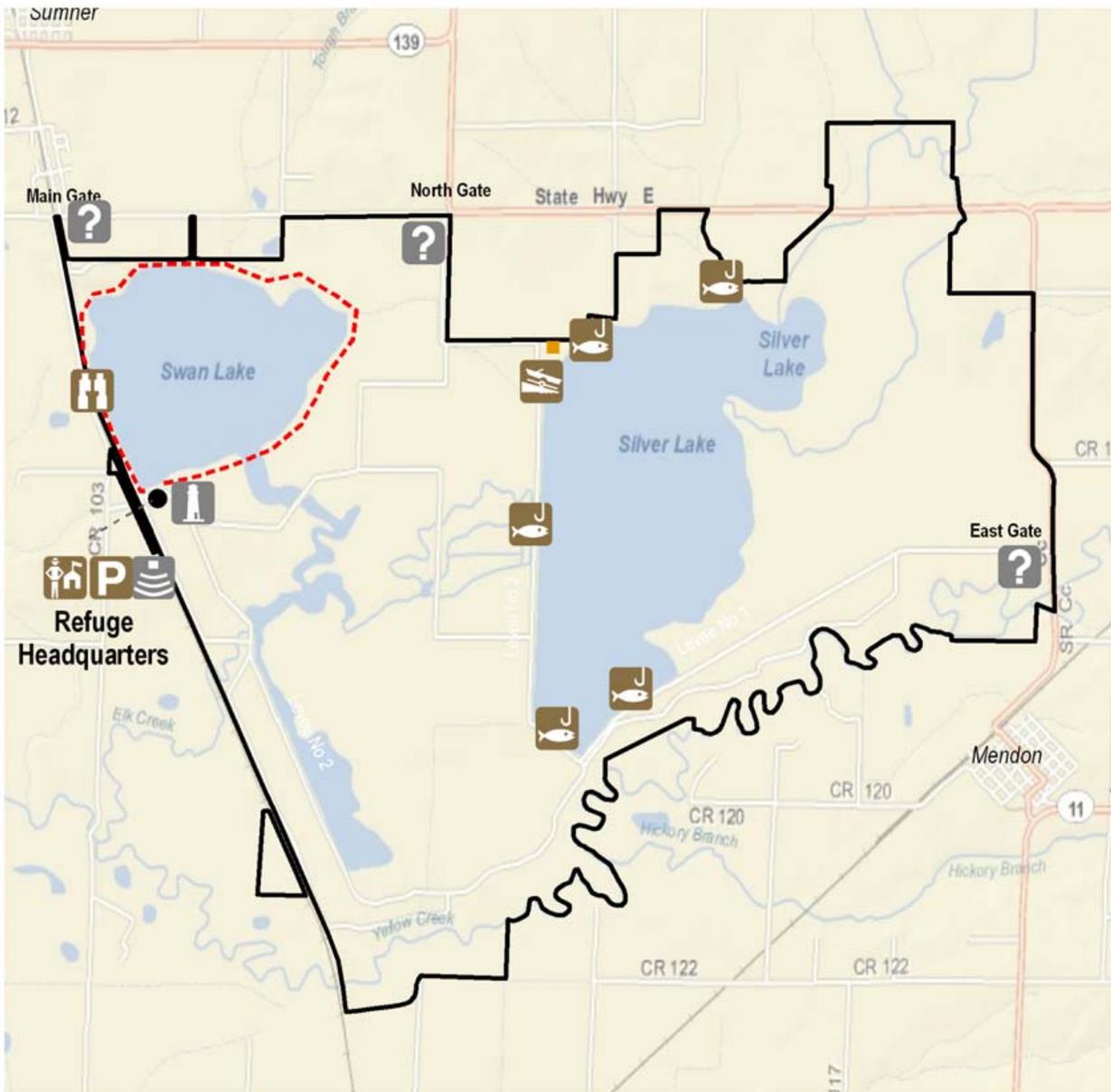
Strategies

1. Determine options for increasing opportunities for compatible public uses to occur concurrently.
2. Develop and have available brochures that are up-to-date and informative.
3. Office personnel will ensure that the office is open to the public as much as possible during business hours.
4. Use volunteer resources to keep the visitor center staffed on holidays, weekends, and evenings.
5. Fully utilize Refuge website and Refuge phone systems to update visitors about Refuge information, including wildlife counts.

Objective 3-2: Hunting

Maintain existing hunting opportunities and within 2 years of CCP approval, propose changes to Refuge regulations (as part of a formal opening package) that includes introducing duck hunting and small game hunting, and

Figure 13: Future Visitor Facilities, Swan Lake NWR



- FWS Approved Acquisition Boundary
- ADA Hunting Blind
- Current Facilities**
- Piers
- Boat Launch
- Parking Lot
- Spotting Scope
- Future Facilities**
- Kiosks
- Bench
- Observation Tower
- Future Swan Lake Trail

Produced by USFWS
R3 Conservation Planning



Scale 1:65,000



emphasize opportunities for youth and the disabled. Within 7 years of approval of the Plan, reliably determine the number of hunting visits to the Refuge and that at least 85 percent of hunters judge that they are being provided a quality opportunity.

Rationale

Hunting is an important wildlife management tool that the Service recognizes as a healthy, traditional outdoor pastime, deeply rooted in the American heritage. Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs. Hunting programs help promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Hunting is a priority general public use of the National Wildlife Refuge System, and Service policy directs us to provide hunting opportunities when compatible (U.S. Fish and Wildlife Service 2006b). To initiate or expand hunting programs, the Service must publish in the Federal Register any proposed and final refuge-specific regulations pertaining to that use prior to implementing or publishing them in Refuge hunt brochures or other public documents. These regulations may include an entirely new hunt program, a new category of hunting (e.g., small game), a new species not addressed in a previous opening package (e.g. ducks), or a new area(s) open to public hunting not addressed in a previous opening package. Monitoring hunter participation and satisfaction are necessary to evaluate the quality of the Refuge hunting program.

Strategies

1. Any existing Refuge waterfowl hunting sites affected by the conversion of cropland to other habitats would be offset by providing hunting opportunities at other locations.
2. As appropriate, prepare hunting opportunities for disabled hunters.
3. Maintain one or more sanctuary areas free of hunting and other human disturbance to provide a feeding and resting area for migratory birds.
4. Compile annual hunting statistics to determine hunter use, success, etc.
5. Host a pre-season hunt public meeting to discuss and inform hunters about the hunting program and a post season hunt public meeting to receive feedback from hunters regarding the Refuge hunt program.



Hunting is a popular wildlife-dependent recreation on the Refuge. Photo credit: FWS

6. Develop a mentoring program for youth waterfowl hunters.
7. Continue cooperating with MDC in implementing seasons for resident game species.

Objective 3-3: Fishing

Over the life of the Plan, provide access for fishing in accordance with state and Refuge regulations.

Rationale

The primary purpose of the Refuge is to provide for the needs of migratory birds. Although the Refuge does harbor some sport fish of interest to anglers, the small, warm water streams and turbid waters within the Silver Lake basin do not support a diverse or abundant fishery. The Service recognizes fishing as a healthy traditional outdoor pastime that is deeply rooted in America's natural heritage, but neither the purpose of the Refuge nor the available resources are well suited to providing a quality fishing experience as defined by Service policy (U.S. Fish and Wildlife Service 2006c). The Refuge will continue to provide access for the limited fishing opportunities that exist, but these opportunities are likely to be sporadic and not a focus of Refuge management.

Strategies

1. Ensure adequate access to Refuge fisheries resources so that the fishing public can access fishing opportunities that exist on the Refuge in accordance with Missouri state regulations and specific Refuge regulations.
2. Allow fishing access to the Taylor Point area of Elk Creek during the winter closure of the Refuge (November through February).

Objective 3-4: Wildlife Observation and Photography

Provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from early March through late October, and by allowing visitors limited access to selected portions of the Refuge during closed periods.

Rationale

Service policy supports providing opportunities for wildlife observation and photography when it is compatible with Refuge purposes and the mission of the National Wildlife Refuge System (U.S. Fish and Wildlife Service 2006d). Wildlife observation can promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Providing opportunities to observe wildlife fosters a sense of stewardship for the Refuge System, wildlife, and habitat resources through direct experience. Wildlife observation is a popular activity at the Refuge especially in October and November during fall migration. Allowing visitors limited access during fall and winter months is one way to accommodate this use while also minimizing disturbance to wildlife.

Strategies

1. Provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from early March through late October.
2. Allow visitors limited access to selected portions of the Refuge during closed periods.
3. Develop a foot trail around Swan Lake and incorporate photo blinds, overlooks, and interpretation within the trail system.
4. Provide for periodic guided tours through the interior of the Refuge throughout the year. Limit participants to a reasonable number to minimize disturbances between October 31 and February 28.
5. Rehabilitate the old observation tower to meet safety standards and make it available to the

public. Incorporate a video camera on the tower for accessible viewing opportunities.

Objective 3-5: Interpretation

Within 10 years of Plan approval, provide staffed interpretive facilities during normal working hours year-round on business days and seasonally on holidays and weekends.

Rationale

Well-designed interpretive programs can be effective resource management tools that provide us an opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service to influence visitor behavior when visiting units of the Refuge System. Interpretation is a priority general public use of the National Wildlife Refuge System, and Service policy directs that refuges provide interpretation when it is compatible with refuge purposes and the mission of the National Wildlife Refuge System (U.S. Fish and Wildlife Service 2006g).

Strategies

1. Consider using a portion of the Refuge headquarters to house a diorama of important habitat types on the Refuge.
2. Train a volunteer visitor center host to interpret Swan Lake NWR, the National Wildlife Refuge System and the U. S. Fish and Wildlife Service.
3. Place a kiosk at each Refuge entrance providing a Refuge map, regulations, activities and interpretation.
4. Develop an auto tour route that includes interpretive information.

Objective 3-6: Environmental/Conservation Education

Within 5 years of Plan approval, develop an environmental education site that includes an outdoor classroom. Once the site is developed, 80 percent of educators using the site annually report it supports their curriculum and helps in promoting resource stewardship and conservation.

Rationale

Providing and promoting environmental education helps develop a citizenry that has the awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively toward the conservation of our nation's environmental resources. Environmental education is a priority general public use of the National Wildlife Refuge System, and Service policy directs refuges to provide environmental education programs when they are compati-

ble with refuge purposes and the mission of the Refuge System.

Strategies

1. Develop an environmental education site at a suitable location outside of the flood plain and in an area that does not lose access due to flooding. Conservation education will be a priority use for this small area. Until that site is identified and established, utilize the current Refuge Headquarters and Visitor Center site (approximately 10 acres) for this purpose.
2. Work with area schools and educational organizations to develop educational/interpretive facilities that meet state conservation education requirements.
3. Ensure that environmental education facilities fit into the natural landscape of the Refuge and that they are energy efficient and facilitate students getting to the outdoors.
4. Develop a wetland education program that uses a wetland within the environmental education site to provide year-around access for students.
5. Incorporate outdoor education related to the priority public uses within the education program.
6. Use special events throughout the year for public interpretation and education.

Objective 3-7: Other Compatible Recreation and Uses

Over the life of the Plan, provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use.

Rationale

The National Wildlife Refuge System Improvement Act of 1997 identifies six priority public uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. These priority uses receive enhanced consideration over other general public uses in planning and management of the Refuge System. Other uses can occur but must support a priority public use or not conflict with priority public uses. No use of a national wildlife refuge can detract from accomplishing the purposes of the Refuge or the mission of the System. Gathering of mushrooms, berries, and antlers has historically been allowed on the Refuge and has become a custom of the local community. The Refuge is open to the public during the time periods that the use is allowed, so no additional disturbance is created by allowing this use. Gathering allows the public to build a connection to the Refuge through personal outdoor experiences that

engage the senses and foster an appreciation of the outdoors.

Strategies:

1. Provide opportunities for these harvesting activities including gathering nuts, berries, mushrooms, and deer antlers consistent with Refuge regulations.
2. As part of the Visitor Services step-down management plan, develop Refuge policy that defines times and limitations on gathering mushrooms, berries, and antlers so as to allow equity among visitors for access to these resources.

Objective 3-8: Friends and Volunteers

Over the life of the Plan, continue to develop the Friends group and provide volunteer opportunities that total at least 1,000 hours annually.

Rationale

A Refuge Friends Group is a grassroots organization formed by citizens who have a shared vision of supporting their local national wildlife refuge. They join with Service personnel in a partnership that seeks to accomplish mutually defined goals. Establishing a Friends group helps build a constituency of support for the Refuge, provides people with opportunities to assist us in accomplishing our mission, and enhances our performance through the creativity, innovations, labor, and expertise contributed by Friends members.

Strategies

1. Refuge staff will initiate and nurture relationships with volunteers and Refuge support groups with the goal of fortifying important Refuge activities.
2. Refuge personnel will seek to make the Refuge an integral part of the community by providing volunteer opportunities that total at least 1,000 hours annually.
3. Develop a work camper program to provide volunteer services for the visitor services program and Refuge management and maintenance activities.
4. Develop a volunteer program by utilizing members of the local community to provide volunteer services to the Refuge. This will include volunteers for mentoring youth hunters as well.

Objective 3-9 Community Relations

Within 3 years of approval of the Plan increase local community support and appreciation for

fish and wildlife conservation and endorse the Refuge's role in conservation.

Rationale

The Service's National Outreach Strategy (U.S. Fish and Wildlife Service, 1997) defines outreach as two-way communication between the U.S. Fish and Wildlife 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. Providing a clear, consistent message about the role of the Refuge helps build support and understanding.

Strategies

1. Speak to local civic and outdoor enthusiasts groups and at special events throughout the year.
2. Continue to provide information and interviews for local news media and outdoors writers as well as distribute news annually.
3. Refuge staff will provide support and assistance to the local community in planning and carrying out the annual Goose Festival in Sumner.
4. Refuge staff will attend and make presentations to area service organizations providing information about the Refuge.
5. Make use of an established friends group to better educate the public in outlying communities such as Chillicothe, Brookfield, Carrollton, Moberly, etc. about the Refuge.

Objective 3-10 Archeological, Cultural, and Historic Protection

Over the life of the Plan, avoid and protect or mitigate against disturbance of all known cultural, historic, or archeological sites.

Rationale

The integrity of cultural resources located on Service lands is subject to threats from erosion, neglect, vandalism, grazing, cultivation, and other land disturbing activities. The Service is required by statute to exercise caution in carrying out its activities to assure that historic properties are not inadvertently sold, demolished, substantially altered, or allowed to deteriorate significantly without adequate review and protection.

Strategies

1. Conduct an archeological, cultural and historical review of Refuge properties and facilities and ensure any areas identified are managed within archeological, cultural and historic policy.

Chapter 5: Plan Implementation

Introduction

This chapter summarizes the actions, funding, coordination, and monitoring to implement the CCP. As noted in the inside cover of this document, this Plan does not constitute a commitment for staffing increases or operational and maintenance increases. These decisions are at the discretion of Congress in overall appropriations, and in budget allocation decisions made at the Washington and Regional levels of the Service.

New and Existing Projects

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

Staffing

Implementing the vision set forth in this CCP will require changes in the organizational structure of the Refuge. Existing staff will direct their time and energy in new directions and new staff members will be added to assist in these efforts. Table 4 presents current staffing and the increases proposed for the Refuge in this Plan.

Partnership Opportunities

Partnerships are an essential element for the successful accomplishment of goals, objectives, and strategies at Swan Lake NWR. The objectives outlined in this CCP need the support and the partnerships of federal, state and local agencies, non-governmental organizations and individual citizens.

Table 4: Current and Proposed Staffing Under the CCP

Current Staff 4.0 FTEs	Proposed Additions 7.0 FTEs
Project Leader	Assistant Project Leader
Office Assistant	Maintenance Worker
Maintenance Mechanic	Park Ranger
Heavy Equipment Operator (Vacant)	Wildlife Biologist
	Biological Technician
	Private Lands Biologist
	Rangeland Technician

Refuge staff will continue to seek creative partnership opportunities to achieve the vision of the Refuge.

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

- Friends of Swan Lake NWR
- Missouri Department of Conservation
- Missouri Department of Natural Resources
- Missouri Department of Transportation
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S Environmental Protection Agency
- Farm Service Agency
- Ducks Unlimited
- The Greater Chillicothe Visitors Region

Step-down Management Plans

The CCP is a plan that provides general concepts and specific wildlife, habitat, and people related objectives. Step-down management plans provide greater detail to managers and employees

Table 5: Step-down Management Plan Schedule

Step-down Management Plan	Estimated Time of Completion After CCP Approval
Hunting Plan	2 years
Habitat Management Plan, including forest, wetland and grassland components	3 years
Visitor Services Plan	4 years
Integrated Pest Management Plan	5 years
Inventory and Monitoring Plan	3 years

who will carry out the strategies described in the CCP. The Refuge staff will revise or develop the step-down plans described in Table 5.

Monitoring and Evaluation

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

Plan Review and Revision

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

Appendix A: Environmental Assessment

U.S. Fish and Wildlife Service

Department of the Interior

ENVIRONMENTAL ASSESSMENT FOR IMPLEMENTATION OF COMPREHENSIVE CONSERVATION PLAN FOR SWAN LAKE NATIONAL WILDLIFE REFUGE

Abstract: The U.S. Fish and Wildlife Service is proposing to implement a Comprehensive Conservation Plan (CCP) for the Swan Lake National Wildlife Refuge (NWR) in Missouri. This Environmental Assessment (EA) considers the biological, environmental, and socioeconomic effects that implementing the CCP (the preferred alternative is the proposed action) or one of the two other alternatives would have on the issues and concerns identified during the planning process. The purpose of the proposed action is to establish the management direction for the Refuge for the next 15 years. This management action will be achieved by implementing a detailed set of goals, objectives, and strategies described in a CCP.

Responsible Agency and Official:

Tom Melius, Regional Director
U.S. Fish & Wildlife Service
Bishop Henry Whipple Federal Building
1 Federal Drive
Ft. Snelling, MN 55111

Contacts for additional information about this project:

Steve Whitson, Refuge Manager
Swan Lake NWR
16194 Swan Lake Avenue
Sumner, MO 64681
660-856-3323

Thomas Larson, Chief of Conservation Planning
U.S. Fish & Wildlife Service
NWRS/Conservation Planning
Bishop Henry Whipple Federal Building
1 Federal Drive
Ft. Snelling, MN 55111
612-713-5430

Swan Lake

National Wildlife Refuge

Environmental Assessment

Table of Contents

Chapter 1: Purpose and Need for the Proposed Action	55
1.1 Purpose and Need for Action	55
1.1.1 Purpose	55
1.1.2 Need for Action	56
1.2 Decision Framework	56
1.3 Background	57
1.3.1 The United States Fish and Wildlife Service	57
1.3.2 The National Wildlife Refuge System	57
1.3.3 Swan Lake National Wildlife Refuge	58
1.3.4 Swan Lake NWR Vision Statement for Desired Future Condition	58
1.3.4.1 Vision Statement	58
1.3.5 Refuge Goals	58
1.4 Scoping and Public Involvement	59
1.4.1 Issues and Concerns	60
1.5 Legal, Policy, and Administrative Guidelines	60
1.5.1 Legal Mandates	60
Chapter 2: Description of Alternatives	61
2.1 Rationale for Alternative Designs	61
2.2 Alternatives Considered But Not Analyzed in Detail	61
2.2.1 Visitor Services Focus	61
2.3 Description of Alternatives	61
2.3.1 Elements Common to All Alternatives	62
2.3.1.1 Habitat	62
2.3.1.2 Wildlife	62
2.3.1.3 People	62
2.3.1.4 Listed Species and Other Species of Interest	62
2.3.1.5 Archaeological and Cultural Resource Values	62
2.3.2 Alternative 1: Current Management Direction (No Action)	62
2.3.3 Alternative 2	63
2.3.4 Alternative 3: Preferred Alternative	63
Chapter 3: Affected Environment	67
3.1 Description of Swan Lake National Wildlife Refuge	67
3.2 Habitat Overview	67
3.2.1 Forested Resources	67
3.2.2 Wetland Resources	67
3.2.3 Grassland Resources	67
3.2.4 Invasive Species	68
3.2.5 Sedimentation and Water Quality	68
3.2.6 Geomorphology and Soils	68

3.2.6.1	Geomorphology	68
3.2.6.2	Soils	68
3.3	Wildlife	69
3.3.1	Migratory Bird Species	69
3.3.2	Fish Species	69
3.3.3	Freshwater Mussels	69
3.3.4	Mammals	69
3.3.5	Upland Game Birds	69
3.3.6	Amphibians and Reptiles	69
3.3.7	Federally Listed Threatened and Endangered Species and Other Species of Concern	69
3.3.7.1	Mammals	69
3.3.7.2	Birds	69
3.3.7.3	Reptiles	70
3.3.7.4	Plants	71
3.4	Public Use	71
3.5	Socioeconomics	71
3.6	Archeological and Cultural Values	72
Chapter 4:	Environmental Consequences	74
4.1	Effects Common to All Alternatives	74
4.1.1	Environmental Justice	74
4.1.2	Archeological and Cultural Values	74
4.1.3	Climate Change Impacts	75
4.1.4	Prescribed Fire as a Management Tool	75
4.1.4.1	Social Implications	75
4.1.4.2	Archeological and Cultural Values	76
4.1.4.3	Flora	76
4.1.4.4	Listed Species	76
4.1.4.5	Soils	77
4.1.4.6	Escaped Fire	77
4.1.5	Trapping	77
4.2	Summary of Effects by Resource and Alternative	77
4.2.1	Waterfowl	78
4.2.1.1	Alternative 1: Current Management Direction (No-Action Alternative)	79
4.2.1.2	Alternative 2	79
4.2.1.3	Alternative 3: Preferred Alternative	79
4.2.2	Shorebirds	79
4.2.2.1	Alternative 1: Current Management Direction (No-Action Alternative)	80
4.2.2.2	Alternative 2	80
4.2.2.3	Alternative 3: Preferred Alternative	80
4.2.3	Marsh Birds and Wading Birds	81
4.2.3.1	Alternative 1: Current Management Direction (No-Action Alternative)	81
4.2.3.2	Alternative 2	81
4.2.3.3	Alternative 3: Preferred Alternative	81
4.2.4	Eastern Massasauga Rattlesnake	82
4.2.4.1	Alternative 1: Current Management Direction (No-Action Alternative)	82

4.2.4.2 Alternative 2	82
4.2.4.3 Alternative 3: Preferred Alternative	82
4.2.5 Wildlife Dependent Recreation	82
4.2.5.1 Alternative 1: Current Management Direction (No-Action Alternative)	82
4.2.5.2 Alternative 2	82
4.2.5.3 Alternative 3: Preferred Alternative	83
4.2.6 Wildlife Disturbance	83
4.2.6.1 Alternative 1: Current Management Direction (No-Action Alternative)	83
4.2.6.2 Alternative 2	84
4.2.6.3 Alternative 3: Preferred Alternative	84
4.2.7 Hydrology and Water Quality	84
4.2.7.1 Effects Alternative 1	85
4.2.7.2 Effects Alternative 2	85
4.2.7.3 Effects Alternative 3	85
4.3 Cumulative Impacts	85
4.3.1 Biological Resources	86
4.3.1.1 Listed Species and Other Species of Special Interest	86
4.3.1.2 Wildlife and Habitat Resource Management	86
4.3.1.3 Impacts of Alternatives to Biological Resources	87
4.3.2 Sedimentation and Water Quality	87
4.3.3 Cultural and Human Resources	88
Chapter 5: List of Agencies, Organizations, and Persons Contacted	93
Chapter 6: References and Literature Cited	94
Figure 1: Location of Swan Lake NWR	56
Figure 2: Concept Diagram Depicting Stream/Floodplain Relationship	84
Table 1: Comparison of Alternatives	64
Table 2: Soil Types, Swan Lake NWR	69
Table 3: Acres and Potential Energy in Millions of Kilojoules for Three Refuge Habitats, Swan Lake NWR	78
Table 4: Acres and Shorebird Forage in Grams for Refuge Mudflat Habitat Within Moist Soil Management Units ...	80
Table 5: Comparison of Impacts by Issue and Alternative	89

Chapter 1: Purpose and Need for the Proposed Action

1.1. Purpose and Need for Action

1.1.1. Purpose

The U.S. Fish and Wildlife Service (Service) is proposing to prepare and implement a Comprehensive Conservation Plan (CCP) for Swan Lake National Wildlife Refuge (Refuge). The Refuge is located in north-central Missouri near Sumner and approximately 30 miles east of Chillicothe, Missouri (Figure 1).

The purpose of the proposed action is to establish the management direction of the Refuge for the next 15 years. This action is needed because adequate, long-term management direction does not exist for the Refuge. Management is now guided by several general policies and short-term plans. Future management direction will be defined as detailed in the set of goals, objectives, and strategies described in the CCP.

Refuge Purpose Statements are primary to the management of each refuge within the National Wildlife Refuge System (NWRS). The Purpose Statement is derived from the legislative authority used to acquire specific refuge lands and is, along with NWRS mission, the basis on which primary management activities are determined. Additionally, these statements are the foundation from which “allowed” uses of refuges are determined through a defined “compatibility process.”

Executive Order 7563 established Swan Lake National Wildlife Refuge (NWR) on February 27, 1937. The purchase of Refuge lands began at that time with money from the “N.I.R., Agriculture, and Wildlife Refuges Funds.” Following purchase of the land, the Civilian Conservation Corps began work on the Refuge creating wetlands, constructing roads and buildings, and initiating the Refuge farming program. The purpose of the Refuge derived from the Executive Order and other legislative authorities is to provide for the needs of migratory birds and other wildlife.

Throughout the 100-year existence of the National Wildlife Refuge System, its functional direction and purpose has evolved to reflect its ever-increasing value as a collection of irreplaceable habitats representing the diverse natural heritage of America. In so doing, the purposes of individual ref-



Swan Lake NWR. Photo credit: USFWS

uges such as Swan Lake NWR have broadened from somewhat narrow definitions aimed at specific animal groups to include entire ecosystems and all the wildlife species and plants within them.

Other aims of Swan Lake NWR include providing opportunities for the public to enjoy wildlife-dependent recreation and preserving, restoring, and managing wetland and upland habitats that represent the Lower Missouri River Ecosystem for the benefit of a diverse complex of fauna and flora with emphasis on threatened and endangered species.

This Environmental Assessment (EA) and the CCP are also needed to assess existing management issues, opportunities, and alternatives, and then determine the best course for managing the natural resources of the Refuge. Further, this action will satisfy the legislative mandate of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges.

This EA was prepared using guidelines of the National Environmental Policy Act of 1969 (NEPA). NEPA requires federal agencies to examine the effects of proposed actions on the natural and human environment. This EA describes three alternatives for future Refuge management, the environmental consequences of each alternative, and our preferred management direction. Each alternative has a reasonable mix of fish and wildlife habitat prescriptions and wildlife-dependent recreational

Figure 1: Location of Swan Lake NWR

opportunities. Selection of the identified preferred alternative was based on its environmental consequences and ability to achieve the Refuge's purpose.

1.1.2. Need for Action

The following needs have been identified for Swan Lake National Wildlife Refuge:

- There is a need to specify the kinds of habitats that can be maintained for the next 15 years.
- There is a need to provide a clear statement of Refuge management direction.
- There is a need to address the siltation of Refuge lakes.
- There is a need to provide Refuge neighbors, visitors, and government officials with an understanding of Service management actions on and around the Refuge.
- There is a need to specify how the habitats of the Refuge should be managed to fulfill its purpose of providing for waterfowl and other migratory birds.
- There is a need to specify how habitats should be managed for eastern massasauga rattlesnakes and bald eagles, two species of particular concern on the Refuge.
- There is a need to ensure that Service management actions, including land protection and

recreation/education programs, are consistent with the mandates of the NWRs.

- There is a need to specify how the mandate to facilitate wildlife-dependent recreation can be fulfilled on the Refuge.
- There is a need to provide a basis for the development of budget requests for operations, maintenance, and capital improvement needs.
- A CCP is needed to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the Service to develop and implement a CCP for all national wildlife refuges.

1.2. Decision Framework

This EA is an important step in the Service's formal decision-making process. In compliance with the National Environmental Policy Act, the Regional Director of Region 3-the Midwest Region of the U.S. Fish and Wildlife Service will consider the information presented in this document to select the alternatives.

The Regional Director will determine whether the preferred alternative is a major federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the NEPA. If it is determined not to be a major federal action that would significantly affect

the quality of the human environment, a Finding of No Significant Impact (FONSI) will be issued. A FONSI means that the preferred alternative is selected and can be implemented in accordance with other laws and regulations. A Decision of Significant Impact would indicate the need to conduct more detailed environmental analysis in an Environmental Impact Statement (EIS).

1.3. Background

1.3.1. The United States Fish and Wildlife Service

The Service is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife resources and their habitats for the continuing benefit of the American people. Some responsibilities are shared with federal, state, tribal, and local entities, but the Service has specific responsibilities for “trust species” – which include endangered species, migratory birds, interjurisdictional fish, and certain marine mammals – as well as management and conservation of lands and waters administered by the Service.

The Service's mission is “Working with others to conserve, protect, enhance and, where appropriate restore fish, wildlife and plants and their habitats for the continuing benefit of the American people.”

The Service is guided by four principal mission goals:

Sustainability of fish and wildlife populations: Conserve, protect, restore, and enhance fish, wildlife, and plant populations entrusted to our care.

Habitat Conservation: A Network of Land and Waters: Cooperating with others, we will conserve an ecologically diverse network of lands and waters of various ownerships providing habitats for fish, wildlife, and plant resources.

Public Use and Enjoyment: Provide opportunities to the public to enjoy, understand, and participate in use and conservation of fish and wildlife resources.

Partnerships in Natural Resources: Support and strengthen partnerships with tribal, state and local governments and others in their efforts to conserve and enjoy fish, wildlife, plants, and their habitats.

1.3.2. The National Wildlife Refuge System

The National Wildlife Refuge System (NWRS) is an integral component of the Service. The mission of the NWRS, as defined by the National Wildlife Refuge System Improvement Act of 1997 (Act) 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.”

As part of its mission, the Service manages more than 540 national wildlife refuges covering over 95 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands set aside specifically for fish and wildlife. The majority of these lands, 77 million acres, are in Alaska. The remaining acres are spread across the other 49 states and several United States territories. In addition to refuges, the Service manages thousands of small wetlands, national fish hatcheries, 64 fishery resource offices, and 78 ecological services field stations. The Service enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

The Act established, for the first time, a clear legislative mission of wildlife conservation for the NWRS. Actions were initiated in 1997 to comply with the direction of this new legislation including an effort to complete CCPs for all refuges. These plans, which are completed with full public involvement, help guide the future management of refuges by establishing natural resources and recreation/education programs. Consistent with this Act, approved plans will serve as the guidelines for refuge management for the next 15 years. The Act states that each refuge shall be managed to:

- Fulfill the mission of the NWRS;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of CCPs that are prepared for each unit of the NWRS;
- Maintain the biological integrity, diversity, and environmental health of the NWRS;
- Recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and
- Allow refuge managers authority to determine compatible public uses.



Swan Lake NWR. Photo credit: USFWS

The currently proposed goals of the NWRS are to:

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

1.3.3. Swan Lake National Wildlife Refuge

The Refuge lies in the floodplain of the Grand River near its confluence with the Missouri River and is bordered on the south by Yellow Creek. Flooding is common, especially during spring and summer periods.

The Refuge acreage is divided into five major habitat types: 3,100 acres of bottomland hardwoods; 3,050 acres of wetlands and moist soil units; 1,365 acres of croplands; 2,100 acres of open water; and 1,250 acres of grasslands.

Silver Lake serves as the Refuge's reservoir pool. Flowage ditches and water control structures can easily transfer the water from the lake to smaller but more manageable wetland units.

Moist soil management, or the production of natural waterfowl foods through water manipulation, is practiced extensively. Water management schemes are aimed at benefiting not only waterfowl but also wading birds, shorebirds, and a variety of wetland plants.

About 1,365 acres of the Refuge are farmed to some degree periodically. The goals of the farming program are to provide waterfowl food, habitat diversity for both migratory and resident wildlife, and complement other Refuge management programs for the benefit of wildlife and people.

Grassland management practices include controlled burning, mowing, planting of native grass varieties, and other measures used to maintain a dynamic upland grass ecosystem. As with grasslands, existing forested tracts are managed to mimic what was here historically. Regardless of the management techniques used, each is designed to help meet the needs of various Refuge plants and animals.

1.3.4. Swan Lake NWR Vision Statement for Desired Future Condition

1.3.4.1. Vision Statement

Diverse and abundant wildlife flourishes within a mosaic of grass, trees, and wetlands recalling an earlier era when the Grand River meandered across its broad, open floodplain. Visitors enjoy recreation dependent on wildlife and show their appreciation by supporting conservation and Swan Lake NWR.

1.3.5. Refuge Goals

The goals presented below are the Service's response to the issues, concerns, and needs expressed by the planning team, the Refuge staff and partners, and the public. These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997, the mission of the NWRS, and the purposes and vision of Swan Lake NWR.

Based on the purposes of the Refuge, the mission of the NWRS, and ecosystem considerations as well as the vision for the Refuge, the planning team established the following goals for what we want to accomplish in the next 15 years:

Goal 1 Habitat: Wetlands, grasslands, and bottomland forests providing habitat for migratory birds, threatened and endangered species, and other wildlife within the Grand River floodplain

Goal 2 Wildlife: Diverse wildlife teeming within native habitats of the Grand River floodplain

Goal 3 People: Visitors enjoy wildlife-dependent recreation and understand the natural and cultural resources of the Refuge and its role in their conservation.

1.4. Scoping and Public Involvement

In accordance with Service guidelines and NEPA recommendations, public involvement has been a crucial factor throughout the development of the Draft CCP and EA for Swan Lake NWR. This Plan has been written with input and assistance from interested citizens, conservation organizations, and employees of local and state agencies. The Service, as a whole, and the Refuge staff, in particular, are very grateful to each one who has contributed time, expertise, and ideas to the planning process. The staff remains impressed by the passion and commitment of so many individuals for the lands and waters administered by the Refuge.

Generally speaking, scoping refers to the process by which the planning team gathers input from a variety of internal and external sources as to what the key issues, concerns, and opportunities are that need to be addressed in this CCP and EA. Internal scoping sources include the Refuge staff itself, other Service biologists, and professionals in the region. External scoping sources include concerned private citizens; research and educational institutions; members of conservation, outdoors enthusiasts, and civic groups; Refuge neighbors; members of the community; and state, Tribal, and local agencies. These various interests are sometimes referred to collectively as stakeholders, which means those individuals and groups that have a stake in how the Refuge is (and will be) managed. The participation of these stakeholders and their ideas has been of great value in setting the management direction for the Swan Lake NWR.

The planning process for this CCP/EA began with a “kick-off” meeting on October 23-26, 2006, for a tour of the Refuge and an overview of its habitat and wildlife resources and public use programs, facilities, and opportunities. At this time, the planning team also conducted additional internal scoping and prepared a preliminary schedule and plans for public involvement. The nucleus of the CCP planning team itself was comprised of the Refuge Man-

ager, a wildlife biologist, a Service natural resource planner from the Regional Office, and a contractor with experience in preparing CCPs.

A Visitor Services Review was also conducted in 2007 as part of the CCP/EA preparation process. A review team met with Refuge staff to discuss the visitor services program. The staff explained what the visitor services program is currently doing to provide recreational, educational, and interpretive opportunities on the Refuge. The Refuge Manager then took the review team to all the different public use areas on the Refuge. After discussions with some of the staff, the review team met to discuss the current status of the programs and to make recommendations. On the final day of the review, the team presented the recommendations to the staff and had an open discussion of the pros and cons of the various recommendations. Later, the team prepared a report with a number of recommendations for improving and expanding upon visitor services facilities and operations.

Scoping continued with a public meeting on January 11, 2007, at the Refuge headquarters facility. Approximately 95 members of the public attended the scoping meeting. The Refuge Manager was on hand to answer any questions by the public, as was Contractor Randy Williams, a consultant with the Mangi Environmental Group, tasked to assist the Service on the Swan Lake CCP/EA. During this period, meeting participants had the opportunity to express their concerns about the Refuge and ideas and suggestions for its future management. In addition, a comment form was distributed for attendees and sent to other interested parties to submit their written comments. Written comments could be submitted at the meeting, mailed subsequently, or sent via email.

A wide range of issues, concerns, and opportunities were identified and addressed during the planning process. Many issues that are very impor-



Swan Lake NWR. Photo credit: USFWS

tant to the public often fall outside the scope of the decision to be made within this planning process. In some instances, the Service cannot resolve issues some people have communicated to us. We have considered all issues throughout our planning process and have developed plans that attempt to balance the competing opinions regarding important issues

1.4.1. Issues and Concerns

The following issues were presented by the public and are addressed in Table 5, “Comparison of Impacts by Issue and Alternative,” on page 89.

Issue 1: Wildlife Management

There are diverse and sometimes conflicting expectations regarding the presence, variety, and abundance of Refuge wildlife. How should this apparent conflict be addressed?

Issue 2: Wildlife Management

Should hunting opportunities be expanded on the Refuge?

Issue 3: Wildlife Management

The decline in Canada Goose use of the Refuge in recent decades has decreased the quality of goose hunting, drawn fewer hunters and wildlife watchers, and changed the cultural identity of local communities – can this trend be reversed?

Issue 4: Habitat Management

Should the Refuge increase the amount of wet prairie habitat?

Issue 5: Habitat Management

Should the Refuge consider, where possible, restoring the natural hydrology across the Refuge to allow for periodic flooding and increased sheet flow?

Issue 6: Habitat Management

What role should cropland play in Refuge management?

Issue 7: Habitat Management

What can be done to improve shorebird habitat?

Issue 8: Habitat Management

What can be done to improve bottomland hardwood habitat on the Refuge?

Issue 9: Habitat Management

What can be done to address the management of parcels and easements assigned to the Refuge but well beyond the contiguous Refuge Boundary?

Issue 10: Habitat Management

What can be done to reduce the impact of severe flooding on the Refuge and adjoining lands?

Issue 11: Habitat Management

What can be done to reverse the trend in sedimentation accumulation that is filling in Silver Lake?

Issue 12: Visitor Services

What can be done to improve public access throughout the Refuge?

Issue 13: Visitor Services

What can be done to improve wildlife observation?

Issue 14: Visitor Services

What can be done to improve hunting opportunity and variety on the Refuge?

Issue 15: Visitor Services

How will the Refuge address an increased demand for wildlife-dependent recreation opportunities and facilities beyond what is presently available?

Issue 16: Environmental Education

What can be done to improve environmental education?

1.5. Legal, Policy, and Administrative Guidelines

1.5.1. Legal Mandates

Laws, Executive Orders, and Service policy guide administration of refuges. A list of pertinent statutes and policy guidance can be found in Appendix E of the CCP, “Relevant Legal Mandates and Executive Orders.”

Chapter 2: Description of Alternatives

This chapter describes the three alternatives for the Swan Lake NWR, including Alternative 3, the proposed action.

2.1. Rationale for Alternative Designs

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve the Refuge's purpose and vision; the goals identified in the CCP; the priorities and goals of the Refuge System; and the mission of the U.S. Fish and Wildlife Service. Alternatives are formulated to address the significant issues, concerns, and problems identified by the Service and the public during public scoping.

The three alternatives identified and evaluated represent different approaches to provide permanent protection, restoration, and management of the Refuge's fish, wildlife, plants, habitats, and other resources as well as compatible wildlife-dependent recreation. Refuge staff assessed the biological conditions and analyzed the external relationships affecting the Refuge. This information contributed to the development of Refuge goals and, in turn, helped to formulate the alternatives. Thus, each alternative presents different sets of objectives for reaching Refuge goals. Each alternative was evaluated based on how much progress it would make and how it would address the identified issues related to fish and wildlife populations, habitat management, resource protection and conservation, visitor services, and Refuge administration. A comparison of each alternative is provided in Table 1 on page 64.

Serving as a basis for each alternative, a number of goals were developed to help achieve the Refuge's purpose and the mission of the NWRS. Objectives are desired conditions or outcomes that are grouped into sets and, for this planning effort, consolidated into three alternatives. These alternatives represent different management approaches for managing the Refuge over a 15-year time frame while still meeting the Refuge's purposes and goals. The three alternatives are summarized at Section 2.3.

2.2. Alternatives Considered But Not Analyzed in Detail

The alternatives development process under the National Environmental Policy Act and the Refuge Improvement Act, as amended by the National Wildlife Refuge System Improvement Act as 1997, are designed to allow consideration of the widest possible range of issues and potential management approaches. During the alternatives development process, many different solutions were considered. The following alternative component was considered but not selected for detailed study in this CCP/EA for the reasons described.

2.2.1. Visitor Services Focus

This alternative was considered in response to requests from citizens for more access to the Refuge and expanded hunting and fishing opportunities. Promoting visitor enjoyment is an important aspect of Refuge management when it does not conflict with the "wildlife first" priority established by the Refuge System. This alternative would have emphasized improving public access to the Refuge, opening areas to visitors, and expanding times of access in order to promote visitor use. In the analysis of such an effort, it was determined that such a focus would ultimately conflict with the priority of the Service to protect the natural environment and focus on wildlife first.

Expanding Refuge access can be done within the framework of the preferred alternative without conflicting with the "wildlife first" mandate. Many of the ideas and efforts to expand visitor access were incorporated into the preferred action alternative without compromising the needs of wildlife. Because key elements could be incorporated into another alternative and because this alternative is not consistent with Refuge purposes, a "Visitor Services Focus" alternative was not developed for evaluation.

2.3. Description of Alternatives

The three alternatives are summarized in this section and compared in Table 1. Appendix 1 contains additional details on the alternatives.

2.3.1. Elements Common to All Alternatives

Although the alternatives differ in many ways, there are similarities among them as well. These common features are listed below to reduce the length and redundancy of the individual alternative descriptions. Each of the three alternatives described above would have the following features in common for the issues targeted for review in this Environmental Assessment:

2.3.1.1. Habitat

Within 5 years of Plan approval, quantify water needs and available water sources necessary to meet Refuge management objectives and over the life of the Plan maintain or improve water quality.

2.3.1.2. Wildlife

Within 10 years of Plan approval, provide habitat suitable to support a viable population of the eastern massasauga rattlesnake.

2.3.1.3. People

Within 5 years of Plan approval, develop an environmental education site that includes an outdoor classroom.

Over the life of the Plan, provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use.

Over the life of the Plan, avoid and protect, or mitigate against disturbance of all known cultural, historic, or archeological sites.

2.3.1.4. Listed Species and Other Species of Interest

Chapter 3 of this EA describes the current status of fish and wildlife in and near the Refuge. The discussion highlights species of interest described in Chapter 3. In all alternatives, the current acreage of wet prairie, which benefits eastern massasauga rattlesnakes, is maintained except Alternative 3 where the acreage increases.

Section 7 of the Endangered Species Act outlines a mechanism for ensuring that actions taken by federal agencies do not jeopardize the existence of any listed species. We conducted a "Section 7" review concurrent with the review of the Draft CCP.

2.3.1.5. Archeological and Cultural Resource Values

As part of its larger conservation mandate and ethic, the Service (through the Refuge Manager) applies several historic preservation laws and regulations to ensure historic properties are identified and are protected to the extent possible within its established purposes and NWRS mission.

The Refuge Manager, early in project planning for all undertakings, informs the RHPO (Regional Historic Preservation Officer) to initiate the Section 106 process. Concurrent with public notification and involvement for environmental compliance and compatibility determinations if applicable, or cultural resources only if no other issues are involved, the Refuge Manager informs and requests comments from the public and local officials through presentations, meetings, and media notices; results are provided to the RHPO.

When the Service and one or more other federal agencies have Section 106 responsibilities, the Service initiates the procedures in 36 CFR Part 800 independently of other agencies unless a lead federal agency has been determined.

Archeological investigations and collecting are performed only in the public interest by qualified archeologists or by persons recommended by the Governor working under an Archeological Resources Protection Act (ARPA) permit issued by the Regional Director. The Refuge Manager has found this third-party use of Refuge land to be compatible. The requirements of ARPA apply to Service cultural resources contracts; the contract is the equivalent of a permit. The Refuge Manager issues special permits for archeological investigations. Refuge personnel take steps to prevent unauthorized collecting by the public, contractors, and Refuge personnel. Violators are cited or other appropriate action taken. Violations are reported to the Regional Historic Preservation Officer.

2.3.2. Alternative 1: Current Management Direction (No Action)

Current management and public use practices would continue under this alternative. Refuge management programs would continue to be developed and implemented with limited baseline biological information and limited monitoring. Wildlife surveys would still be completed for the presence and absence of species and to alert Refuge staff to large-scale changes in population trends. Cooperation with partners for monitoring waterfowl, eagle, fish, and deer herd health surveys would continue. The Refuge would continue to provide habitat for and monitor the progress on the eastern massasauga rattlesnake. It would also maintain the current habitat mix for the benefit of other migratory birds, shorebirds, marshbirds, and landbirds. Staff would continue existing surveys to monitor long-term population trends and health of resident species.

Hunting, fishing, and environmental education programs would continue to be the priority focus of public use on Swan Lake NWR with no expansion of current opportunities. Current restrictions or prohi-

bitions would remain. Environmental education and wildlife observation and photography would be accommodated at present levels with a few interpretive sites added. Staffing would remain at its current level with no new positions added.

Under this alternative, there would be no major change in Refuge goals, objectives, and strategies. Some strategies would be revised to incorporate improved techniques, which have been learned from current management practices. The current goals and objectives call for maintenance and modest enhancement of wetland habitat, fish and wildlife populations, public use, resource conservation, facilities, work force, and administration. This alternative does not fully address long-term needs and issues.

Additional information describing this alternative can be found in Table 1.

2.3.3. Alternative 2

Under this alternative, Refuge streams that are now impounded would be restored as free flowing streams. Existing levees and dikes would be removed, breached, or otherwise modified to allow water movement across the Refuge. The amount of stream flow and open water within the Refuge would be closely linked to runoff within the watershed, meaning streams and wetlands would undergo seasonal and annual periods with little or no water. The habitats within the Silver Lake basin would convert from open water to varying amounts of emergent wetland, wet meadow, and bottomland forest. None of the estimated 1,200 acres of emergent wetland would be managed using moist soil management practices. All cropland would be converted to prairie, wet meadow, or other native habitats. Wildlife monitoring would focus on threatened and endangered species, waterfowl, shorebirds, and the eastern massasauga rattlesnake.

Goose hunting and deer hunting would continue under this alternative, but the Refuge would also formally propose the addition of duck and small game hunting and emphasize opportunities for youth and people with disabilities. Stream fishing opportunities would continue, but fishing opportunities within Silver Lake would not be available because it would no longer be managed as a year-round reservoir. Seasonal access to some portions of the Refuge would be extended, increasing opportunities for wildlife observation and photography. There would be an increased emphasis on welcoming and orienting visitors and on interpretation. There would be continued emphasis on developing the Refuge Friends group.

2.3.4. Alternative 3: Preferred Alternative

Under Alternative 3, Silver Lake would no longer serve as a year-round reservoir to provide source water for wetland management across the Refuge. Most of the year Refuge streams would rise and fall along with stream flow, creating seasonal and annual variations in water levels within the Silver Lake and Swan Lake basins. One departure would be that the basins would typically be flooded in the fall to accommodate migratory birds. The habitats within the Silver Lake and Swan Lake basins would convert from open water to varying amounts of wet meadow and emergent wetland dominated by bulrush and cattails. Other emergent wetlands would be managed using moist soil management practices. All cropland would be converted to prairie, wet meadow, or other native habitats. Wildlife monitoring would be closely linked to management information needs.

Goose hunting and deer hunting would continue under this alternative, but the Refuge would also formally propose the addition of duck and small game hunting and emphasize opportunities for youth and people with disabilities. Stream fishing opportunities would continue, but fishing opportunities within Silver Lake would be dependent on seasonal and annual water levels. Seasonal access to some portions of the Refuge would be extended, increasing opportunities for wildlife observation and photography. There would be an increased emphasis on welcoming and orienting visitors and on interpretation above that included in Alternative 2. There would be continued emphasis on developing the Refuge Friends group and on providing an increase in the amount of volunteer opportunities.

Additional information describing this alternative can be found in Table 1.

Table 1: Comparison of Alternatives

	Alternative 1 (No Action Alternative)	Alternative 2	Alternative 3 (Preferred Alternative)
<u>Streams and Water Bodies</u>	Continue to impound Refuge streams and use Silver Lake as a reservoir to provide water for wetland management across the Refuge.	Restore Refuge streams to free flowing streams with seasonally fluctuating water levels.	Mimic components of historic hydrologic function along reaches of Refuge streams. Allow for seasonal and annual variations in water levels within Swan Lake and Silver Lake basins to increase the amount and variety of native vegetation
<u>Emergent Wetland and Moist Soil Management</u>	Maintain at least 500 acres and up to 1,000 acres of emergent wetland with a mixture of bulrush and cattails, and additionally manage about 800 acres using moist soil management techniques ensuring at least 10 percent is available as mud flat habitat for migrating shorebirds.	Maintain approximately 1,200 acres as emergent wetland habitat primarily within the Swan Lake basin.	Maintain at least 1,200 acres and up to 1,800 acres of emergent wetland habitat. Use moist soil techniques to manage emergent wetlands at locations and an amount to be determined after the completion of an ongoing hydrogeomorphic evaluation. Ensure that up to 25 percent of the acreage is available as mud flat or shallow water unvegetated habitat in the spring and up to 10 percent is available in the fall for migrating shorebirds.
<u>Shrub Swamp</u>	Maintain 300 to 500 acres of shrub swamp dominated by buttonbush and willow.	Maintain up to 70 acres of shrub swamp dominated by buttonbush and willow.	Same as Alternative 1.
<u>Wet Meadow</u>	Maintain wet meadow habitat at present levels (110 acres).	Convert approximately 4,000 acres of existing cropland, open water, emergent wetland and other habitats to wet meadow and	Convert approximately 530 acres of existing cropland, food plots, areas of dense young forest, and areas dominated by reed canary grass to wet meadow.
<u>Native Prairie</u>	Maintain existing grasslands at present levels (1,000 acres) and species mix.	Convert approximately 950 acres of existing cropland to native prairie, and maintain a diverse floral community within converted and existing grasslands.	Convert approximately 835 acres of existing cropland or food plots to native prairie, and maintain a diverse floral community within converted and existing grasslands.
<u>Cropland</u>	Maintain existing amount (1,365 acres) of cropland annually leaving at least 30 percent and up to 100 percent of planted crops as food and cover for wildlife.	Convert all existing cropland (1,365 acres) to native habitats.	Convert all existing cropland (1,365 acres) to native habitats.
<u>Bottomland Forest</u>	Maintain existing bottomland forest (3,100 acres) and ensure that 20 percent of stands are comprised of selected oak species.	Increase the amount of bottomland forest from 3,100 acres to 3,800 acres	Same as Alternative 1.
<u>Watershed Conservation</u>	Quantify water needs and available water sources necessary to meet Refuge management objectives and improve water quality within Refuge source waters.	Same as Alternative 1.	Same as Alternative 1.
<u>Outlying Fee Title Properties and Easements</u>	Maintain existing methods for managing or monitoring outlying fee title properties and easements.	Develop a strategy for ensuring the condition and management of outlying fee title properties and easements.	Develop a strategy for ensuring the condition and management of outlying fee title properties and easements.

Table 1: Comparison of Alternatives

	Alternative 1 (No Action Alternative)	Alternative 2	Alternative 3 (Preferred Alternative)
<u>Threatened and Endangered Species</u>	Continue monitoring Bald Eagle numbers via Missouri Department of Conservation surveys.	Implement a program to monitor all federally listed threatened and endangered species on the Refuge and assist with monitoring of state-listed threatened and endangered species.	Implement a monitoring program to track abundance, population trends, and/or habitat associations of selected species.
<u>Migratory and Resident Birds</u>	Monitor waterfowl numbers bi-weekly during duck hunting season via Missouri Department of Conservation bi-weekly waterfowl counts.	Conduct weekly counts of waterfowl and shorebirds during migration.	Monitor migratory bird species with emphasis on waterfowl and shorebirds.
<u>Eastern Massasauga Rattlesnake</u>	Provide habitat suitable to support a viable population of the Eastern Massasauga Rattlesnake	Same as alternative 1	Same as alternative 1
<u>Welcoming and Orienting Visitors</u>	Provide an unstaffed point of contact 7 days a week year-round.	Provide a staffed point of contact most business days during normal working hours year-round.	Provide a staffed point of contact during normal working hours year-round on business days and seasonally on holidays and weekends.
<u>Hunting</u>	Continue to offer goose hunting and managed deer hunts (including opportunities for disabled hunters).	Same as Alternative 1, but also within 2 years of CCP approval, propose changes to Refuge regulations (as part of a formal opening package) that includes introducing duck hunting and small game hunting, and emphasize opportunities for youth and disabled hunters.	Same as Alternative 2 .
<u>Fishing</u>	Continue to provide existing facilities for shore and boat fishing.	Stream fishing only in accordance with state and Refuge regulations. Silver Lake basin is restored as a stream channel.	Fishing opportunities within Silver Lake basin are dependent on seasonal and annual water levels.
<u>Wildlife Observation and Photography</u>	Continue to provide existing opportunities for wildlife observation and photography by allowing access to the entire Refuge from mid March through mid October.	Same as Alternative 1, but also allow visitors limited access to selected portions of the Refuge from mid October through the end of February.	Same as Alternative 2.
<u>Interpretation</u>	Provide unstaffed interpretive facilities 7 days a week year-round.	Provide staffed interpretation facilities most business days during normal working hours year-round.	Provide staffed interpretive facilities during normal working hours year-round on business days, and seasonally on holidays and weekends.
<u>Environmental Education</u>	Develop an environmental education site that includes an outdoor classroom.	Same as Alternative 1.	Same as Alternative 1.
<u>Other Compatible Recreation and Uses</u>	Provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use.	Same as Alternative 1.	Same as Alternative 1.
<u>Friends and Volunteers</u>	Continue to provide current level of volunteer opportunities (approximately 625 hours annually).	Continue to develop the Refuge Friends group and maintain existing level of volunteer opportunities (625 hours annually).	Continue to develop the Refuge Friends group and provide volunteer opportunities that total at least 1,000 hours annually.

Table 1: Comparison of Alternatives

	Alternative 1 (No Action Alternative)	Alternative 2	Alternative 3 (Preferred Alternative)
<u>Outreach</u>	Continue to speak to local groups upon request (up to 2-3 times per year), provide information and interviews for local and outdoors media and distribute news releases 2-3 times annually.	Continue to speak to local groups upon request (up to 4-6 times per year), provide information and interviews for local and outdoors media and distribute news releases 4-6 times annually.	Increase local community support and appreciation for fish and wildlife conservation and endorse the Refuge's role in conservation.
<u>Archeological, Cultural, and Historic Protection</u>	Avoid and protect or mitigate against disturbance of all known cultural, historic, or archeological sites.	Same as Alternative 1.	Same as Alternative 1.

Chapter 3: Affected Environment

3.1. Description of Swan Lake National Wildlife Refuge

This chapter provides a brief introduction to the existing physical and social environment of Swan Lake National Wildlife Refuge (NWR), including the location; size and habitat of the Refuge; geomorphology; sedimentation and water quality; soils; habitat; wildlife; public use activities; the social environment; and cultural resources that are known to exist on Refuge lands. Greater detail on the affected environment is provided in Chapter 3 of the Comprehensive Conservation Plan (CCP).

The Refuge lies in the glacial till plain of North-central Missouri in Chariton County near the town of Sumner. It is located near the confluence of the Grand and Missouri Rivers and is bordered in the south by Yellow Creek. The Refuge acreage is divided into five major habitat types: 3,100 acres of bottomland hardwoods; 3,050 acres of wetlands and moist soil units; 1,365 acres of croplands; 2,100 acres of open water; and 1,250 acres of grasslands.

3.2. Habitat Overview

Along with the five habitat types noted above, there are a number of areas in transition between habitat types. These transition areas are often in a state of flux, succeeding from one seral stage to the next. Enhancement measures undertaken for wildlife diversity include moist soil units. Enhancement measures undertaken for wildlife diversity include the conversion of cropland to moist soil units. These units are managed for high invertebrate populations and a variety of plant species that are attractive to a mix of wetland dependent wildlife species. Prairie areas are burned periodically to maintain and rejuvenate native grass stands. The Yellow Creek Research Natural Area provides 1,000 acres of old growth bottomland hardwood forest habitat.

3.2.1. Forested Resources

The Refuge has 3,100 acres of bottomland hardwoods primarily in the Yellow Creek Research Natural Area. These forestlands are dominated by pin oak, hickory, silver maple, eastern cottonwood, American elm, American plum, black cherry, and river birch.



Beaver activity, Swan Lake NWR. Photo Credit: FWS

3.2.2. Wetland Resources

More than 800 acres of Refuge land are managed annually for moist soil plant production. Fall tillage, partial flooding, various drawdown schemes, and planting are all used as management tools. There are 12 individual wetland management units ranging in size from 8 to 1,850 acres.

Management strategies are designed to increase waterfowl maintenance levels in addition to meeting the objectives for endangered species, other migrant species, and resident wildlife. Silver Lake is used as a reservoir to supply water, as needed, for the Refuge moist soil units through annual manipulation of water levels in these units. Water level is also manipulated to maintain wetland food productivity and limit encroachment of brush and undesirable vegetation.

3.2.3. Grassland Resources

Warm season grasses native to Missouri have disappeared from much of their natural range as a result of farming, overgrazing, and invasions of woody plants. The original Refuge objective to preserve a remnant flock of Prairie Chickens is no longer feasible, and current management objectives are to restore and maintain representative native grasslands for habitat diversity.

Currently, the preferred land management technique to restore and maintain grasslands and curtail invasion by undesirable species is prescribed fire. Prescribed fire can help restore native warm season

grasses as the dominant species in the Refuge grasslands ecosystem. Haying can also be beneficial and should be considered as an alternative management technique when there is a demand for hay in the local area.

3.2.4. Invasive Species

Non-native mammals, birds, insects, mollusks, fish, and plants have been introduced to the Refuge over the years. Exotic, invasive, or alien species cause vast ecological and economic damage, sometimes impacting human health. These species range across almost every ecosystem of the country. Invading species are usually very successful when introduced to a new environment because they have no natural enemies and they can usually find a niche to exploit.

Many areas of the Swan Lake NWR have noxious and exotic weeds that are controlled biologically, mechanically, physically, and chemically. Missouri has state noxious weed laws that require public land managers to control specific weeds including marijuana (*Cannabis sativa*), musk thistle (*Carduus nutans L.*), Canada thistle (*Cirsium arvense*), Johnson grass (*Sorghum halepense*), field bindweed (*Convolvulus arvensis*), and purple loosestrife (*Lythrum salicaria*).

The Service has made prevention and control of invasive plant and animal species a top priority. It is the policy of the Department of Interior, the Service, and Region 3 that all reasonable steps should be taken to minimize or, when feasible, eliminate dependence on chemical pest control agents. Reduction of chemical usage on Service lands is unquestionably the best thing to do for the resources in our care.

3.2.5. Sedimentation and Water Quality

With its 7,900 square mile watershed extending into Iowa, the Grand River has been a constant source of floodwater and debris entering Swan Lake NWR. Agricultural runoff flows into the streams of the Grand River watershed, four of which flow through or adjacent to the Refuge. This agricultural runoff contains whatever residue from pesticides and fertilizers that have been used on the fields in the watershed. Hundreds of levees have increased velocity and frequency of flooding, impacting Refuge water management, facilities, and habitat. This alteration of hydrology is of major concern. Silver Lake, the main reservoir pool for the Refuge and the source of water for nearly 3,000 acres of seasonally flooded moist soil and other wetland management units, is silting in.

The 1993 Swan Lake National Wildlife Refuge Contaminants Survey documented potential contamination problems from dieldrin, chlordane, copper, chromium, manganese, and zinc on the Refuge. The major source of these compounds was speculated to be agricultural runoff from the area surrounding the Refuge. It was recommended that if there were concern that populations of fish and wildlife using the Refuge were decreasing or did not seem healthy, there should be further investigations into the abovementioned compounds.

There have been changes in agricultural practices in the watershed since that 1993 contaminants survey. Confined animal facility operations have become more prevalent in the watershed. The effects of these changes should be monitored. Eutrophication from increased nutrients from non-point source pollution has become a cause for concern on many natural areas throughout the nation. It is recommended that at least a water quality monitoring plan be developed and implemented for the Refuge, including monitoring sites on the main streams flowing into the Refuge (Molitor, 2006).

3.2.6. Geomorphology and Soils

3.2.6.1. Geomorphology

The Refuge lies in the glacial till plain of North-central Missouri. Most of the Refuge is relatively flat with elevations ranging from a minimum of 653 feet MSL to a maximum of 741 feet MSL. The Refuge is subject to flooding from local intermittent streams, the Grand River, and Yellow Creek. As a result, external water sources greatly influence water management capabilities, and although conditions vary widely, excess water is generally the greatest hindrance to water management efforts.

3.2.6.2. Soils

Approximately 61 percent of the Refuge soils are classified as Darwin Silty Clay. This very poorly drained soil has a surface layer of very dark gray with a light silty clay layer approximately 14 inches thick and a 46 inch subsoil layer. Permeability and surface runoff are very slow. The pH ranges from slightly acidic to mildly alkaline. Natural fertility and organic matter content is high.

The other major soil type is Kennebec Silt Loam. Covering about 16 percent of the Refuge, this moderately well drained soil has a 26-inch-thick surface layer and a 35-inch substratum. Permeability is moderate, pH ranges from neutral to medium acidic, and natural fertility and organic matter is high.

A complete list of soil types with Refuge acreage is shown in Table 2.

Table 2: Soil Types, Swan Lake NWR

Soil Type	Acreage
Ankeny fine sandy loam	27
Bremer silt loam	576
Chariton silt loam	616
Darwin silty clay	3,736
Edina silt loam	80
Grundy silt loam	103
Haynie very fine sandy loam	5
Kennebec silt loam	977
Submerged soil	4,550

3.3. Wildlife

3.3.1. Migratory Bird Species

The Refuge bird list (see Appendix C of the Draft CCP) contains species that have been recorded on the Refuge. Another 17 birds, listed under “Accidental” birds, have been reported but are not normally expected to be present.

Waterfowl are the most prominent and economically important group of migratory birds using the Refuge. Birdwatching, a non-consumptive use of bird resources, is another important activity on the Refuge.

3.3.2. Fish Species

The Refuge lies within the floodplain of the Missouri River. The Refuge’s temporary wetlands do not typically hold enough water to support fisheries, but Silver Lake does have a resident population of game and other fish species. Beyond those fish found in Silver Lake, species found at Swan Lake NWR come mostly from Elk Creek and Yellow Creek. There are at least 10 species of fish present on the Refuge.

Species commonly found on the Refuge include shortnose gar, common carp, smallmouth buffalo, largemouth buffalo, river carpsucker, channel catfish, black bullhead, largemouth bass, white crappie, and green sunfish.

3.3.3. Freshwater Mussels

Freshwater mussels are one of the most imperiled groups of animals in North America. Currently 70 mussel species are listed as endangered or threatened under the Endangered Species Act, and a number of others are candidates or potential candidates for protection. The Yellow Creek has historically supported a variety of freshwater mussels.

Today, the Refuge continues to support assemblages of mussels and provides an important refuge for maintaining mussel biodiversity. While no threatened or endangered freshwater mussel species are currently known to inhabit the Refuge, current residents may be reclassified as such. The potential also exists to introduce species in peril to suitable habitat on the Refuge.

Freshwater mussels are typically found buried in the substrate in beds often containing several different species with similar habitat requirements. Most of these species require flowing water and coarse gravelly substrates, although some survive well in silty, lake-like conditions in backwaters. Water and sediment quality are important habitat criteria for mussels.

3.3.4. Mammals

Swan Lake NWR is home to many resident mammal species that have been observed on the Refuge by Refuge personnel and visiting mammalogists (see Appendix C). White-tailed deer are the only big game on the Refuge. Furbearers found on the Refuge include Virginia opossum, raccoon, striped skunk, river otter, beaver, mink, nutria, and muskrat. Gray fox, red fox, coyote, and bobcats are also present. Both eastern cottontail and swamp rabbits inhabit the Refuge. Fox and gray squirrels are found on the Refuge with fox squirrels in the more open woods and gray squirrels inhabiting the dense forests.

3.3.5. Upland Game Birds

Four species of upland game birds – Northern Bobwhite, Ring-necked Pheasant, Wild Turkey, and Mourning Dove – reside on Refuge lands (see Appendix C).

3.3.6. Amphibians and Reptiles

Species regularly seen are common snapping turtles, painted turtles, box turtles, fox snakes, water snakes, and various garter snakes (see Appendix C).

3.3.7. Federally Listed Threatened and Endangered Species and Other Species of Concern

3.3.7.1. Mammals

No federally listed endangered or threatened mammal species occur on the Refuge.

3.3.7.2. Birds

Federally listed threatened and endangered species sighted in the recent past have included the Piping Plover and Least Tern.

The interior Least Tern was federally listed as endangered in May 1985. The interior population of the Least Tern (*Sterna antillarum athalassos*) currently nests in the Mississippi, Missouri, and Rio Grande River Basins from Montana south to Texas and from Eastern New Mexico and Colorado to Indiana and Louisiana. Interior populations of the Least Tern, formerly well distributed in the Missouri Basin, now survive only in scattered remnants. Habitat has been decimated by extensive water management projects. Loss of sandbar habitat due to dams, river channelization, and water level changes has caused a decline in interior Least Tern populations. Undisturbed sandbars are critical for successful Least Tern nesting. Predation, flooding, and recreational activities on sandbars can cause nest disturbance and abandonment.

The Piping Plover (*Chadarius melodus*) (Great Plains population) is rarely seen on Swan Lake NWR. Piping Plovers nest in coastal areas, but they are also prairie birds, nesting across the Great Plains of the United States and Canada but in perilously low numbers. The Great Plains population is listed as threatened. The loss of sandbar habitat and prairie wetland areas contributes to their decline. Like many shorebirds, Piping Plovers feed on immature and adult insects and other invertebrates at the water's edge. They winter primarily along beaches, sandflats, and algal flats on the Gulf of Mexico.

Both the formerly listed Peregrine Falcon and Bald Eagle use the Refuge as well.

The Peregrine Falcon is an occasional visitor to the Refuge. They are most often seen during the winter months. They feed almost exclusively on birds such as doves, waterfowl, and songbirds, but occasionally they hunt small mammals including bats, rats, voles, and rabbits.

The Bald Eagle breeds throughout the United States and winters throughout the southern portion of its breeding range. The Bald Eagle was recently delisted from the federal Threatened and Endangered Species List but is still a species of interest at the Refuge. Bald Eagles will use the Refuge during the winter to feed on fish, waterfowl, coots, muskrats, and nutria.

Other bird species of interest found on the Refuge and listed on the Missouri Department of Conservation's Rare and Endangered Species List include the Black Tern, King Rail, and American Bittern.

The Black Tern (*Chlidonias niger*) usually nests in small groups and in shallow water throughout Canada and the Northern United States. Their colonies occur in freshwater marshes and wetlands with

emergent vegetation found along lake margins and occasionally in rivers (Dunn and Argo, 1995). Unlike other terns, these birds frequently fly over land areas as they hunt for insects. Black Terns also eat small fish and crustaceans, which they pick from the water. Populations have decreased markedly since the mid-1960s due to habitat loss and human disturbance.

A large rail of freshwater marshes, the King Rail (*Rallus elegans*) has declined alarmingly in much of its range over the last 40 years. The King Rail usually gets its food in aquatic habitats but will feed on insects away from water. When it catches food on land, it often takes the item to water and dunks it before eating it. King Rails usually place nests above water in shallow parts of marsh in tussock or clump of aquatic vegetation, i.e. grasses, sedges, or rushes of uniform height (Terres, 1980).

Although common in much of its range, the American Bittern (*Botaurus lentiginosus*) is usually well hidden in bogs, marshes, and wet meadows. Usually solitary, it walks stealthily among cattails or bulrushes. If it senses that it has been seen, the American Bittern becomes motionless with its bill pointed upward, causing it to blend into the reeds. It is most active at dusk. More often heard than seen, this bittern has a call that resembles a congested pump (Gibbs, et al., 1992).

3.3.7.3. Reptiles

Swan Lake NWR is home to one of the last viable breeding populations of the eastern massasauga rattlesnake, a candidate species for federal listing. Candidate species are plants and animals for which the Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act but for which development of a listing regulation is precluded by other higher priority listing activities.

The Candidate Conservation Program provides a means for conserving these species. Early conservation preserves management options, minimizes the cost of recovery, and reduces the potential for restrictive land use policies in the future. Effective candidate conservation may reverse the species' decline, ultimately eliminating the need for Endangered Species Act protection.

Candidate species receive no statutory protection under the Endangered Species Act. However, the Service encourages the formation of partnerships to conserve these species because they are by definition species that may warrant future protection under the Endangered Species Act.

3.3.7.4. Plants

No federally listed endangered or threatened plant species occur on the Refuge.

3.4. Public Use

The 1997 National Wildlife Refuge System Improvement Act gives priority to six wildlife-dependent recreational uses of national wildlife refuges when these uses are compatible with the purposes for which the refuge was established. These uses include hunting, fishing, wildlife photography, wildlife observation, and environmental education and interpretation.

Wildlife observation remains the primary visitor activity throughout the year. The Refuge also has strong local support and traditional ties to waterfowl hunting, and each year large portions of the Refuge are closed to all public use except hunting. This closure limits user conflicts but also reduces access for wildlife observation, photography, fishing, interpretation, and other activities during a popular time of year to visit the Refuge. To reduce user conflicts between hunters and other visitors, the Refuge may consider zoning areas or expanding pedestrian access for non-hunting activities in other ways.

Current visitation for the Refuge averages an estimated 17,000 visitors annually. The nearest Refuge with visitor services staff is Squaw Creek NWR, which is more than two hours at 127 miles away. The potential for expanding the volunteer program or creating a Friends group to support the Refuge visitor services program is also limited by the demographics of the area, lack of volunteer facilities, and distance to urban centers.



Swan Lake NWR. Photo credit: USFWS

3.5. Socioeconomics

The National Environmental Policy Act requires agencies to disclose to decision makers and to the public what society gains or loses with projects that have the potential of altering the environment. In addition, Executive Order 12898 requires agencies within the Department of Interior to evaluate whether any notable impacts to minority and low-income populations and communities will occur with the proposed project action.

Based upon 2000 Census data, or more recent census data as indicated, Chariton County can be characterized by the following statistics (United States Census Bureau, 2009; Indiana Business Research Center, 2009):

- The estimated population in 2008 was 7,740. This was a decrease of minus 8.3 percent from the 2000 Census.
- In 2007, the per capita personal income in Chariton County was \$27,795. This was an increase of 7.6 percent from 1997. The 2007 figure was 72 percent of the national per capita income, which was \$38,615.
- In 2008, 95.1 percent of the population was white, not of Hispanic or Latino origin, with the balance being other races.
- 79.6 percent were high school graduates and 11.4 percent had graduate degrees.
- In 2008, there were 4,373 housing units in the county.
- Mean travel time to work was 23.4 minutes.
- 80.2 percent of the county residents worked in the county.

The Service produced “Banking on Nature: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation” in 1997. The report, which was updated in 2002 and 2006, is the first of a multi-phase study investigating the impact of national wildlife refuges on their local economies. It is a broad spectrum report that discusses the income and employment effects that recreational visitors to refuges have on the economies of local regions. In addition to the economic effects of refuge hunting and fishing programs in local communities, it measures the economic impact of eco-tourism, the relatively recent phenomenon of large numbers of people traveling substantial distances to take part in non-consumptive uses of the natural environment. Eco-tourism is one way to derive economic benefits from the conservation of wildlife and habitat.

The study found that recreational visits to national wildlife refuges generate substantial economic activity. In fiscal year 2006, people visited refuges in the lower 48 states more than 34.8 million times for recreation and environmental education. Their spending generated \$1.7 billion of sales to regional economies. As this spending flowed through the economy, more than 27,000 people were employed, and \$542.8 million in employment income was generated.

3.6. Archeological and Cultural Values

Archeological and historical information on Chariton County and Swan Lake NWR is limited mainly from the lack of professional studies, excavations, and inventories (Bray, 1980; Boyd, 1982; Dobrovolny, 2008). Native American Oneota sites represent most of the known prehistoric sites in Chariton County and the surrounding area. Other Indian tribes in the area with records are the Missouri and Osage (Bray, 1980). It is believed that property related to the Civilian Conservation Corps (CCC) and other early materials exist on the Refuge. These items would need to be inventoried so that they can be managed appropriately (Dobrovolny, 2008).

Many prehistoric sites have been located on the Refuge. They include Lithic scatter, burned clay fragments, and habitation sites. None of these have been evaluated for their qualification for nomination to historical registers (Dobrovolny, 2008). Based on the evidence found in the drainages that Chariton County is a part of, the potential exists for additional prehistoric and historical sites in Chariton County that are worthy of study and could represent most of the prehistoric and historic periods (Bray, 1980; Boyd, 1982). Further investigation may result in the discovery of more sites, and the Refuge's marshy conditions would aid in the preservation of archeological remains (Dobrovolny, 2008; Boyd, 1982; Bray, 1980).

The earliest generally accepted human culture in North America is termed PaleoIndian, which began approximately 12000 B.C. Kill sites are typically the evidence from this period (Boyd, 1982). While the characteristic fluted points of weapons and tools have been discovered in the nearby counties of Saline, Howard, and Randolph, none have been found in Chariton County (Bray, 1980; Boyd, 1982). The lack of field investigations, rather than lack of existence, is the probable reason (Boyd, 1982).

The next period is the Archaic period, which ranges approximately from 7000 B.C. to 1000 B.C. (Boyd, 1982). Some Archaic period habitation sites have been located on the Refuge (Dobrovolny, 2008). Known sites from this period exist near Chariton

County (Boyd, 1982). Two well-known sites in nearby counties include Graham Cave and Arnold Research Cave (Boyd, 1982; NPS, No date).

The Woodland period is from 1000 B.C. to 900 A.D. This period includes the transition to agricultural societies (Boyd, 1982). Currently, the evidence is mostly pottery fragments from this period. Further investigations may reveal additional sites (Bray, 1980; Boyd, 1982).

The Mississippian period is from 900 to 1600 A.D. During this period, there were semi-sedentary villages as well as smaller special activity sites that were dispersed upriver. Hunting camps would be expected near or in the Refuge. There is one Utz site in Saline County from this period. The lack of other sites is not understood (Boyd, 1982).

The Historical Aboriginal period is from 1600 to 1830 A.D. This period begins the European influence and the displacement of eastern tribes. Some Oneota sites have been located in the area around Chariton County. Burial sites have been found in Adair County (Boyd, 1982).

French influenced the area with miners and visitors. In particular, as the earliest and furthest west French outpost on the Missouri, Fort Orleans influenced the lives of the Native Americans. It symbolized the French presence in the area, which affected the Kansas, Osages, and Missouri tribes. By the time of statehood in 1820, many white settlements existed in the Chariton area including several trading posts, forts, and houses (Bray, 1980). These people included French, Germans, and other Anglo-Americans. They were craftsmen and farmers, and they brought livestock (Bray, 1980; Boyd, 1982). Records, if they existed, of more settlements were possibly lost. Chariton did not have as much slavery as the neighboring counties. During the Civil War, the state was one of the most severely divided between some people favoring the South and others favoring the Union (Bray, 1980).

Executive Order 7563 on February 27, 1937, established Swan Lake NWR, which began with the purchase of 10,670 acres. Following the purchase of land, the CCC began work on the Refuge creating wetlands, constructing roads and buildings, and initiating the Refuge farming program (USFWS, No date). A couple of sites exist on the Refuge related to the CCC including the service building and a storage building (Dobrovolny, 2008).

No National Register of Historic Places properties are located on the Refuge (Dobrovolny, 2008; NPS, 2007). However, Chariton County has six sites, Carroll County has five, Livingston County has three, and Linn County has five (NPS, 2007). Additionally, Chariton County has no sites on the

National Historic Landmarks Program (NPS, No date). No state historic sites or parks exist in Chariton County, but Perishing State Park is to the north within 10 miles of the Refuge (MODNR, 2006). The Refuge may contain properties and items worthy of nomination once evaluated.

Certain public groups may become interested in the Refuge's cultural resources once identified. The Otoe-Missouria Tribe, Choctaw Nation of Oklahoma, Delaware Tribe of Indians, Osage Nation of Oklahoma, Iowa Tribe of Kansas and Nebraska, Iowa Tribe of Oklahoma, and Winnebago Tribe of Nebraska are Native American tribes that could have an interest in sites on the Refuge for traditional cultural resources reasons, sacred sites, and cultural hunting and gathering areas. Communication has not yet been established with these tribes regarding these potential matters. The archeological studies, to date, were performed before reporting to tribes was required. Nothing since has triggered the need to report to these tribes. The current sites found have not been of interest, but further investigations may discover sites of interest (Dobrovolny, 2008). Although Indian tribes are generally considered to have concerns about traditional cultural properties, other groups such as church congregations, civic groups, and county historical societies could identify similar concerns.

Cultural resources are important parts of the nation's heritage. The Service is committed to protecting valuable evidence of human interactions with each other and the landscape. Protection is accomplished in conjunction with the Service's mandate to conserve fish, wildlife, and plant resources.

Chapter 4: Environmental Consequences

4.1. Effects Common to All Alternatives

4.1.1. Environmental Justice

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

None of the management alternatives described in this Environmental Assessment (EA) will disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. Implementation of any action alternative that includes public use and environmental education is anticipated to provide benefits equally to all residents residing in the surrounding communities.

4.1.2. Archaeological and Cultural Values

The activities that are most positive for cultural resources are those that reduce or eliminate activities on the Refuge. All the alternatives presented in this EA envision low levels of development, thereby producing little negative effect on the Refuge’s cultural and historic resources. Potentially negative effects could include construction of new trails or facilities and further development of water impoundments. In most cases, these management actions would require review by the Service’s Regional Archaeologist in consultation with the State of Missouri Historic Preservation Office, as mandated by Section 106 of the National Historic Preservation Act. Therefore, the determination of whether a particular action within an alternative has



Mourning Dove. Photo credit: FWS

the potential to affect cultural resources is an ongoing process that would occur during the planning stages of every project.

In general, recreation activities and invasive species control have little potential to affect cultural resources and are envisioned as having a neutral effect on cultural resources. However, non-motorized use of trails may have a negative impact on cultural resources by increasing visitor traffic to sensitive cultural areas. Cultural resources are sensitive to ground disturbing activities. Fire suppression activities can also damage archaeological sites if new roads and firelines are constructed while combating the fire.

The impacts of the alternatives on cultural resources were evaluated with the assumption that significant, but as yet unidentified, cultural resources may occur on the Refuge. Under any alternative, site specific actions such as construction of facilities will be subject to additional environmental review in accordance with the National Environmental Policy Act, which affords protection to significant cultural resources as prescribed by the National Historic Preservation Act and other applicable regulations and guidelines. Although avoidance is the preferred approach, mitigation of effect is an acceptable treatment and development activities may result in a net loss of resources.

4.1.3. Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors.

The increase of carbon within the Earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's "Carbon Sequestration Research and Development" (U.S. DOE, 1999) defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Perhaps no subject relevant to managers of public lands and waters is as complex and multi-faceted as climate change. According to the "Fourth Assessment Report" of the Intergovernmental Panel on Climate Change (IPCC), climate change manifests itself primarily as increased temperature, changes in precipitation patterns, and sea-level rise. A changing climate is expected to affect precipitation patterns, vegetation types and distribution, wildlife habitat and behavior, fire frequency, sea levels, and disease trajectories as well as a broad range of human activities.

Climate change impacts will vary due to the different nature of the ecosystems on Refuge managed lands. Anthropogenic stressors, such as chemical pollution, over-fishing, land-use changes, habitat fragmentation, population growth, and elevated ultraviolet radiation, are likely to interact synergistically and sometimes unpredictably with climate change, and together are likely to affect various Refuge lands in different ways.

The land is a tremendous force in carbon sequestration. Terrestrial biomes of all sorts (grasslands, forests, wetlands, tundra, perpetual ice, and desert) are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric carbon dioxide. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Preserving natural habitat for wildlife is the heart of any long range plan for national wildlife refuges. The actions proposed under any of the alternatives would conserve or restore land and water

and would thus enhance carbon sequestration. This in turn contributes positively to efforts to mitigate human-induced global climate changes.

4.1.4. Prescribed Fire as a Management Tool

The Refuge's Fire Management Plan (FMP) provides additional detail beyond what is captured in this section and will be adopted by reference through this EA.

4.1.4.1. Social Implications

Prescribed burns will have an effect on the local public. Public concern is noticed every time a fire is set. A prescribed burn will effect and benefit the local community in many ways. These benefits must be explained to the public at every opportunity.

A prescribed burn on the Refuge will be a direct benefit to the public in creating recreational opportunities through increased wildlife populations for hunting and observation. If a wildfire is started on or near the Refuge, the areas that had prescribed burning previously and the firebreaks intended for prescribed burning, will be of extreme benefit in controlling the fire.

The aspect of the fire that will solicit the most public concern will be the smoke. Smoke from a Refuge fire could impair visibility on roads and become a hazard. Actions to manage smoke include use of road guards and car; signing; altering ignition techniques and sequence; halting ignition; suppressing the fire; and use of local law enforcement as traffic control. Burning will be done only on days that the smoke will not be blown across nearby communities and/or Refuge neighbors or when the wind is sufficient as not to cause heavy concentrations.

If Missouri institutes smoke regulations, the FMP will be amended to ensure consistency with those regulations. Combustion of fuels during prescribed fire operations may temporarily impact air quality, but the impacts are mitigated by small burn unit size, the direction of winds that the burns are conducted with, and the distance from population centers. All efforts will be taken to assure that smoke does not impact smoke sensitive areas such as roads and local residences. In the event of wind direction changes, mitigative measures will be taken to assure the public safety and comfort. Refuge staff will work with neighboring agencies and in consultation with Missouri air quality personnel to address smoke issues that require additional mitigation. The fire prescription portion of the Annual Prescribed Fire Plan for each unit proposed to be burned during the burning season will have specific mitigative measures to deal with unexpected smoke manage-

ment problems. This will include identified problems that not forecasted wind changes might cause and measures to be employed to protect the public.

Public concern may arise with any kind of smoke from the Refuge. This concern can be relieved only by a concerted effort by Refuge personnel to carefully inform the local citizens about the prescribed burning program. Emphasis will be placed on the benefits to wildlife as well as the safety precautions in effect. Formal interpretive programs both on and off the Refuge explaining the prescribed burning program will be encouraged.

4.1.4.2. Archaeological and Cultural Values

There may be archaeological sites within prescribed burn units. When these units are burned, it is doubtful that the fire will have any adverse impact on the sites. The fire will be only a temporary disturbance to the vegetation in the area and in no way destroy or reduce the archeological value, because all artifacts are buried well beneath the surface and no above ground evidence exists. Therefore, no known sites will be impacted by prescribed burning operations.

4.1.4.3. Flora

The prescribed burning program will have a visible impact on vegetation and the land. Immediately after a fire much of the land will be blackened. There will be no grasses or ground forbs remaining, and most of the higher brush such as oak sprouts and willow will be bare of leaves. Trees will be scorched up to 20 feet above the ground. This will be particularly noticeable on the light colored bark of aspen and birch. There may be large areas up to one acre in size interspersed throughout the burn that are untouched by the fire. This may be a result of wet ground conditions or a break in fuel continuity.

Within three days after the burn, the grasses and forbs will begin to grow. The enriched soil will promote rapid growth such that after two or three weeks the ground will be completely covered. The willow and oak will, in many cases, re-sprout. The bases of the trees as well as the burned slash and stumps will be partially or completely covered by the new growth. Some of the less fire resistant trees will show signs of wilting and may succumb within a month or two. Generally, after one season any sign of the prescribed burn will be difficult to detect without close examination. After two or three years, it will be virtually impossible to detect the presence of the fire.

Other more long lived signs will remain for an indefinite period of time. The firebreaks will not be allowed to grow over in order to realize their benefit during wildfires and future prescribed burns. Vehi-

cle tracks through the burn are visible on the freshly burned ash and may be longer lived if the vehicle became stuck or created tire grooves in the ground. Travel across the burn area will be kept to a minimum. Vehicle travel may be necessary in some instances, such as lighting the fire lines or quickly getting water to an escape point. A fire plow will be used only in the event that a break-over does occur and cannot be controlled by any other method. The deep trench of the plow would leave a very long lived scar. This trench could be repaired by filling, which would eliminate it from view after 5 to 10 years.

4.1.4.4. Listed Species

If there is any impact at all, the potential impacts of fire on listed species are likely to be positive. Of the federally listed threatened and endangered species on or near the Refuge, two are birds (interior Least Tern and Piping Plover). The interior Least Tern favors sandbar habitat for nesting. This generally is not habitat that will be burned. If a burn were to be conducted to clear vegetation on a sandbar to benefit the terns, it would be done at a time of the year that would not conflict with the tern use of the area.

Missouri is the southern edge of the northern Great Plains population of Piping Plover. In this area, plovers make their nests on beaches, sand bars, and dredged material islands of major river systems. The northern Great Plains birds are federally listed as threatened. With approximately 1,398 breeding pairs, it is the largest population of piping plovers in the United States. Beaches, sandbars, and islands are not typically locations where prescribed burns are conducted. If a burn were to be conducted in this kind of habitat, it would be scheduled so that conflict with the Piping Plovers would be avoided.

Swan Lake NWR is within the historical range of the eastern massasauga rattlesnake, which is a candidate species for listing. While it is positive that the eastern massasauga rattlesnake appears to be thriving on the Refuge, populations expanding into new areas pose a problem for spring burns. The Refuge's prescribed burning program has been modified to account for any potential problems. Modifications include burning early in the spring, prior to the snakes emerging from their underground hibernation areas, as well as burning later in the fall after the snakes have gone back into hibernation. We conducted a Section 7 review concurrent with the review of the Draft CCP. The Section 7 review will examine the modified prescribed burning program.

4.1.4.5. Soils

The effect of fire on the soil depends largely on the fire intensity and duration. On areas with high fuel loads, a slow backing fire is usually required for containment and desirable results. The intense heats generated by this type of fire will have a greater effect on the soils than fast, cool head-fires used on farm fields and wildlife openings. The cool, moist soils of wetter areas in the burn units or areas with little fuel will be unaffected by the fire.

The severity of damage to the soil depends to a great degree on the thickness and composition of the organic mantle. In cases where only the top layer of the mantle is scorched or burned, no damage will result to the soil below. This is usually the case in forested areas.

In open areas such as dry grassland or wet meadow sites, the blackening of the relatively thin mantle will cause greater heat absorption and retention from the sun. This will encourage earlier germination during the spring growing season. Nutrient release occurs as a result of the normal decomposition process. Fire on the soil will greatly speed up the process. The rate and amount of nutrients released will be dependent on the fire duration and intensity as well as the amount of humus, duff, and other organic materials present in the mantle. The increase immediately after a burn of calcium, potash, phosphoric acid, and other minerals will give the residual and emergent vegetation a short-term boost. However, the rapid leaching through the sandy soils will cause rapid runoff of these nutrients and only short-term benefits. The increased nitrification of the soil by the emergent vegetation and increased nutrient release result in rapid regrowth of grasses and other succulent vegetation on the sites.

There is no evidence to show that the direct heating of the soil by the burning of material above it with a fire of low intensity has any significant adverse effect. Fire of this type has little total effect on the soils and, in most cases, would be beneficial.

4.1.4.6. Escaped Fire

With any prescribed fire, there always exists the possibility of its escape into the surrounding area. This can be caused by one or more factors that may or may not be preventable. Inadequate firebreaks, too few personnel, unpredicted changes in weather conditions, peculiar fuel type, being in too big a hurry, and insufficient knowledge of fire behavior are a few factors that could cause loss of control. An escaped fire could turn into a very serious situation. The damage that could result would be much less severe on the Refuge than if it encroached on private land where buildings, equipment, and land

improvements would be involved. Many of the prescribed burn areas are well within the Refuge and of minimal threat to private or other improved lands in the event of an escape. Extreme care, careful planning, and adherence to the unit prescription will be exercised when prescribed burning all units, particularly when burning areas that are near or adjacent to the Refuge boundary.

In the event that a prescribed fire does jump a firebreak and burn into unplanned areas, there is a high probability of rapid control with minimal adverse impact. The network of firebreaks and roads will greatly assist in rapid containment. In most cases, all of the Refuge firefighting equipment will be immediately available at the scene with all nearby water sources previously located. The applicable Department of Natural Resources (DNR) fire suppression crews and local fire departments will always be notified of a prescribed burn. Thus, maximum numbers of experienced personnel and equipment are immediately available for wildfire suppression activities.

4.1.5. Trapping

Trapping is occasionally used as a management tool under permit or by Refuge staff. Removing beavers that are plugging water control structures and muskrats, beavers, or woodchucks that are damaging dikes by undermining them with tunnels are examples of management uses for trapping. The direct impact upon the animal trapped is fatal, but impacts on the overall population of the species in the area are negligible due to the small number of animals taken and the restricted areas trapped.

4.2. Summary of Effects by Resource and Alternative

Key analysis factors are defined as habitat requirements or limiting factors important to each of the resources analyzed below. The analysis that follows focuses on the effects of each alternative on these factors. In all of the alternative analysis, it is important to remember that precise quantification of impacts was not possible given the necessary flexibility for long-term planning and the unknowns inherent with long-term planning, such as variability in precipitation patterns, effects of climate change, increases in scientific knowledge/management practices, and offsite influences. Consequently, the conclusions are focused on projected significance. For example, a major unknown of the implementation of the action alternatives (Alternatives 2 and 3) is the ability of the Refuge to provide shoreline and wetland habitat with reduced on-site water control capability given offsite water level

Table 3: Acres and Potential Energy in Millions of Kilojoules for Three Refuge Habitats, Swan Lake NWR

	Alternative 1	Alternative 2	Alternative 3
Emergent Wetland Acres	500-1,000	1,200	1,200-1,800
--Potential Energy	199-399	479	479-718
Moist Soil Acres	830	0	830 ¹
--Potential Energy	1,220	0	1,220
Cropland	1,365	0	0
--Potential Energy (corn)	280	0	0
Total Potential Energy	1,699-1,899	479	1,699-1,938

1. Final acreage to be determined after completion of hydrogeomorphic evaluation

management and natural variability of weather patterns, which was the reason to create these on-site water control structures.

4.2.1. Waterfowl

Factors considered in this analysis include:

- Seasonal availability of high energy foods
- Seasonally available open water
- Disturbance

Spring migrating waterfowl use Swan Lake NWR for feeding and courtship. Moist soil units provide seeds, rhizomes, and tubers – foods with high energy content – as well as invertebrates. Vertical structure of the bottomland forest, largely related to tree density and diameter, creates isolated areas favorable for waterfowl courtship behavior. Hard mast production of bottomland forests also provides food for waterfowl during fall migration. Migrating waterfowl require loafing habitat, areas largely free of disturbance with adequate hiding cover and water depth.

Many types of waterfowl use the Refuge, but Canada Geese at one time wintered there in high numbers. Beginning in the 1950s, use of Swan Lake NWR by wintering Canada Geese of the Eastern Prairie Population (EPP) steadily increased until it peaked in 1977 at 181,000 birds. The decades following the peak saw a steady decline in the number of geese wintering on the Refuge despite a steady increase in Canada Goose numbers (EPP geese and others) within the Mississippi Flyway (Missouri Department of Conservation, 1995). Studies of the Canada Goose population show a variety of factors interact to affect their distribution. These include

increased availability of habitats across the landscape, fall and winter weather conditions, and variations in hunting pressure along the migratory flyway (Sheaffer et al., 2004), which are all factors outside the influence of Refuge management. Canada Geese that do winter on the Refuge, with peak numbers of about 20,000 to 40,000 in recent years, require high energy foods, open water, and low levels of disturbance. This analysis considers the effects of each alternative on these factors, but it is important to note that they are not thought to be primary determinants in the number of Canada Geese that winter on the Refuge.

High energy foods (those high in calories) to meet the needs of migrating and wintering Canada Geese and other waterfowl primarily are provided on the Refuge: 1) within emergent wetlands, especially those managed using moist soil techniques, and 2) through planted crops. Moist soil foods consisting of a mixture of seeds, roots, tubers, and green browse from naturally occurring wetland plants are known to contain high energy and are preferred by wintering Canada Geese when available (Austin 1998). As moist soil foods are depleted or made unavailable because of ice, geese shift to agricultural and other foods both within and beyond the Refuge. As spring nears and wetlands are again available, geese shift back to moist soil foods in preparation for migration.

Table 3 compares wetland and cropland acreages, and available energy, across all alternatives. Energy estimates for each habitat are derived from values provided in the Upper Mississippi River and Great Lakes Region Joint Venture Waterfowl Conservation Strategy (2007).

In addition to high energy foods, waterfowl also need areas where they can loaf and rest undisturbed. Although goose hunting has long occurred at designated locations on the perimeter of the Refuge, the opposite is the case for the interior of the Refuge where all public uses are prohibited during the wintering period. In this way the Refuge provides for the daily energy requirements of waterfowl in an area largely free of human disturbance.

4.2.1.1. Alternative 1: Current Management Direction (No-Action Alternative)

Migratory waterfowl are expected to continue using the Refuge at present levels over the life of the CCP, barring changes in waterfowl numbers or migration patterns influenced by conditions beyond the Refuge. Under Alternative 1, the amount of high energy foods provided in emergent wetlands and cropland would remain at present levels. Silver Lake would be held at its present level providing more than 2,000 acres of open water throughout each year. Impounding water within the Silver Lake basin would provide a reliable water source for moist soil management across the Refuge but would do so by flooding an area that might otherwise provide additional high energy wetland habitat. Goose hunting would continue at designated sites along the perimeter of the Refuge, but the interior would serve as a sanctuary largely free of human disturbance. See Section 4.2.6. “Wildlife Disturbance” on page 83 for additional discussion of wildlife disturbance.

4.2.1.2. Alternative 2

Under this alternative the amount of high energy foods for waterfowl would decrease compared to existing amounts within two of the three habitats analyzed (Table 3). Without impounded water, the Silver Lake and Swan Lake basins would likely convert to wet meadow, emergent wetland, or bottomland forest. The availability of open water would become more variable because it would be closely linked to the amount of runoff within the watershed (see Section 4.2.7. “Hydrology and Water Quality” on page 84). Increased amounts of wildlife-dependent recreation would increase the amount of disturbance along the perimeter of the Refuge, but disturbance within the interior of the Refuge would likely decrease without much of the existing infrastructure especially roads and levees. Migratory waterfowl are expected to continue using the Refuge but the amount and frequency of use would be linked to water availability.

4.2.1.3. Alternative 3: Preferred Alternative

Under this alternative the amount of high energy foods for waterfowl would remain the same or increase compared to existing amounts within the

three habitats analyzed (Table 3 on page 78). The availability of open water would become more variable because it would be closely linked to the amount of runoff within the watershed (see Section 4.2.7. “Hydrology and Water Quality” on page 84), but Refuge wetlands including the Silver Lake basin would be seasonally flooded to accommodate migrating waterfowl and shorebirds. Increased opportunities for wildlife-dependent recreation, especially duck hunting, would likely increase the amount of disturbance in some locations, but the interior of the Refuge would remain closed seasonally to reduce disturbance to wintering and migrating waterfowl. See Section 4.2.6. “Wildlife Disturbance” on page 83 for additional discussion of wildlife disturbance. Migratory waterfowl are expected to continue using the Refuge at present levels over the life of the plan barring changes in waterfowl numbers or migration patterns influenced by conditions beyond the Refuge.

4.2.2. Shorebirds

Factors considered in this analysis include:

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

Presently, migrating shorebirds primarily utilize Swan Lake NWR for stopover feeding habitat. Most migration occurs from March through May and again from July through November. Invertebrates found in seasonally exposed mud flats within some moist soil units provide a high energy food source. Shorebirds require low levels of disturbance as well as specific amounts of hiding cover and water depths ranging from 0 to 8 inches, depending on the species.

The Upper Mississippi and Great Lakes Region Joint Venture Shorebird Habitat Conservation Strategy (Potter et al. 2007) identifies five shorebird foraging guilds. According to the Refuge bird list, the most commonly occurring migrant shorebirds are clustered in two foraging guilds: Wet Mudflat/moist soil plants and Shallow Water (<5cm). This analysis focuses on the amount of Wet Mudflat/moist soil plants habitat (hereafter mudflats) likely to occur under each of the alternatives and how well the amounts provide for the needs of the estimated numbers of migrating shorebirds. The amount of shallow water habitat is dependent on subtle variations in topography and is difficult to quantify, but in all but drought years it is reasonable to conclude that the amount of shallow water habitat would rise and fall along with the amount of mudflats within moist soil units. Using information provided in Pot-

Table 4: Acres and Shorebird Forage in Grams for Refuge Mudflat Habitat Within Moist Soil Management Units

	Alternative 1		Alternative 2		Alternative 3	
	Spring	Fall	Spring	Fall	Spring	Fall
Mudflat (acres)	80	80	0	0	200 ¹	80 ²
Forage (grams)	648,000	648,000	0	0	1,620,000	648,000

1. Final acreage to be determined after completion of hydrogeomorphic evaluation.
2. Final acreage to be determined after completion of hydrogeomorphic evaluation.

ter et al. (2007) shows that the daily forage energy requirement for members of the Wet Mudflat guild ranges from 5.80 grams to 14.84 grams with an average of 8.79 grams per day, and that most migrants within this guild stay 5-10 days at a site.

In 2003, the Refuge was designated as a regional site of importance under the Western Hemisphere Shorebird Reserve Network. This means that at least 20,000 shorebirds use the Refuge annually, but only a portion of these feed in mudflat habitat. Table 4 shows the estimated amount of shorebird forage for mudflat habitat within moist soil units for each alternative. Alternatives 1 and 3 both provide sufficient forage to meet the needs of the estimated number of migrant shorebirds using the Refuge.

4.2.2.1. Alternative 1: Current Management Direction (No-Action Alternative)

Under Alternative 1, approximately 10 percent (about 80 acres) of the total area managed using moist soil practices would be seasonally exposed as mud flats to provide feeding habitat for migrating shorebirds. This is expected to provide sufficient forage to meet the needs of migrant shorebirds within the mudflat foraging guild that use the Refuge as stopover habitat.

The relatively shallow and flat Refuge wetlands would provide a range of water depths to meet the needs of other shorebird foraging guilds. Silver Lake would continue to function as a reservoir with relatively constant water depths and would provide little or no shorebird feeding habitat.

Under Alternative 1, public uses that occur on the Refuge would be segregated by location and time of year to minimize disturbance in these areas during peak migration activity. See Section 4.2.6. "Wildlife Disturbance" on page 83 for additional discussion of wildlife disturbance.

4.2.2.2. Alternative 2

Under this alternative none of the emergent wetland would be managed using moist soil practices and there would be no mudflat habitat associated with these areas. The amount of forage available to shorebirds would increase greatly at first as the sediments of the Silver Lake basin are exposed, but eventually these would convert to vegetative cover and there would be little mudflat habitat on the Refuge. Use of the Refuge by the shorebird foraging guild dependent on this habitat (currently one of the most common) would decrease along with the habitat. The availability of shallow water habitat would become more variable because it would be closely linked to the amount of runoff within the watershed (see Section 4.2.7. "Hydrology and Water Quality" on page 84). Increased amounts of wildlife-dependent recreation would increase the amount of disturbance along the perimeter of the Refuge but disturbance within the interior of the Refuge would likely decrease without much of the existing infrastructure especially roads and levees.

4.2.2.3. Alternative 3: Preferred Alternative

Under Alternative 3, approximately 25 percent (about 200 acres) of the total area currently managed using moist soil practices would be seasonally exposed as mud flats in the spring and 10 percent (80 acres) in the fall. These acreages may vary because the final amount and location of moist soil managements are not yet determined. This alternative would provide the most forage for shorebirds associated with mudflats. Increasing the amount of mudflat habitat in the spring would benefit migrating shorebirds because some species use the Refuge in larger numbers during the spring, and it would provide migrants additional resources leading into the breeding season. Seasonal variations of water levels within the Silver Lake basin may also increase the amount of mudflat habitat.

The availability of shallow water habitat would become more variable because it would be closely linked to the amount of runoff within the watershed (see Section 4.2.7. “Hydrology and Water Quality” on page 84), but Refuge wetlands including the Silver Lake basin would be seasonally flooded to accommodate migrating shorebirds and waterfowl. Increased opportunities for wildlife-dependent recreation, especially duck hunting, would likely increase the amount of disturbance in some locations, but the interior of the Refuge would remain closed seasonally to reduce disturbance to wintering and migrating waterfowl. See Section 4.2.6. “Wildlife Disturbance” on page 83 for additional discussion. Migratory shorebirds are expected to continue using the Refuge at or above present levels over the life of the Plan barring changes in numbers or migration patterns influenced by conditions beyond the Refuge.

4.2.3. Marsh Birds and Wading Birds

Factors considered in this analysis:

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

Swan Lake NWR provides habitat for both migrating and nesting marsh birds and wading birds. Marsh birds, including bitterns, rails, grebes, and coots, are often secretive and difficult to survey. Many nesting marsh birds require dense vertical cover, often of a single plant species, along with stable water levels. The type of vegetation and water levels varies by marsh bird species. Wading birds, which include herons and egrets, primarily feed by wading in shallow waters. They require wetlands with abundant prey and various water depths to accommodate a range of species. Both marsh birds and wading birds are sensitive to disturbance by humans. See Section 4.2.6. “Wildlife Disturbance” on page 83 for additional discussion.

4.2.3.1. Alternative 1: Current Management Direction (No-Action Alternative)

Under Alternative 1, the amount of wetlands and dense marsh vegetation would remain at present levels. Exposure of mudflats in the spring and fall (see Section 4.2.2. “Shorebirds” on page 79) would provide a variety of water depths for wading birds. Use of the Refuge by marsh and wading birds would continue at present rates. Periodic catastrophic flooding worsened in part by changes within the

watershed (see Section 4.2.7. “Hydrology and Water Quality” on page 84) would continue to adversely affect nesting marsh birds. Marsh birds initially attracted to Refuge wetlands, with seemingly stable water levels, would continue to lose nests, eggs, or young to later flooding when it occurs. The interior of the Refuge, where most marsh and wading bird habitat is located, would continue to serve as sanctuary free from human disturbance much of the year. See Section 4.2.6. “Wildlife Disturbance” on page 83 for additional discussion.

4.2.3.2. Alternative 2

Under Alternative 2, the amount of dense marsh vegetation would decrease, especially within former moist soil units, but there would be a large increase in the amount of wet meadow habitat. The amount of forage available to wading birds and marsh birds would increase greatly as the sediments of the Silver Lake basin are exposed. The amount of foraging habit would vary along with water levels, but would be greater than present amounts. Periodic catastrophic flooding would continue to be a problem for nesting marsh birds as described in Alternative 1. The amount of disturbance would increase along the perimeter of the Refuge, but the interior of the Refuge, where most marsh and wading bird habitat is located, would continue to serve as a sanctuary free from human disturbance much of the year. See Section 4.2.6. “Wildlife Disturbance” on page 83 for additional discussion.

4.2.3.3. Alternative 3: Preferred Alternative

Under this alternative, the amount of dense marsh vegetation would increase, especially within the Swan Lake and Silver Lake basins. The amount of wet meadow habitat also would increase, but much less than under Alternative 2. These changes would increase the amount of foraging habitat for all wetland associated birds. Reestablishing the relationship between water surface elevation and stream flow throughout much of the year would provide a variety of water depths, conditions favorable to wading birds. The amount of nesting habitat for marsh birds would increase, but periodic catastrophic flooding would continue to be a problem as described in Alternative 1. Locating some moist soil units at higher elevations within the Refuge may allow some nesting marsh birds to avoid flooding. The amount of disturbance would increase along the perimeter of the Refuge, but the interior of the Refuge, where most marsh and wading bird habitat is located, would continue to serve as a sanctuary free from human disturbance much of the year. See Section 4.2.6. “Wildlife Disturbance” on page 83 for additional discussion.

4.2.4. Eastern Massasauga Rattlesnake

Factors considered in this analysis:

- Contiguous mosaic of early successional uplands and lowlands at least 250 acres largely free of woody vegetation, and in close proximity to known hibernation sites
- Wetlands especially wet meadow and wet prairie

Swan Lake NWR harbors a population of the eastern massasauga rattlesnake, a candidate species for listing under the Endangered Species Act. The existing amount of habitat is thought to be the minimum necessary to meet the needs of the population (Durbian et al. 2008).

4.2.4.1. Alternative 1: Current Management Direction (No-Action Alternative)

Under this alternative, the amount of contiguous habitat for the eastern massasauga rattlesnake would remain at present levels. If the habitats are regularly disturbed to retard succession it would maintain the minimum amount of habitat required to sustain a viable population. Recurrent flooding would continue to be a threat and restricting the population to one minimally sized patch of habitat potentially threatens the long-term viability of the population.

4.2.4.2. Alternative 2

Under Alternative 2, the amount of prairie would increase by nearly 1,000 acres and the amount of wet meadow habitat by about 4,000 acres. This would increase the size of the existing contiguous habitat and create additional separate patches of contiguous habitat. The elimination of Sliver Lake would increase the opportunities for the population to expand westward within the Refuge. If the habitats are regularly disturbed to retard succession it would improve habitat conditions for the snake as well as the probability of maintaining a viable population. Recurrent flooding would continue to have an adverse effect, especially when it coincides with the hibernation period, a time when the snakes are unable to move away from flood waters.

4.2.4.3. Alternative 3: Preferred Alternative

Under Alternative 3, the amount of prairie would increase by more than 800 acres and the amount of wet meadow habitat by more than 500 acres. This would increase the size of the existing contiguous habitat and create additional patches. If the habitats are regularly disturbed to retard succession it would improve habitat conditions for the snake as well as the probability of maintaining a viable population. Reestablishing the relationship between stream flow and water surface elevation may provide oppor-

tunities for westward dispersal during periods when the Sliver Lake basin contains little or no water, but existing infrastructure would continue to serve as barriers to dispersal.

4.2.5. Wildlife Dependent Recreation

4.2.5.1. Alternative 1: Current Management Direction (No-Action Alternative)

Despite the desire to increase Refuge access by the public, there would only be an unstaffed point of contact 7 days a week year-round under this alternative to provide information on such access due to staffing considerations. Because this alternative would allow for the continued impoundment of Refuge streams and use Silver Lake as a reservoir to provide water for wetland management across the Refuge, there would continue to be opportunities for fishing at existing facilities for shore and boat fishing. With regard to hunting, there would be an effort to provide a quality hunting experience for participants of managed deer hunts (including disabled hunters) and the annual goose hunt.

Other wildlife-dependent recreational and educational opportunities would be addressed under this alternative. There would be an effort to provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from mid March through mid October. This alternative also calls for the development of an environmental education site that includes an outdoor classroom. As another example of providing recreational opportunities, this alternative would provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use.

With regard to public outreach and educational opportunities, this alternative would continue to provide volunteer opportunities that total approximately 625 hours annually and call for Refuge personnel to continue to speak to local civic and sportsmen's groups and special events upon request approximately two to three times per year.

4.2.5.2. Alternative 2

Under this alternative, the response to the growing demand for greater access to the Refuge by the public would be to provide a staffed point of contact and interpretation facilities most business days during normal working hours year-round to accommodate up to 17,000 visitors annually. Because under this alternative there would be an effort to return hydrology on the Refuge to historic patterns prior to the installation of the present water control structures on the Refuge, open water fishing opportunities may be reduced. However, over the life of the plan, the Refuge would continue to provide access

for fishing in accordance with state and Refuge regulations. With regard to hunting, there would be an effort to develop a hunting plan that introduces duck hunting and small game hunting and emphasizes opportunities for youth and disabled hunters.

Other wildlife-dependent recreational and educational opportunities would be addressed under this alternative. While still making an effort to protect sensitive wildlife from disturbance, this alternative would provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from mid March through mid October, and by allowing visitors limited access to selected portions of the Refuge from mid October through the end of February. As another example of providing recreational opportunities, this alternative would provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use. Under this alternative, Refuge personnel would continue to develop the Friends group and maintain the existing level of volunteer opportunities (625 hours annually). With regard to outreach, over the life of the plan there would be an effort to continue to speak to local civic and outdoors enthusiasts groups and special events upon request approximately four to six times per year. There would also be an effort to continue to provide information and interviews for local news media and outdoors writers as well as distribute news releases four to five times annually.

Implementing Alternative 2 would enhance wildlife-dependent recreation on the Refuge by increasing wildlife recreation over current opportunities and would be more beneficial than Alternative 1 by increasing public outreach, interpretation, and access to the Refuge. Therefore, Alternative 2 would be beneficial to wildlife-dependent recreation.

4.2.5.3. Alternative 3: Preferred Alternative

Under this alternative, the response to the growing demand for greater access to the Refuge by the public would be to provide a staffed point of contact and interpretation facilities during normal working hours year-round on business days and seasonally on holidays and weekends to accommodate up to 50,000 visitors annually. Alternative 3 would be the same as Alternative 2 with regard to hunting. Because under this alternative there would be an effort to replicate some of the historic water hydrology patterns prior to the installation of the present water control structures on the Refuge, open water fishing opportunities may be reduced. However, over the life of the plan, the Refuge would continue to provide access for fishing in accordance with state and Refuge regulations.

Other wildlife-dependent recreational and educational opportunities would be addressed under this alternative. While still making an effort to protect sensitive wildlife from disturbance, this alternative would provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from mid March through mid October, and by allowing visitors limited access to selected portions of the Refuge from mid October through the end of February. As another example of providing recreational opportunities, this alternative would provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use. Under this alternative, Refuge personnel would continue to develop the Friends group and increase the amount of volunteer opportunities (1,000 hours annually). With regard to outreach, over the life of the plan, there would be an effort to continue to speak to local civic and outdoors enthusiasts groups and special events upon request approximately four to six times per year. There would also be an effort to continue to provide information and interviews for local news media and outdoors writers as well as distribute news releases four to five times annually. These outreach efforts should result in an increase in local community support and appreciation for fish and wildlife conservation and the public's endorsement of the Refuge's role in conservation.

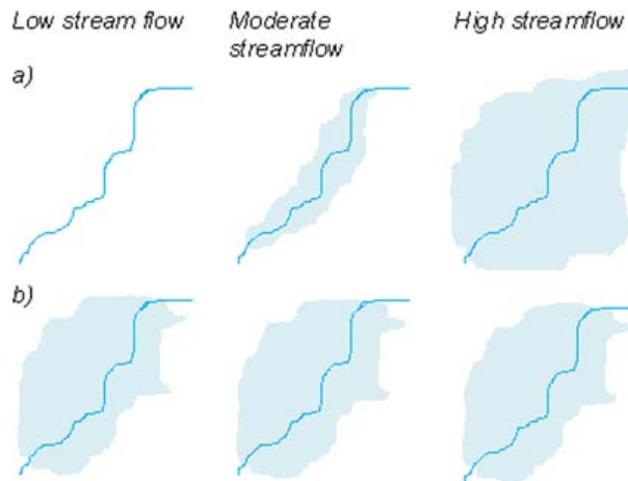
Implementing this alternative would be beneficial to the Refuge's wildlife dependent recreation through increasing access to the Refuge and hunting opportunities over current. Alternative 3 would be more beneficial than the other alternatives by increasing volunteer opportunities and interpretation.

4.2.6. Wildlife Disturbance

Swan Lake NWR offers opportunities for six priority wildlife-dependent public uses: hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. In addition, the Refuge also offers opportunities for the following uses: hiking, jogging, boating, canoeing, kayaking, wild edibles gathering for personal use, and picnicking. The potential to disturb wildlife is an element common to all uses occurring on the Refuge. This analysis discusses the amount of potential wildlife disturbance from these uses for all alternatives.

4.2.6.1. Alternative 1: Current Management Direction (No-Action Alternative)

Under this alternative, current management practices that support wildlife disturbance will continue to be supported. These include sanctuary areas for waterfowl during hunting season and Ref-

Figure 2: Concept Diagram Depicting Stream/Floodplain Relationship

use “No-Access” areas during nesting season. Continuing current practices represents no change, which would be less than significant as these measures are designed to protect the species from disturbance during sensitive/critical times.

4.2.6.2. Alternative 2

As discussed within this EA, there are certain species that are especially sensitive to disturbance including shorebirds, wading birds, and marsh birds. Restoration of historic water hydrology patterns and conversion of all current cropland to other native habitats called for under this alternative should provide additional habitat for these sensitive species. Implementation of that Refuge change combined with efforts to reduce wildlife disturbance of these species will benefit these wildlife species. Therefore, these additional protective measures and increased habitat would represent a beneficial impact.

4.2.6.3. Alternative 3: Preferred Alternative

Under Alternative 3 water management on the Refuge would change. This change would allow for the creation of more diverse habitat that would attract a greater variety of species to utilize the Refuge. This alternative also calls for the greatest use of the Refuge by visitors. This alternative would establish periods of access by the public along with “No-Access” areas that should provide needed sanctuary for many sensitive species.

4.2.7. Hydrology and Water Quality

- Factors considered in this analysis
- Water surface elevation relative to stream flow

■ Sedimentation

Hydrology within the Grand River Watershed has been dramatically altered over the past 150 years through land use changes, levee and dam construction, and stream channelization. This includes the construction of levees and water control structures within the Refuge to impound water. One consequence to Refuge waters is a change in the relationship between water surface elevation (water depth and distribution) and stream flow (volume of water moving past a given point). Historically (prior to watershed alterations), water elevation and distribution would rise and fall along with stream flow. Today, there is little relationship between these two hydrologic variables; Figure 2 depicts the relationship between a stream and its floodplain under (a) historic hydrologic conditions and (b) with existing impoundments and levees.

The absence of this relationship has contributed to a number of effects within the Silver Lake basin including a decrease in the amount of aquatic vegetation and an increase in sedimentation, turbidity, and carp, a fish species that thrives in slow moving or standing water and that has behavior that increases turbidity and decreases aquatic vegetation. Sedimentation is also a factor affecting water quality and quantity within the Refuge, especially the Silver Lake basin. Comparing the original capacity of the Silver Lake basin to estimates derived from bathymetric data collected in 2007 shows that the volume of the basin is decreasing. Such sedimentation is typical of impoundments like Silver Lake and although the present rate of sedimentation is not known, the trend is expected to continue.

4.2.7.1. Effects Alternative 1

Under this alternative the relationship between water surface elevation and stream flow would remain unchanged. Silver Lake would continue to serve as a reservoir to provide source water for management of other wetlands within the Refuge. Sedimentation would likely continue within the Silver Lake basin, but a Refuge emphasis on enhancing land and water conservation practices within the watershed would help decrease erosion and sedimentation. Despite such efforts, the water holding capacity of the basin would likely continue to decrease which could hamper wetland management across the Refuge.

4.2.7.2. Effects Alternative 2

Under this alternative water no longer would be impounded on the Refuge in an attempt to restore the relationship between water surface elevation and stream flow. This means that water elevation and distribution would rise and fall along with stream flow and that Refuge streams and wetlands would undergo seasonal and annual periods with little or no water.

Stream restoration would occur gradually. Initially, sheet flow would increase as water flowing into the Refuge spread across the flat, exposed sediments within the Silver Lake basin. As the sediments compact, flows would first scour a braided channel and eventually form a meandering main channel. This would create a stretch of riverine habitat, something that presently does not exist within the Refuge or throughout much of the Grand River Watershed.

Water and land use changes across the Grand River Watershed described above preclude full restoration of hydrologic function within the Refuge. Today runoff reaches the Refuge more quickly and in greater amounts than in the time prior to the watershed changes. It is likely that the magnitude and frequency of high flow events would increase and overbank flooding along with it once Silver Lake is no longer serving as a buffer. The lower portion of the Silver Lake basin would receive floodwaters from both the Grand River and Yellow Creek and is expected to be inundated more frequently than the upper basin. Habitat within the Silver Lake basin would begin to convert to wet meadow, emergent wetland, or bottomland forest.

Refuge streams, especially Elk Creek and Turkey Creek, would continue to carry sediment, but a Refuge emphasis on enhancing land and water conservation practices within the watershed would help decrease erosion and sedimentation. The elimination of Silver Lake and restoration of riverine habi-

tat would increase the amount of aquatic vegetation and create conditions less favorable to carp, both of which would help reduce stream turbidity.

4.2.7.3. Effects Alternative 3

This alternative would mimic components of historic hydrologic function within Refuge streams by restoring the relationship between water surface elevation and stream flow throughout much of the year. This means water elevation and distribution would rise and fall along with stream flow creating seasonal and annual variations in water levels within the Silver Lake and Swan Lake basins. One departure would be that the basins would typically be flooded in fall to accommodate migratory birds. It is expected that partial or total flooding of both basins in fall would be possible in all but drought years.

Refuge streams, especially Elk Creek and Turkey Creek, would continue to carry sediment, but a Refuge emphasis on enhancing land and water conservation practices within the watershed would help decrease erosion and sedimentation. Within the Silver Lake basin the variations in water levels are expected to help flush sediment, increase the amount of aquatic vegetation, and create conditions less favorable for carp. It is expected that an increase in aquatic vegetation and lower carp numbers would also help lower turbidity.

4.3. Cumulative Impacts

A cumulative impact is defined as an impact on the natural or human environment, which results from the incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or nonfederal) or person undertakes such other actions (40 Code of Federal Regulations 1508.7).

Cumulative impacts are the overall net effects on a resource that arise from multiple actions. Impacts can “accumulate” spatially when different actions affect different areas of the same resource. They can also accumulate over the course of time from actions in the past, in the present, and in the future. Occasionally, different actions counterbalance one another, which cause them to partially cancel out each other’s effect on a resource. Nevertheless, more typically, multiple effects add up with each additional action contributing an incremental impact on the resource. In addition, sometimes the overall effect is greater than merely the sum of the individual effects, such as when one more reduction in a population crosses a threshold of reproductive sustainability and threatens to extinguish the population.

A thorough analysis of impacts always considers their cumulative aspects. Because actions do not take place in a vacuum, there are virtually always some other actions that have affected that resource in some way in the past, are affecting it in the present, or will affect it in the reasonably foreseeable future. Thus, any assessment of a specific action's effects must in fact be made with consideration of what else has happened to that resource, what else is happening, or what else will likely happen to it.

The Refuge is not aware of any past, present, or future planned actions that would result in a significant cumulative impact when added to the Refuge's proposed actions as outlined in the preferred alternative.

4.3.1. Biological Resources

4.3.1.1. Listed Species and Other Species of Special Interest

Habitat loss and other factors across the range of certain wildlife species have caused declines in their populations to levels of special concern and classification. The eastern massasauga rattlesnake and Least Bittern have special classifications and occur on the Refuge. Another species of interest on the Refuge is the Bald Eagle.

Massasaugas are historically known from 13 sites in eight counties in Missouri. Eight populations (comprising four counties) are extirpated, and two others are likely extirpated (no longer are present). Of the remaining three populations, one is secure and two are vulnerable. Threats to the massasauga still exist. Those threats will cause its numbers and range to continue declining, and as a result of those threats, it may become extinct in the future. Habitat loss is one of the primary factors in the decline of the eastern massasauga rattlesnake.

Least Bitterns are widespread, abundant, and secure globally but are quite rare in parts of their range. They are classified as imperiled in Missouri because of rarity or because of factors making it very vulnerable to extirpation from the state. Least Bitterns were described as locally common in large, permanent marshes in most parts of the state in the early 1900s. Squaw Creek NWR, Swan Lake NWR, Mingo NWR, and the refuges that were formerly part of the Mark Twain National Wildlife Refuge Complex (Port Louisa NWR, Great River NWR, Clarence Cannon NWR, Two Rivers NWR and Middle Mississippi NWR) and the Ted Shanks and Marais Temps Clair state conservation areas now harbor the largest known breeding populations in the state.

Bald Eagles were once very common throughout most of the United States. Their population numbers have been estimated at 300,000 to 500,000 birds in the early 1700s. Their population fell to "threatened" levels in the continental United States of less than 10,000 nesting pairs by the 1950s and to "endangered" levels of less than 500 pairs by the early 1960s. The Bald Eagle is making a gradual but dramatic recovery. There are now more than 6,000 nesting eagle pairs and more than 20,000 individual birds in the lower 48 states; the Bald Eagle has been delisted from the Endangered Species Act.

4.3.1.2. Wildlife and Habitat Resource Management

Prairies once occurred in every part of Missouri, including extensive prairies in the Ozarks. Of the remaining 90,000 acres of native prairie in Missouri, about 68,000 acres are in private ownership. Missouri Department of Conservation, the Missouri Department of Natural Resources, The Nature Conservancy, the Missouri Prairie Foundation, the University of Missouri, and the Ozark Regional Land Trust own an estimated 22,000 acres of native prairie. These agencies and organizations maintain prairie through selective cutting of woody species, periodic haying, grazing, and prescribed burning.

When Lewis and Clark embarked on their historic exploration of the West in 1803, the Missouri River was a diverse 2,300-mile long system of floodplains, braided channels, riparian lands, chutes, sloughs, islands, sandbars, and backwaters. The River constantly reshaped the channel and the floodplain, resulting in a complex natural system supporting an incredible diversity of fish, wildlife, and plants.

Six major dams were built in the upper reaches of the Missouri River in the first half of the 20th century. These dams and other river projects transformed the Missouri River from a free-flowing river into a series of reservoirs and channelized waterways, effectively separating the river from its floodplain. By 1972, the river's length had been shortened by 46 miles and its surface area decreased from 121,739 acres to 71,151 acres. In addition to these dams, levees such as the Garden of Eden levee add to the severity of flooding events within the Swan Lake watershed.

Statewide, the loss of historic wetlands in Missouri has exceeded the national rate; approximately 87 percent of Missouri's original 4.5 million acres of wetlands have been lost. Roughly 168,000 acres of natural channel and 354,000 acres of associated habitat have been lost on the lower 730 miles of river.

By 1972, floodplain forest that once made up 76 percent of floodplain vegetation comprised only 13 percent.

Habitat loss and other factors have caused declines in species populations to the level of concern that warrants special classification.

4.3.1.3. Impacts of Alternatives to Biological Resources

All of the alternatives are intended to maintain or improve biological resources on the Refuge. The biological integrity of the Refuge and achievement of Refuge purposes would be enhanced best under the preferred alternative (Alternative 3). The combination of our proposed management actions with those of other organizations could result in substantial, beneficial cumulative effects by:

- Increasing protection and management for federally and state-listed threatened or endangered species.
- Protecting habitats that are regionally declining.
- Reducing invasive plants and animals.

However, these beneficial impacts are dependent on the success of the proposed actions.

We used regional bird conservation plans, Partners in Flight, shorebird, waterbird, and waterfowl plans as well as cooperation with the Missouri DNR in determining the highest resource priorities for the Refuge to protect and manage. This process allows the Refuge to focus its conservation and management actions on those resources of concern that are internationally, nationally, regionally, and locally important. We expect positive cumulative impacts on neotropical migratory birds, waterfowl, waterbirds, species of special concern, fish, and other resident wildlife and their habitats from Refuge actions.

Alternative 1 (No Action)

Alternative 1 does not call for major changes in Refuge goals, objectives, and strategies. Over time, wetland habitat could be expected to decline under Alternative 1, and a corresponding decline in wildlife health and populations could be expected. This would be due primarily to the loss of capacity in Silver Lake due to sedimentation. Because Silver Lake is used as a reservoir to supply water used to manipulate wetland habitat throughout the Refuge, any loss of water capacity will eventually reduce Refuge ability to manage these wetland areas effectively. Efforts would be made to conserve habitat as it is today but would not fully address long-term issues such as sedimentation in the wetland management units. This alternative does not contribute to reversing the dramatic loss of habitat, including prairies and wetlands, which the state of Missouri has experienced. However, as the Refuge is not the only site of these habitats and Refuge would still implement measures to provide for these habitats under this

alternative, the cumulative impact of implementing Alternative 1 to other past, present, and reasonably foreseeable future actions should be less than significant.

Alternative 2

Restoring historic hydrologic patterns and increasing the amount of native prairie habitat would be the focus of Alternative 2. Species depending on these habitats, such as the eastern massasauga rattlesnake, would benefit greatly while species that depend on other habitat types would see no benefit over current management or even a negative impact due to decrease in habitat availability driven by less water control level management by the Refuge. The magnitude of impacts to these wetland-dependent species depends on the Refuge's ability to provide these water-dependent habitats without on-site water control structures and in the presence of anthropogenic offsite-caused fluctuations in water levels and natural variations. However, as long as the habitats are provided at quantities and qualities necessary for the species, cumulative impacts would be less than significant.

Alternative 3

Of the three alternatives, the preferred alternative (Alternative 3) would generate the greatest benefits for wildlife, habitat, and people by optimizing resource management while increasing the current level of public use. A more concerted effort to conserve, manage, and restore habitats that are native to the Lower Missouri River Ecosystem would benefit wildlife species. A greater diversity of species would benefit from this alternative, because it would include additional wetland, riparian, and native grass development and enhancement. Biological monitoring would increase, resulting in greater knowledge that could be used to better manage habitat. Greater monitoring of listed species would help staff manage more effectively for these species. However, with less water level control under this alternative, Alternative 3 has the same risks discussed in Alternative 2. Therefore, while Alternative 3 has a greater opportunity for beneficial impacts, implementing this alternative would still have less than significant cumulative impacts as long as the habitats are provided at quantities and qualities necessary for the species.

4.3.2. Sedimentation and Water Quality

Factors influencing sedimentation and water quality near and in the Refuge include:

- Swan Lake NWR is filling in due to siltation.
- Within the Lower Missouri River Ecosystem, nearly 95 percent of the basin's land mass is applied to agriculture. Non-point source pollu-

tion is a major contributor to the contamination in the river and its floodplain.

- Erosion of farmland soils as well as direct rainfall runoff can introduce fertilizers and a variety of pesticides into the bottomland ecosystem.
- The presence of heavy metals such as mercury, selenium, copper, and cadmium in sediments and fauna of the Missouri River and its tributaries have been documented over the years.
- Most of the 15,000 miles of streams in the North-central region of Missouri have suffered extensive channelization, unrestricted livestock access, and sedimentation.
- Levee systems downstream of the Refuge prolong the negative impacts of flooding events.

All three alternatives would benefit the watershed and alleviate sedimentation by encouraging conservation practices and fostering improved soil and water uses. The incremental impact of any of the alternatives to past, present, and reasonable foreseeable future activities would likely be less than significant to sedimentation and water quality given the contribution of the Refuge to any water pollution and sedimentation.

4.3.3. Cultural and Human Resources

Factors related to the cumulative impacts on cultural and human resources include:

- Swan Lake NWR receives an estimated 17,000 visitors annually.
- The Service has identified six priority wildlife-dependent public uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation.
- Swan Lake NWR was recognized historically as a premiere hunting location for geese. Declines in populations of these birds have had an impact on the economy of the local area.
- Efforts to diversify habitat and expand hunting opportunities on the Refuge should attract greater utilization and improve the local economy.

We expect none of the alternatives to have cumulative impacts on cultural resources on the Refuge. Beneficial impacts would accrue at various levels, depending on the alternative, because of our proposed expansion of environmental education and interpretation programs as well as increased field surveys to identify and protect any sites discovered.

The lack of cumulative impacts is partially due to the fact that cultural resource impacts are generally localized, such as crushing of artifacts with heavy machines. Accordingly, under all of the alternatives, management practices on the Refuge would consider potential impacts to historical resources. Projects requiring excavation would be sampled using test pits in the affected area before work begins. Our regional archaeologist reviews annual prescribed burn plans before we implement them and, even then, we select methods to avoid impacts on any resources, which reduces the risk of negative impacts.

We expect none of the alternatives to have significant, adverse, and/or negative cumulative impacts on the economy of the local area. With Alternatives 2 and 3, we expect increased Refuge visitation and increased tourism to bring additional revenues to local communities, but we do not predict a significant increase in overall revenue in any area.

Table 5: Comparison of Impacts by Issue and Alternative

Issue	Alternative 1 Current Management Direction (No Action)	Alternative 2	Alternative 3 (Preferred Alternative)
<i>Issue No. 1: Wildlife Management:</i> There are diverse and sometimes conflicting expectations regarding the presence, variety, and abundance of Refuge wildlife. How should this apparent conflict be addressed?	The FWS focus is always “Wildlife First” in any management decision. If a refuge has the opportunity to address the needs of a species of interest, it will weigh that opportunity against potential impacts to populations of other species. This will be done before and in preference to any actions that impact public use.	Same as Alternative 1.	Same as Alternative 1.
<i>Issue No. 2: Wildlife Management:</i> Should hunting opportunities be expanded on the Refuge?	This alternative would provide a quality hunting experience for managed deer hunts (including hunters with disabilities) and the annual goose hunt.	This alternative would add to Alternative 1 by proposing duck hunting and small game hunting and emphasize opportunities for youth and hunters with disabilities.	Same as Alternative 2.
<i>Issue No. 3: Wildlife Management:</i> The decline in Canada Goose use of the Refuge in recent decades has decreased the quality of goose hunting, drawn fewer hunters and wildlife watchers, and changed the cultural identity of local communities – can this trend be reversed?	Studies indicate that the trend in a reduction of Canada Geese at the Refuge is more a reflection of changes in land use throughout the watershed than it is with changes in Refuge management. Under this alternative, the trend is likely to continue.	Efforts will be made under this alternative to expand hunting options on the Refuge as noted in Issue No. 2.	This alternative will expand on Alternative 2.
<i>Issue No. 4: Habitat Management:</i> Should the Refuge increase the amount of wet meadow habitat?	This alternative would maintain wet meadow habitat at present levels.	Under this alternative, about 4,000 acres of existing cropland, open water, emergent wetland and other habitats would be converted to wet meadow comprised of sedges, prairie cordgrass, and forbs.	Implementation of this alternative would convert approximately 530 acres of existing cropland, food plots, and areas of dense early successional forest to wet meadow.
<i>Issue No. 5: Habitat Management:</i> Should the Refuge consider, where possible, restoring the natural hydrology across the Refuge to allow for periodic flooding and increased sheet flow?	Current management practice relies on gravity flow through control structures to manage the time, duration, and flooding depth of most moist soil units on the Refuge.	Under this alternative, the restoration of a more natural hydrology regime on the Refuge would be considered because it would reduce Refuge management costs and could allow for a more natural ebb and flow of waters seasonally.	Over the long term, this alternative would mimic components of historic hydrologic function along reaches of Elk Creek, Turkey Creek, Tough Branch, and Yellow Creek that are within the Refuge. Over the life of the plan, allow for seasonal and annual variations in water levels within Swan Lake and Silver Lake basins to increase the amount and variety of native vegetation.

Table 5: Comparison of Impacts by Issue and Alternative

Issue	Alternative 1 Current Management Direction (No Action)	Alternative 2	Alternative 3 (Preferred Alternative)
<i>Issue No. 6: Habitat Management: What role should cropland play on the Refuge?</i>	Co-op farming practices would continue to be reviewed annually to measure impacts to Refuge habitat and wildlife health, and the Refuge would maintain the existing amount of cropland (1,365 acres) annually leaving at least 30 percent and up to 100 percent of planted crops as food and cover for wildlife.	Over the life of the plan, this alternative would convert all existing cropland to native habitats, which could benefit wildlife by providing more natural habitat.	Same as Alternative 2.
<i>Issue No. 7: Habitat Management: What can be done to improve shorebird habitat?</i>	Current management practices call for a review of water management in the moist soil units to try to manipulate flooding levels to leave more shoreline during certain times of the year to benefit migrating shorebirds.	This alternative would restore Refuge streams to free flowing streams with seasonally fluctuating water levels. In the short term this could potentially increase seasonal availability of shoreline and mudflats that are the preferred habitat of shorebirds.	This alternative would ensure that at least 25 percent of moist soil acreage is available as mud flat habitat for migrating shorebirds in the spring and 10 percent in the fall.
<i>Issue No. 8: Habitat Management: What can be done to improve bottomland hardwood habitat on the Refuge?</i>	Over the long term, this alternative would maintain the existing bottomland hardwood stands and ensure that approximately 20 percent of the Refuge hardwood stands are converting to red oak species, willow oak, and their associates based on regeneration surveys.	This alternative would maintain approximately 3,800 acres of bottomland hardwood stands with a mosaic of age and structural classes distributed across a narrow elevation gradient with species listed in Table 1 on page 64.	Same as Alternative 1.
<i>Issue No. 9: Habitat Management: What can be done to address the management of parcels and easements assigned to the Refuge but well beyond the contiguous Refuge Boundary?</i>	Some of the easement and title parcels have potential for habitat restoration and wildlife-dependent recreation opportunities that would help fulfill Refuge purposes and support the mission of the NWRS. But few staff and long distances mean these properties currently receive little attention; this situation will not change under this alternative.	Within 5 years of Plan approval, this alternative calls for the development of a strategy for ensuring that the condition and management of outlying fee title properties and easements are in compliance with Service direction.	Same as Alternative 2.
<i>Issue No. 10: Habitat Management: What can be done to reduce the impact of flooding on the Refuge and adjoining lands?</i>	There will be no effort to modify this impact under this alternative.	This alternative would eliminate much of the infrastructure subject to flood damage. Wildlife, especially nesting marsh birds, would continue to be adversely affected by periodic catastrophic floods.	This Refuge would participate as a partner in the Lower Grand River Conservation Opportunity Area to work on watershed issues including the magnitude and frequency of flooding.

Table 5: Comparison of Impacts by Issue and Alternative

Issue	Alternative 1 Current Management Direction (No Action)	Alternative 2	Alternative 3 (Preferred Alternative)
Issue No. 11: Habitat Management: What can be done to reverse the trend in sedimentation accumulation that is filling in Silver Lake?	Under this alternative, Refuge personnel will try to work with land owners within the watershed to modify land management practices that may be contributing to this problem.	Same as Alternative 1, but this alternative also calls for the restoration of Refuge streams to free flowing streams with seasonally fluctuating water levels. Silver Lake basin would no longer be used as a reservoir.	Same as Alternative 1, but this alternative also would allow for seasonal and annual variations in water levels within the Silver Lake basin reducing its role as a reservoir and diminishing concerns about sedimentation filling in the basin.
<i>Issue No. 12: Visitor Services:</i> What can be done to improve public access throughout the Refuge?	The Refuge is currently reviewing how to improve Refuge access. Two important factors control that debate: controlling access to easily disturbed critical habitat and obtaining manpower.	While addressing the issue of easily disturbed habitat, this alternative would provide a staffed point of contact most business days during normal working hours year-round to accommodate up to 17,000 visitors annually and certain portions of the Refuge would be opened from mid October 15 through the end of February.	In addition to Alternative 2, Alternative 3 calls for a staffed point of contact seasonally on holidays and weekends to accommodate up to 50,000 visitors annually.
<i>Issue No. 13: Visitor Services:</i> What can be done to improve wildlife observation?	The Refuge is currently reviewing improvements to Refuge wildlife observation opportunities through improvements in Refuge walking tours and allow visitors access to the entire Refuge from mid March through mid October.	This alternative would go beyond Alternative 1 by additionally allowing visitors limited access to selected portions of the Refuge from mid October through the end of February.	Same as Alternative 2.
<i>Issue No. 14: Visitor Services:</i> What can be done to improve hunting opportunity and variety on the Refuge?	Over the life of the CCP, this alternative would provide a quality hunting experience for participants of managed deer hunts (including disabled hunters) and the annual goose hunt but would not expand beyond that.	Within 2 years of CCP approval, this alternative would propose changes to Refuge regulations that include introducing duck hunting and small game hunting, emphasizing opportunities for youth and hunters with disabilities. It would also make efforts to reliably determine the number of hunting visits to the Refuge and assure that at least 85 percent of hunters judge that they are being provided a quality opportunity.	Same as Alternative 2.

Table 5: Comparison of Impacts by Issue and Alternative

Issue	Alternative 1 Current Management Direction (No Action)	Alternative 2	Alternative 3 (Preferred Alternative)
<i>Issue No. 15: Visitor Services:</i> How will the Refuge address an increased demand for wildlife-dependent recreation opportunities and facilities beyond what is presently available?	Under this alternative, Refuge personnel will maintain the current level of Public Use activities.	This alternative will expand on Alternative 1 by developing and implementing Public Outreach programs designed to increase use of the Refuge.	This alternative will expand on Alternative 2 by improving and expanding Refuge facilities designed for Public Use and explore opening the Refuge to greater access by the public.
<i>Issue No. 16: Environmental Education:</i> What can be done to improve environmental education?	Within 5 years of CCP approval, this alternative would call for the development of an environmental education site that includes an outdoor classroom. Once the site is developed, efforts would be made to ensure that 80 percent of educators using the site annually would report that its use supported their curriculum and helped in promoting resource stewardship and conservation.	Same as Alternative 1.	Same as Alternative 1.

Chapter 5: List of Agencies, Organizations, and Persons Contacted

Elected Federal Officials

- U.S. Senator Christopher Bond
- U.S. Senator Claire McCaskill
- U.S. Representative Ike Skelton
- U.S. Representative Sam Graves
- U.S. Representative Blaine Luetkemeyer

Federal Agencies

- U.S. Army Corps of Engineers, Vicksburg Division, Rock Island and St. Louis Districts
- U.S. Geological Survey, Long Term Monitoring Program, Jackson, Missouri
- U.S. Department of Agriculture/NRCS, Columbia, Missouri
- Environmental Protection Agency, Chicago, Illinois; Kansas City, Kansas
- Columbia Environmental Research Center, Columbia, Missouri
- Upper Midwest Science Center, LaCrosse, Wisconsin
- Squaw Creek National Wildlife Refuge
- Shawnee National Forest, Murphysboro, Illinois
- U.S. Fish and Wildlife Service, Ecological Services, Rock Island, Illinois
- U.S. Fish and Wildlife Service Historic Preservation Officer

Elected State Officials

- Missouri Governor Jay Nixon

State Agencies

- Missouri Department of Natural Resources
- Missouri Department of Conservation
- Missouri Department of Transportation
- University of Missouri, Extension Services
- State Historic Preservation Officer
- Office of the State Archeologist
- Indian Affairs Council
- The Advisory Council on Historic Preservation

City/County/Local Governments

- Chariton County

Organizations:

- Archaeological and historic preservation state-wide groups
- The Sierra Club, Washington, D.C.
- Ducks Unlimited
- Pheasants Forever
- Wild Turkey Federation
- The American Fisheries Society, Columbia, Missouri
- The Missouri Prairie Foundation, Columbia, Missouri
- The Wildlife Society, Missouri Chapter, Missouri Dept. of Conservation
- Missouri Wildlife Society, Hannibal, Missouri
- Missouri Conservation Foundation, Jefferson, Missouri
- The Conservation Federation of Missouri, Jefferson City, Missouri
- The Missouri Audubon Council, Jefferson City, Missouri
- Missouri State Chapter, Soil and Water Conservation Society
- The Audubon Society of Missouri, St. Louis, Missouri
- Wildlife Management Institute, Washington, D.C.
- National Wildlife Foundation
- Defenders of Wildlife, Washington, D.C.
- The National Wildlife Refuge Association, Washington, D.C.
- The Natural Resources Council of America, Washington, D.C.
- National Audubon Society, Washington, D.C.
- Northeast Midwest Institute, Washington, D.C.

Individuals:

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

Chapter 6: References and Literature Cited

Please see Appendix F of the CCP. Also, please see Appendix B for the acronyms and abbreviations used in the Environmental Assessment.

Appendix 1: Objectives Grouped by Alternative

Alternative 1 No Action

Objective 1-1: Streams and Water Bodies

Over the life of the Plan, continue to impound Refuge streams and use Silver Lake as a reservoir to provide water for wetland management across the Refuge.

Objective 1-2: Emergent Wetland

Over the life of the Plan, maintain at least 500 acres and up to 1,000 acres of emergent wetland habitat primarily within the Silver Lake and Swan Lake basins where bulrush and cattails comprise 25-50 percent of areal coverage and narrow-leaved cattail, bur reed, lotus, and arrowhead comprise less than 5 percent of areal coverage. Within one year of CCP approval, develop a water management regime that helps maintain the plant species mix described above. Additionally, manage approximately 800 acres of emergent wetland using moist soil management techniques to provide a diversity of native herbaceous plant foods such as wild millet (*Echinochloa* spp.); panic grass (*Panicum* spp.); sedges (*Cyperus* spp. and *Carex* spp.); and beggarticks (*Bidens* spp.). Ensure that at least 10 percent of the acreage is available as mud flat habitat for migrating shorebirds.

Objective 1-3 Shrub Swamp

Over the life of the Plan, maintain 300 to 500 acres of shrub swamp dominated by at least 50 percent areal coverage of buttonbush and willow.

Objective 1-4 Wet Meadow

Maintain wet meadow habitat at present levels.

Objective 1-5 Native Prairie

Maintain existing grasslands at present species mix

Objective 1-6 Cropland

Maintain existing amount (1,365 acres) of cropland annually leaving at least 30 percent and up to 100 percent of planted crops as food and cover for wildlife.

Objective 1-7 Bottomland Forest

Over the long term (100-200 years), maintain the existing amount (approximately 3,100 acres) of bottomland hardwood stands with a mosaic of

age and structural classes distributed across a narrow elevation gradient with lower elevations dominated by black willow, silver maple, and river birch, mid elevations dominated by pin oak, swamp white oak, red maple, green ash, sycamore, and cottonwood, and upper elevations dominated by other oaks, hickory, and pecan. Within 10 years of Plan approval ensure that approximately 20 percent of stands are converting to red oak species, willow oak and their associates based on regeneration surveys.

Objective 1-8 Watershed Conservation

Within 5 years of Plan approval, quantify water needs and available water sources necessary to meet Refuge management objectives. Also, over the life of the Plan, maintain or improve water quality within Refuge source waters to meet Refuge management objectives and comply with current standards of the Environmental Protection Agency and Missouri Department of Natural Resources.

Objective 1-9 Outlying Fee Title Properties and Easements

Maintain existing methods for managing and monitoring outlying fee title properties and easements.

Objective 2-1: Threatened and Endangered Species

Over the life of the Plan, continue monitoring bald eagle numbers via Missouri Department of Conservation surveys.

Objective 2-2 Migratory and Resident Birds

Over the life of the Plan, monitor waterfowl numbers bi-weekly during duck hunting season via Missouri Department of Conservation bi-weekly waterfowl counts.

Objective 2-3: Eastern Massasauga Rattlesnake

Within 10 years of Plan approval, provide habitat suitable to support a viable population of the Eastern Massasauga Rattlesnake and potentially avoid listing the snake under the Endangered Species Act.

Objective 3-1: Welcoming and Orienting Visitors

Throughout the life of the Plan, provide an unstaffed point of contact 7 days a week year round.

Objective 3-2: Hunting

Over the life of the Plan, provide a quality hunting experience for participants of managed deer hunts (including disabled hunters) and the annual goose hunt.

Objective 3-3: Fishing

Over the life of the Plan, continue to provide existing facilities for shore and boat fishing.

Objective 3-4: Wildlife Observation and Photography

Provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from mid March through mid October.

Objective 3-5: Interpretation

Throughout the life of the Plan, provide unstaffed interpretive facilities 7 days a week year round.

Objective 3-6: Environmental/Conservation Education

Within 5 years of Plan approval, develop an environmental education site that includes an outdoor classroom. Once the site is developed, eighty percent of educators using the site annually report it supports their curriculum and helps in promoting resource stewardship and conservation.

Objective 3-7: Other Compatible Recreation and Uses

Over the life of the Plan, provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use.

Objective 3-8: Friends and Volunteers

Over the life of the Plan, continue to provide volunteer opportunities that total approximately 625 hours annually.

Objective 3-9 Outreach

Over the life of the Plan, continue to speak to local civic and sportsmen's groups and special events upon request approximately 2-3 times per year. Also continue to provide information and interviews for local news media and outdoors writers as well as distribute news releases 2-3 times annually.

Objective 3-10 Archeological, Cultural, and Historic Protec

Over the life of the Plan, avoid and protect or mitigate against disturbance of all known cultural, historic, or archeological sites.

Alternative 2

Objective 1-1: Streams and Water Bodies

Restore Refuge streams to free flowing streams with seasonally fluctuating water levels.

Objective 1-2: Emergent Wetland

Over the life of the Plan, maintain approximately 1,200 acres as emergent wetland habitat primarily within the Swan Lake basin where bulrush and cattails comprise 25-50 percent of areal coverage and narrow-leafed cattail, bur reed, lotus, and arrowhead comprise less than 5 percent of areal coverage.

Objective 1-3 Shrub Swamp

Over the life of the Plan, maintain up to 70 acres of shrub swamp dominated by at least 50 percent areal coverage of buttonbush and willow.

Objective 1-4 Wet Meadow

Over the life of the Plan, convert approximately 4,000 acres of existing cropland, open water, emergent wetland and other habitats to wet meadow comprised of sedges (e.g. *Cyperus* spp. and *Carex* spp.), prairie cordgrass (*Spartina pectinata*), and forbs (e.g. *Asclepias* spp., *Polygonum* spp., *Vernonia* spp., *Solidago* spp., *Bidens* spp., *Ambrosia* spp., *Rudbeckia* spp.).

Objective 1-5 Native Prairie

Within 10 years of Plan approval, convert approximately 950 acres of existing cropland to native prairie, and maintain a diverse floral community within converted and existing grasslands composed of at least 50 percent of native prairie plant species identified for this area.

Objective 1-6 Cropland

Over the life of the Plan, convert all existing cropland (1,365 acres) to native habitats.

Objective 1-7 Bottomland Forest

Over the long term (100-200 years), maintain approximately 3,800 acres of bottomland hardwood stands with a mosaic of age and structural classes distributed across a narrow elevation gradient with lower elevations dominated by black willow, silver maple, and river birch, mid elevations dominated by pin oak, swamp white oak, red maple, green ash, sycamore, and cottonwood, and upper elevations dominated by other oaks, hickory, and pecan.

Objective 1-8 Watershed Conservation

Within 5 years of Plan approval, quantify water needs and available water sources necessary to meet Refuge management objectives. Also, over

the life of the Plan, maintain or improve water quality within Refuge source waters to meet Refuge management objectives and comply with current standards of the Environmental Protection Agency and Missouri Department of Natural Resources.

Objective 1-9 Outlying Fee Title Properties and Easements

Within 5 years of Plan approval, develop a strategy for ensuring that the condition and management of outlying fee title properties and easements are in compliance with Service direction.

Objective 2-1: Threatened and Endangered Species

Within 5 years of Plan approval, implement a program to monitor all federally threatened and endangered species on the Refuge and assist with monitoring of state-listed threatened and endangered species.

Objective 2-2 Migratory and Resident Birds

Over the life of the Plan, conduct weekly counts of waterfowl and shorebirds during migration.

Objective 2-3: Eastern Massasauga Rattlesnake

Within 10 years of Plan approval, provide habitat suitable to support a viable population of the Eastern Massasauga Rattlesnake and potentially avoid listing the snake under the Endangered Species Act.

Objective 3-1: Welcoming and Orienting Visitors

Within 5 years of Plan approval, provide a staffed point of contact most business days during normal working hours year round to accommodate up to 17,000 visitors annually.

Objective 3-2: Hunting

Maintain existing hunting opportunities, and within 2 years of CCP approval, propose changes to Refuge regulations (as part of a formal opening package) that includes introducing duck hunting and small game hunting, and emphasize opportunities for youth and the disabled. Within 7 years of approval of the Plan, reliably determine the number of hunting visits to the Refuge and that at least 85 percent of hunters judge that they are being provided a quality opportunity.

Objective 3-3: Fishing

Over the life of the Plan, provide access for fishing in accordance with state and Refuge regulations.

Objective 3-4: Wildlife Observation and Photography

Provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from early March through late October, and by allowing visitors limited access to selected portions of the Refuge during closed periods.

Objective 3-5: Interpretation

Within 5 years of Plan approval, provide staffed interpretation facilities most business days during normal working hours year round

Objective 3-6: Environmental/Conservation Education

Within 5 years of Plan approval, develop an environmental education site that includes an outdoor classroom. Once the site is developed, eighty percent of educators using the site annually report it supports their curriculum and helps in promoting resource stewardship and conservation.

Objective 3-7: Other Compatible Recreation and Uses

Over the life of the Plan, provide compatible opportunities for gathering mushrooms, berries, and antlers for personal use.

Objective 3-8: Friends and Volunteers

Over the life of the Plan, continue to develop the Friends group and maintain existing level of volunteer opportunities (625 hours annually).

Objective 3-9 Outreach

Over the life of the Plan, continue to speak to local civic and sportsmen's groups and special events upon request approximately 4-6 times per year. Also continue to provide information and interviews for local news media and outdoors writers as well as distribute news releases 4-5 times annually.

Objective 3-10 Archeological, Cultural, and Historic Protection

Over the life of the Plan, avoid and protect or mitigate against disturbance of all known cultural, historic, or archeological sites.

Alternative 3 (Preferred Alternative)

Objective 1-1: Streams and Water Bodies

Over the long term (50 years), mimic components of historic hydrologic function along reaches of Elk Creek, Turkey Creek, Tough Branch, and Yellow Creek that are within the Refuge. Over the 15 year life of the Plan, allow for seasonal and annual variations in water levels within Swan Lake and Silver Lake basins to increase the amount and variety of native vegetation (see Objective 1-2 Emergent Wetland).

Objective 1-2: Emergent Wetland

Within Wetland Management Units

Over the life of the Plan, maintain at least 1,200 acres and up to 1,800 acres of emergent wetland habitat primarily within the Silver Lake, Swan Lake, and South Pool basins where bulrush and cattails comprise 25-50 percent of areal coverage and narrow-leafed cattail, bur reed, lotus, and arrowhead comprise less than 5 percent of areal coverage. Within one year of CCP approval, develop a water management regime that helps maintain the plant species mix described above.

Within Moist Soil Management Units

Over the life of the Plan, use moist soil techniques (as described on page 24) to manage emergent wetlands at locations and an amount to be determined after the completion of an ongoing hydrogeomorphic evaluation. Manage moist soil areas to provide a diversity of native herbaceous plant foods such as wild millet (*Echinochloa* spp.); panic grass (*Panicum* spp.); smartweed (*Polygonum* spp.); sedges (*Cyperus* spp. and *Carex* spp.); and beggarticks (*Bidens* spp.), and ensure that up to 25 percent of the acreage is available as mud flat or shallow water (6 inches or less) unvegetated habitat in the spring and up to 10 percent of the acreage is available as mud flat or shallow water habitat with less than 50 percent cover in the fall for migrating shorebirds.

Objective 1-3 Shrub Swamp

Over the life of the Plan, maintain 300 to 500 acres of shrub swamp dominated by at least 50 percent areal coverage of buttonbush and willow.

Objective 1-4 Wet Meadow

Within 5 years of Plan approval, convert approximately 530 acres of existing cropland; food plots; areas of dense early successional forest largely comprised of willow; buttonbush, and silver maple; and areas dominated by reed canary grass to wet meadow comprised of sedges (e.g. *Cyperus* spp. and *Carex* spp.), prairie cordgrass (*Spartina pectinata*), and forbs (e.g. *Asclepias* spp., *Polygonum* spp., *Vernonia* spp., *Solidago* spp., *Bidens* spp., *Ambrosia* spp., *Rudbeckia* spp.).

Objective 1-5 Native Prairie

Within 10 years of Plan approval, convert approximately 835 acres of existing cropland or food plots to native prairie, and maintain a diverse floral community within converted and

existing grasslands composed of at least 50 percent of native prairie plant species identified for this area.

Objective 1-6 Cropland

Within 10 years of Plan approval, convert all cropland to other native habitats (see Objectives 1-2, 1-4 and 1-5).

Objective 1-7 Bottomland Forest

Over the long term (100-200 years), maintain the existing amount (approximately 3,100 acres) of bottomland hardwood stands with a mosaic of age and structural classes distributed across a narrow elevation gradient with lower elevations dominated by black willow, silver maple, and river birch, mid elevations dominated by pin oak, swamp white oak, red maple, green ash, sycamore, and cottonwood, and upper elevations dominated by other oaks, hickory, and pecan. Within 10 years of Plan approval ensure that approximately 20 percent of stands are converting to red oak species, willow oak and their associates based on regeneration surveys.

Objective 1-8 Watershed Conservation

Within 5 years of Plan approval, quantify water needs and available water sources necessary to meet Refuge management objectives. Also, over the life of the Plan, maintain or improve water quality within Refuge source waters to meet Refuge management objectives and comply with current standards of the Environmental Protection Agency and Missouri Department of Natural Resources.

Objective 1-9 Outlying Fee Title Properties and Easements

Within 5 years of Plan approval, develop a strategy for ensuring that the condition and management of outlying fee title properties and easements are in compliance with Service direction.

Objective 2-1: Threatened and Endangered Species

Within 5 years of Plan approval, implement a monitoring program to track abundance, population trends, and/or habitat associations of selected species (of present interest is Indiana bat).

Objective 2-2 Migratory and Resident Birds

Within 5 years of Plan approval, implement a monitoring program to track abundance, population trends, and/or habitat associations of migratory bird species with emphasis on waterfowl and shorebirds. Link monitoring to management information needs and to species or habitats of concern or special interest.

Objective 2-3: Eastern Massasauga Rattlesnake

Within 10 years of Plan approval, provide habitat suitable to support a viable population of the Eastern Massasauga Rattlesnake and potentially avoid listing the snake under the Endangered Species Act.

Objective 3-1: Welcoming and Orienting Visitors

Within 10 years of Plan approval, provide a staffed point of contact during normal working hours year round on business days and seasonally on holidays and weekends to accommodate up to 50,000 visitors annually.

Objective 3-2: Hunting

Maintain existing hunting opportunities, and within 2 years of CCP approval, propose changes to Refuge regulations (as part of a formal opening package) that includes introducing duck hunting and small game hunting, and emphasize opportunities for youth and the disabled. Within 7 years of approval of the Plan, reliably determine the number of hunting visits to the Refuge and that at least 85 percent of hunters judge that they are being provided a quality opportunity.

Objective 3-3: Fishing

Over the life of the Plan, provide access for fishing in accordance with state and Refuge regulations.

Objective 3-4: Wildlife Observation and Photography

Provide quality wildlife observation and photography opportunities by continuing to allow visitors access to the entire Refuge from early March through late October, and by allowing visitors limited access to selected portions of the Refuge during closed periods.

Objective 3-5: Interpretation

Within 10 years of Plan approval, provide staffed interpretive facilities during normal working hours year round on business days and seasonally on holidays and weekends.

Objective 3-6: Environmental/Conservation Education

Within 5 years of Plan approval, develop an environmental education site that includes an outdoor classroom. Once the site is developed, eighty percent of educators using the site annually report it supports their curriculum and helps in promoting resource stewardship and conservation.

Objective 3-7: Other Compatible Recreation and Uses

Over the life of the Plan, provide compatible

opportunities for gathering mushrooms, berries, and antlers for personal use.

Objective 3-8: Friends and Volunteers

Over the life of the Plan, continue to develop the Friends group and provide volunteer opportunities that total at least 1,000 hours annually.

Objective 3-9 Outreach

Within 3 years of approval of the Plan increase local community support and appreciation for fish and wildlife conservation and endorse the Refuge's role in conservation.

Objective 3-10 Archeological, Cultural, and Historic Protection

Over the life of the Plan, avoid and protect or mitigate against disturbance of all known cultural, historic, or archeological sites.

Appendix B: Glossary

Alternative

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

Biological Diversity

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

Compatible Use

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

Comprehensive Conservation Plan

A document that describes the desired future conditions of the refuge, and specifies management actions to achieve refuge goals and the mission of the National Wildlife Refuge System.

Cultural Resources

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

Ecosystem

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

Ecosystem Approach

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

Ecosystem Management

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

Endangered Species

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

Environmental Assessment

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

Extirpation

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

Goals

Descriptive statements of desired future conditions.

Interjurisdictional Fish

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

Issue

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

National Wildlife Refuge System

All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife and plant resources.

Objectives

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

Preferred Alternative

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

Scoping

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

Species

A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Strategies

A general approach or specific actions to achieve objectives.

Threatened Species

Those plant or animal species likely to become endangered species throughout all of or a signifi-

cant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Undertaking:

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

Vegetation

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

Vegetation Type

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

Watershed

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

Wetland

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

Wildlife-dependent Recreational Use

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

Wildlife Diversity

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

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 C: Species List

Amphibians	104
Birds	105
Butterflies	114
Fish	115
Mammals	116
Mussels	118
Odonates	119
Plants (Rare)	119
Reptiles	120

Swan Lake NWR Amphibian List

Species	Scientific Name	Presence in 2003 Frog and Toad Breeding Survey	State Status
Frogs			
Blanchard's Cricket Frog	<i>Acris crepitans blanchardi</i>	✓	
Gray Treefrog	<i>Hyla versicolor</i>	✓	
N. Spring Peeper	<i>Pseudacris crucifer crucifer</i>	✓	
W. Chorus Frog	<i>Pseudacris triseriata triseriata</i>	✓	
Plains Leopard Frog	<i>Rana blairi</i>	✓	
S. Leopard Frog	<i>Rana sphenocephala</i>	✓	
Green Frog	<i>Rana clamitans</i>	✓	
Bullfrog	<i>Rana catesbeiana</i>	✓	
Northern Crawfish Frog	<i>Rana areolata</i>		Vulnerable
Toads			
American Toad	<i>Bufo americanus</i>	✓	
Woodhouse's Toad	<i>Bufo woodhousei woodhousei</i>	✓	
Fowlers Toad	<i>Bufo woodhousei fowleri</i>		
Great Plaions Toad	<i>Bufo cognatus</i>		Status Unknown
Eastern Narrow-mouthed Toad	<i>Gastrophyrne carolinensis</i>		
Plains Spadefoot Toad	<i>Scaphiopus bombifrons</i>		
Salamanders			
Eastern Tiger Salamander	<i>Ambystoma tigrinum</i>		Status Unknown
Small-mouthed Salamander	<i>Ambystoma texanum</i>		

Swan Lake NWR Bird Checklist

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Loons							
Common Loon		r		u			
Grebes							
Pied-billed Grebe		c	o	c			
Horned Grebe		o		o			
Eared Grebe		r		r			
Western Grebe		r		r			
Pelicans							
American White Pelican		c	u	a			
Cormorants							
Double-crested Cormorant		u	o	o			
Hérons and Bitterns							
American Bittern		u	u	u			critically imperiled
Least Bittern		r	u	r			vulnerable
Great Blue Heron	✓	c	a	c	u		
Great Egret		c	c	c			vulnerable
Snowy Egret		o	o	r			imperiled
Little Blue Heron		r	o	o			vulnerable
Cattle Egret		o	o	o			
Green Heron	✓	o	o	o			
Black-crowned Night Heron		u	u	o			vulnerable
Yellow-crowned Night Heron	✓	o	o	r			
Swans, Geese, and Ducks							
Tundra Swan		r		r	r		
Greater White-fronted Goose			r	o	c		
Snow Goose		r	r	c	a		
Ross's Goose				r	o		
Canada Goose		a	u	a	a		
Wood Duck	✓	u	c	c	o		
Green-winged Teal		c	o	c	u		
American Black Duck		r		r	r		
Mallard	✓	o	u	c	a		
Northern Pintail		c	o	a	c		
Blue-winged Teal		c	u	a	o		

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Cinnamon Teal		r		r	r		
Northern Shoveler		c	o	a	o		
Gadwall		c		c	u		
American Wigeon		u		c	u		
Canvasback		u		r	o		
Redhead		o		o	u		
Ring-necked Duck		c	r	u	c		
Lesser Scaup		c		o	c		
Common Goldeneye		u		u	u		
Bufflehead		o		o	o		
Hooded Merganser		o	u	u	o		
Common Merganser		o		u	u		
Red-breasted Merganser		o		r	r		
Ruddy Duck		c	r	o	o		
Vultures							
Turkey Vulture		c	c	c			
Hawks and Eagles							
Osprey		r	r	r			status unknown
Bald Eagle		o	r	c	c		vulnerable
Northern Harrier	✓	c	o	c	c		imperiled
Sharp-shinned Hawk		u	o	u	u		vulnerable
Cooper's Hawk		o	u	o	o		
Northern Goshawk				r	r		
Red-shouldered Hawk		u	u	u	u		
Broad-winged Hawk		o		c			
Swainson's Hawk		r		r	r		imperiled
Red-tailed Hawk	✓	c	c	c	c		
Rough-legged Hawk		o		u	u		
Golden Eagle		r		r	r		
Falcons							
American Kestrel	✓	c	u	c	c		
Merlin		o		o	r		

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Peregrine Falcon		u		u	r		critically imperiled
Upland Game Birds							
Ring-necked Pheasant		u	u	u	u		
Wild Turkey	✓	u	u	u	u		
Northern Bobwhite	✓	c	c	c	c		
Rails and Coots							
King Rail	✓	r	r				critically imperiled
Virginia Rail		u	r	r			imperiled
Sora		u	r	c			imperiled
American Coot		a	u	a	r		
Common Moorhen		r	r	r			imperiled
Cranes							
Sandhill Crane		r	r	r			status unknown
Shorebirds							
Black-bellied Plover		u	r	o			
American Golden Plover		c	r	c			
Semipalmated Plover		c	u	o			
Piping Plover (E)		r		r			
Killdeer	✓	c	c	c	o		
American Avocet		r	r	r			
Greater Yellowlegs		c	u	c			
Lesser Yellowlegs		a	c	a			
Solitary Sandpiper		u	c	o			
Willet		c	r	u			
Spotted Sandpiper	✓	c	u	u			
Upland Sandpiper	✓	o	o	o			
Whimbrel		o	r	r			
Hudsonian Godwit		u		o			
Marbled Godwit		r		r			
Ruddy Turnstone		u		o			
Red Knot		o		o			

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Sanderling		u	u	o			
Semipalmated Sandpiper		c	u	c			
Western Sandpiper		r		u			
Least Sandpiper		c	u	c			
Baird's Sandpiper		u	r	u			
Pectoral Sandpiper		a	c	a			
Dunlin		o		c			
Stilt Sandpiper		u	o	c			
Buff-breasted Sandpiper		o	r	o			
Short-billed Dowitcher		c	u	c			
Long-billed Dowitcher		c	u	c			
Common Snipe		c	u	c	r		
American Woodcock		o	u	u	r		
Wilson's Phalarope		u	r	u			
Red-necked Phalarope		r		r			
Gulls and Terns							
Franklin's Gull		c	u	c	r		
Bonaparte's Gull		o	r	c	r		
Ring-billed Gull		c	c	c	o		
Herring Gull		r	r	o	o		
Caspian Tern		u	r	u	r		
Common Tern		o	o	o			
Forster's Tern		u	o	c			
Least Tern		o	u	o		Endangered	critically imperiled
Black Tern		c	c	u			SX
Doves							
Rock Dove	✓	o	c	c	o		
Mourning Dove	✓	c	a	c	o		
Cuckoos and Roadrunners							
Black-billed Cuckoo		u	u	u			
Yellow-billed Cuckoo	✓	c	c	o			

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Owls							
Common Barn Owl		r	r	r	r		vulnerable
Eastern Screech Owl	✓	u	u	u	u		
Great Horned Owl	✓	c	c	c	c		
Snowy Owl				r			
Barred Owl	✓	c	c	c	c		
Short-eared Owl		o	r	o	o		imperiled
Long-eared Owl		r	r	r	o		status unknown
Nighthawks and Nightjars							
Common Nighthawk	✓	u	u	u			
Whip-poor-will	✓	u	u	u			
Swifts							
Chimney Swift	✓	u	o	u			
Hummingbirds							
Ruby-throated Hummingbird		u	c	c			
Kingfishers							
Belted Kingfisher	✓	u	c	o	o		
Woodpeckers							
Red-Headed Woodpecker	✓	c	c	c	o		
Red-bellied Woodpecker	✓	c	c	c	c		
Yellow-bellied Sapsucker		o	r	o	r		
Downy Woodpecker	✓	c	c	c	c		
Hairy Woodpecker	✓	u	u	u	u		
Northern Flicker	✓	c	c	c	c		
Pileated Woodpecker	✓	u	u	u	u		
Flycatchers							
Olive-sided Flycatcher		o	r	u			
Eastern Wood Pewee	✓	u	c	u			
Acadian Flycatcher		u	u	r			
Willow Flycatcher		u	u	r			
Eastern Phoebe	✓	c	c	c			
Great Crested Flycatcher	✓	u	c	o			

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Western Kingbird		r		r			
Eastern Kingbird	✓	c	c	c			
Larks							
Horned Lark	✓	c	c	u	u		
Swallows							
Purple Martin		o	o	r			
Tree Swallow	✓	c	c	c			
Northern Rough-winged Swallow		c	c	a			
Bank Swallow		c	c	c			
Cliff Swallow		u	o	u			
Barn Swallow	✓	c	c	c			
Jays, Magpies and Crows							
Blue Jay	✓	c	c	c	c		
American Crow	✓	c	c	a	c		
Chickadees and Titmice							
Black-capped Chickadee	✓	c	c	c	c		
Tufted Titmouse	✓	c	c	c	c		
Nuthatches							
Red-breasted Nuthatch		r		r	o		
White-breasted Nuthatch		u	u	u	u		
Creepers							
Brown Creeper		u		u	u		status unknown
Wrens							
Carolina Wren		r	r	r	r		
House Wren	✓	c	c	c			
Winter Wren					r		
Sedge Wren	✓	o	c	o			
Marsh Wren		o	o	u			vulnerable
Kinglets, Bluebirds, and Thrushes							
Golden-crowned Kinglet		c		c	u		
Ruby-crowned Kinglet		u		u	u		

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Blue-gray Gnatcatcher	✓	u	u	r			
Eastern Bluebird	✓	c	u	c	r		
Gray-cheeked Thrush		o					
Swainson's Thrush		u	r	u			
Hermit Thrush		u		u			
Wood Thrush	✓	u	o	u			
American Robin	✓	c	c	c	o		
Mimics							
Gray Catbird	✓	c	c	c			
Northern Mockingbird	✓	u	u	u	r		
Brown Thrasher	✓	c	c	c			
Pipits							
American Pipit		u		u			
Waxwings							
Cedar Waxwing		c	u	c	u		
Shrikes							
Loggerhead Shrike	✓	u	u	u	u		imperiled
Starlings							
European Starling	✓	c	c	c	c		
Vireos							
White-eyed Vireo		r	r	r			
Bell's Vireo	✓	u	u	u			
Solitary Vireo		o		o			
Yellow-throated Vireo		u	u	r			
Warbling Vireo	✓	c	c	u			
Red-eyed Vireo	✓	c	c	c			
Warblers							
Blue-winged Warbler		u	r	u			
Tennessee Warbler		u		u			
Nashville Warbler		u		u			
Northern Parula		u	u	r			
Yellow Warbler	✓	u	u	r			
Chestnut-sided Warbler		u		u			vulnerable

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Magnolia Warbler		u		u			
Yellow-rumped Warbler		c		c	o		
Blackburnian Warbler		u		u			
Blackpoll Warbler		u		o			
Black-and-white Warbler		u		u			
American Redstart	✓	c	u	c			
Prothonotary Warbler		u	r	r			
Ovenbird		u	r	u			
Louisiana Waterthrush		u	r	u			
Kentucky Warbler		r					
Mourning Warbler		u		r			
Common Yellowthroat		c	c	c			
Wilson's Warbler		u		u			
Yellow-breasted Chat		o		o			
Tanagers							
Summer Tanager		o	o	o			
Sparrows, Buntings, and Grosbeaks							
Northern Cardinal	✓	c	c	c	c		
Rose-breasted Grosbeak	✓	u	u	u			
Indigo Bunting	✓	c	c	c			
Dickeissel	✓	a	a	c			
Rufous-sided Towhee	✓	c	c	c			
American Tree Sparrow		u		u	c		
Chipping Sparrow	✓	u	u	u			
Field Sparrow	✓	u	u	u	r		
Vesper Sparrow		u	r	u			
Lark Sparrow		u	o	r			
Savannah Sparrow		c	r	c			
Grasshopper Sparrow	✓	c	u	c			
Le Conte's Sparrow		o		o			
Sharp-tailed Sparrow		r		r			
Fox Sparrow		u		u	r		
Song Sparrow	✓	c	c	c	u		

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Lincoln's Sparrow		o		o	r		
Swamp Sparrow		u	o	u	u		
White-throated Sparrow		c		c	u		
White-crowned Sparrow		u		u	u		
Harris' Sparrow		o		o	r		
Dark-eyed Junco		u		u	c		
Lapland Longspur		u		u	o		
Snow Bunting					r		
Blackbirds and Orioles							
Bobolink		u	r	u			
Red-winged Blackbird	✓	a	a	a	c		
Eastern Meadowlark	✓	c	c	c	c		
Western Meadowlark		r	r	r	r		
Yellow-headed Blackbird		r		r			vulnerable
Rusty Blackbird		u		u	o		
Brewer's Blackbird		o		o			
Common Grackle	✓	a	c	a	c		
Brown-headed Cowbird	✓	c	c	c	u		
Orchard Oriole	✓	c	c	o			
Baltimore Oriole	✓	c	c	o			
Finches							
Purple Finch		c		c	u		
Pine Siskin		r		r	r		
Common Redpoll		r		r	r		
American Goldfinch	✓	c	c	c	c		
Old World Sparrows							
House Sparrow	✓	c	c	c	c		
Accidental Birds							
Tricolored Heron							
Ferruginous Hawk							
White-faced Ibis							
Common Moorhen							
Glossy Ibis							
Sprague's Pipit							

Swan Lake NWR Bird Checklist (Continued)

Common Name	Nest On/ Near Swan Lake NWR	Seasonal Presence				Status	
		Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sep-Nov)	Winter (Dec-Feb)	Federal	State
Roseate Spoonbill							
Golden-winged Warbler							
Greater Scaup							
Prairie Warbler							
Surf Scoter							
Lark Bunting							
Mississippi Kite							
Great-tailed Grackle							

Swan Lake NWR Butterflies

Species	Scientific Name
Roadside Skipper	<i>Amblyscirtes vialis</i>
Least Skipper	<i>Ancyloxypha numitor</i>
European Cabbage Butterfly	<i>Artogeia rapae</i>
Red-spotted Purple	<i>Basilarchia arthemis astyanax</i>
Wood Nymph	<i>Cercyonis pegala</i>
Gorgone Checkerspot	<i>Charidryas gorgone carlota</i>
Alfalfa Butterfly	<i>Colias eurhytheme</i>
Clouded Sulphur	<i>Colias philodice philodice</i>
Monarch	<i>Danaus plexippus</i>
Eastern-tailed Blue	<i>Everes comyntas comyntas</i>
Buckeye	<i>Junonia coenia</i>
Black Swallowtail	<i>Papilio polyxenes asterius</i>
Cloudless Sulphur	<i>Phoebis sennae eubule</i>
Common Sooty Wing	<i>Pholisora catullus</i>
Pearl Crescent	<i>Phyciodes tharos</i>
Comma	<i>Polygonia comma</i>
Tiger Swallowtail	<i>Pterourus glaucus glaucus</i>
Little Sulphur	<i>Pyrisitia lisa lisa</i>
Great Spangled Fritillary	<i>Speyeria cybele cybele</i>
Red Admiral	<i>Vanessa atalanta rubria</i>

Swan Lake NWR Fish Species

Species	Scientific Name	Federal Status	State Status	1996 Silver Lake Fish Survey	Found in Past Surveys But Not in 1996 Survey.	Missouri Natural Heritage Database Imperiled Fish Species that Occur In the Lower Grand River Watershed
Black Bullhead	<i>Ameiurus melas</i>			✓		
Yellow Bullhead	<i>Ameiurus natalis</i>			✓		
Freshwater Drum	<i>Aplodinotus grunniens</i>			✓		
River Carpsucker	<i>Carpiodes carpio</i>				✓	
Quillback Sucker	<i>Carpiodes cyprinus</i>			✓		
Blue Sucker	<i>Cyleptus elongatus</i>		vulnerable			✓
Red Shiner	<i>Cyprinella lutrensis</i>			✓		
Common Carp	<i>Cyprinus carpio</i>			✓		
Gizzard Shad	<i>Dorosoma cepedianum</i>			✓		
Mooneye	<i>Hiodon tergisus</i>		vulnerable			✓
Western Silvery Minnow	<i>Hybognathus argyritis</i>		imperiled			✓
Plains Minnow	<i>Hybognathus placitus</i>		imperiled			✓
Channel Catfish	<i>Ictalurus punctatus</i>			✓		
Smallmouth Buffalo	<i>Ictiobus bubalus</i>			✓		
Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>			✓		
Longnose Gar	<i>Lepisosteus osseus</i>				✓	
Shortnose Gar	<i>Lepisosteus platostomus</i>			✓		
Green Sunfish	<i>Lepomis cyannelus</i>			✓		
Bluegill	<i>Lepomis macrochirus</i>			✓		
Silver Chub	<i>Macrhybopsis storianna</i>		vulnerable			✓
Largemouth Bass	<i>Micropterus salmoides</i>			✓		
Golden Shiner	<i>Notemigonus crysoleucas</i>				✓	
Trout-perch	<i>Percopsis omniscomycus</i>		critically imperiled			✓
White Crappie	<i>Pomoxis annularis</i>			✓		
Black Crappie	<i>Pomoxis nigromaculatus</i>			✓		
Flathead Catfish	<i>Pylodictis olivaris</i>				✓	
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	Endangered	Endangered			✓

Swan Lake NWR Mammals

Species	Scientific Name	Status		2004 species list	Species on the 1979 List But Not Recently Seen	Species Listed as Captured in 2003 Bat Survey Report
		Federal	State			
Pouched Mammals						
Virginia Opossum	<i>Didelphis virginiana</i>			✓		
Insectivors						
Short-tailed Shrew	<i>Blarina brevicauda</i>			✓		
Least Shrew	<i>Cryptotis parva</i>			✓		
Masked Shrew	<i>Sorex cinereus</i>			✓		
Southeastern Shrew	<i>Sorex longirostris</i>			✓		
Eastern Mole	<i>Scalopus aquaticus</i>			✓		
Bats						
Little Brown Bat	<i>Myotis lucifugus</i>			✓		✓
Big Brown Bat	<i>Epescicus fuscus</i>			✓		✓
Eastern Red Bat	<i>Lasiurus borealis</i>			✓		✓
Hoary Bat	<i>Lasiurus cinereus</i>			✓		✓
Evening Bat	<i>Nycticeius humeralis</i>			✓		✓
Indiana Bat	<i>Myotis sodalis</i>	Endangered	Endangered	✓		✓
Northern Long-eared Bat ^{1,3}	<i>Myotis septentrionalis</i>			✓		✓
Eastern Pipistrelle	<i>Pipistrellus subflavus</i>			✓		✓
Lagomorphs						
Eastern Cottontail	<i>Sylvilagus floridanus</i>			✓		
Rodents						
White-footed Mouse	<i>Peromyscus leucopus</i>			✓		
Deer Mouse	<i>Peromyscus maniculatus</i>			✓		
Meadow Jumping Mouse	<i>Zapus hudsonius</i>			✓		
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>			✓		
Woodchuck	<i>Marmota monax</i>			✓		
Beaver	<i>Castor canadensis</i>			✓		
Muskrat	<i>Ondatra zibethicus</i>			✓		
Prairie Vole	<i>Microtus ochrogaster</i>			✓		
Meadow Vole	<i>Microtus pennsylvanicus</i>			✓		
Southern Bog Lemming	<i>Synaptomys cooperi</i>			✓		

Swan Lake NWR Mammals

Species	Scientific Name	Status		2004 species list	Species on the 1979 List But Not Recently Seen	Species Listed as Captured in 2003 Bat Survey Report
		Federal	State			
Plains Pocket Gopher	<i>Geomys bursarius</i>				✓	
Southern Flying Squirrel	<i>Glaucomys volans</i>			✓		
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>			✓		
Fox Squirrel	<i>Sciurus niger</i>			✓		
Franklins Ground Squirrel	<i>Spermophilus franklinii</i>		Imperiled		✓	
Eastern Chipmunk	<i>Tamias striatus</i>				✓	
Hispid Cotton Rat	<i>Sigmodon hispidus</i>				✓	
Norway Rat	<i>Rattus norvegicus</i>				✓	
Carnivores						
Raccoon	<i>Procyon lotor</i>			✓		
Long-tailed Weasel	<i>Mustela frenata</i>		Imperiled	✓		
Least Weasel	<i>Mustela nivalis</i>		Apparently Secure	✓		
Mink	<i>Mustela vison</i>			✓		
Badger	<i>Taxidea taxus</i>			✓		
Coyote	<i>Canid latrans</i>			✓		
Red Fox	<i>Vulpes vulpes</i>			✓		
Bobcat	<i>Lynx rufus</i>			✓		
River Otter	<i>Lutra canadensis</i>			✓		
Striped Skunk	<i>Mephitis mephitis</i>			✓		
Eastern Spotted Skunk	<i>Spilogale putorius</i>		Endangered		✓	
Gray Fox	<i>Urocyon cenereoargenteus</i>				✓	
Deer						
White-tailed Deer	<i>Odocoileus virginianus</i>			✓		

Swan Lake NWR Mussels

Species	Scientific Name	State Status
Flat Floater	<i>Anodonta suborbiculata</i>	Imperiled
Giant Floater	<i>Anodonta grandis</i> spp.	
Squaw Foot	<i>Strophitus undulatus</i>	
White heel-splitter	<i>Lasmigona complanata</i>	
Maple Leaf	<i>Quadrula quadrula</i>	
Pond-horn	<i>Unio merus tetralasmus</i>	
Pink heel-splitter	<i>Potamilus alatus</i> spp.	
Sandshell sp.	<i>Lampsilis teres</i> sp.	
Liliput shell	<i>Toxolasma parvus</i>	
Paper Floater	<i>Anodonta imbecilis</i>	
Fragile Paper Shell	<i>Leptodea fragilis</i>	
List based on 1997 survey of Swan Lake NWR waters		

Swan Lake NWR Odonates

Species	Scientific Name
Common Green Darner	<i>Anax junius</i>
Blue-fronted Dancer	<i>Argia apicalis</i>
Powdered Dancer	<i>Argia moesta</i>
Halloween Pennant	<i>Celithemis eponina</i>
Familiar Bluet	<i>Enallagma civile</i>
Prince Baskettail	<i>Epicordulia princeps</i>
Eastern Pondhawk	<i>Erythemis simplicicollis</i>
Citrine Forktail	<i>Ischnura hastata</i>
Fragile Forktail	<i>Ischnura posita</i>
Eastern Forktail	<i>Ischnura verticalis</i>
Common Spreadwing	<i>Lestes disjunctus</i>
Slender Spreadwing	<i>Lestes rectangularis</i>
Spangled Skimmer	<i>Libellula cyanea</i>
Widow Skimmer	<i>Libellula luctuosa</i>
Twelve-spotted Skimmer	<i>Libellula pulchella</i>
Blue Dasher	<i>Pachydiplax longipennis</i>
Wandering Glider	<i>Pantala flavescens</i>
Eastern Amberwing	<i>Perithemis tenera</i>
Common Whitetail	<i>Plathemis lydia</i>
Riverine Clubtail	<i>Stylurus plagiatus</i>
Blue-faced Meadowhawk	<i>Sympetrum ambiguum</i>
Variiegated Meadowhawk	<i>Sympetrum corruptum</i>
Saffron-winged meadowhawk	<i>Sympetrum costiferum</i>
Black Saddlebags	<i>Tramea lacerata</i>
List compiled from 2003 Refuge Survey.	

Swan Lake NWR Rare Plants

Species	Scientific Name	State Status ¹
A Barnyard Grass	<i>Echinochloa walteri</i>	critically imperiled
An Umbrella Sedge	<i>Cyperus flavicomus</i>	critically imperiled
A Sedge	<i>Carex arkansana</i>	vulnerable

Swan Lake NWR Reptiles

Snakes	Scientific Name	Status		¹ 1999 Snake Inventory Report	² 2003-2004 Drift Fence Survey
		Federal	State		
Diamondback Watersnake	<i>Nerodia rhombifer</i>			✓	✓
Yellowbelly Watersnake	<i>Nerodia erythrogaster flavigaster</i>			✓	✓
Blotched Watersnake	<i>Nerodia erythrogaster transversa</i>			✓	
Northern Watersnake	<i>Nerodia sipedon sipedon</i>			✓	
Rough Greensnake	<i>Opheodrys aestivus</i>			✓	
Graham's Crayfish Snake	<i>Regina grahamii</i>			✓	✓
Northern Redbelly Snake	<i>Storeria occipitomaculata occipitomaculata</i>			✓	
Midland Brown Snake	<i>Storeria dekayi wrightorum</i>			✓	
Western Ribbon Snake	<i>Thamnophis proximus proximus</i>			✓	✓
Eastern Plains Garter Snake	<i>Thamnophis radix radix</i>			✓	✓
Red-sided Garter Snake	<i>Thamnophis sirtalis parietalis</i>			✓	✓
Easter Yellowbellied Racer	<i>Coluber constrictor flaviventris</i>				✓
Speckled Kingsnake	<i>Lampropeltis getula holbrooki</i>				✓
Prairie Kingsnake	<i>Lampropeltis calligaster calligaster</i>				✓
Prairie Ring-necked Snake	<i>Diadophis punctatus arnyi</i>				✓
Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>				✓
Eastern Gartersnake	<i>Thamnophis sirtalis sirtalis</i>				✓
Lined Snake	<i>Tropidoclonion lineatum</i>				✓
Western Spiny Softshell	<i>Apalone spinifera hartwegi</i>				✓
Black Rat Snake	<i>Elaphe obsoleta obsoleta</i>				
Eastern Massasauga	<i>Sistrurus catenatus catenatus</i>	Candidate	Endangered		✓
Turtles					
Red-eared Slider	<i>Trachemys scripta elegans</i>				
Common Snapping Turtle	<i>Chelydra serpentina serpentina</i>				
Western Painted Turtle	<i>Chrysemys picta bellii</i>				
Three-toed Box Turtle	<i>Terrapene carolina triunguis</i>				
Ornate Box Turtle	<i>Terrapene ornata ornata</i>				
Midland Smooth Softshell Turtle	<i>Apalone mutica mutica</i>				

Appendix D: Regional Conservation Priority Species for the Lower Missouri River Ecosystem

RCP Species for the Lower Missouri River Ecosystem

COMMON NAME	SCIENTIFIC NAME
Indiana Bat	<i>Myotis sodalis</i>
Elktoe	<i>Alasmidonta marginata</i>
Threeridge	<i>Amblyma plicata</i>
Rock pocketbook	<i>Arcidens confragosus</i>
Asiatic clam	<i>Corbicula fluminea</i>
Spectaclecase	<i>Cumberlandi mondonga</i>
Zebra mussel	<i>Dreissena polymorpha</i>
Snuffbox	<i>Epioblasma triquetra</i>
Pink mucket pearlymussel	<i>Lampsilis abrupta</i>
Neosho mucket	<i>Lampsilis rafinequeana</i>
Scaleshell mussel	<i>Leptodea leptodon</i>
Black sandshell	<i>Ligumia recta</i>
Washboard	<i>Megalonaias nervosa</i>
Sheepnose	<i>Plethobasus cyphus</i>
Round pigtoe	<i>Pleurobema coccineum</i>
Fat pocketbook	<i>Potamilus capax</i>
Monkeyface	<i>Quadrula metanevra</i>
Pimpleback	<i>Quadrula pustulosa</i>
Mapleleaf	<i>Quadrula quadrula</i>
Pistolgrip	<i>Tritogonia verrucosa</i>
Mead's milkweed	<i>Asclepias meadii</i>
Decurrent false aster	<i>Boltonia decurrens</i>
Geocarpon (no common name)	<i>Geocarpon minimum</i>
Prairie bush-clover	<i>Lespedeza leptostachya</i>

RCP Species for the Lower Missouri River Ecosystem

Missouri bladderpod	<i>Lesquerella filiformis</i>
Western prairie fringed orchid	<i>Platanthera praeclara</i>
Hall's bulrush	<i>Schoenoplectus hallii</i>
Eastern massasauga	<i>Sistrurus catenatus catenatus</i>
Wood duck	<i>Aix sponsa</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Mallard	<i>Anas platyrhynchos</i>
Short-eared owl	<i>Asio flammeus</i>
Long-eared owl	<i>Asio otus</i>
Upland sandpiper	<i>Bartramia longicauda</i>
Canada goose – Eastern Prairie population	<i>Branta canadensis</i>
Canada goose – Giant population	<i>Branta canadensis</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Stilt sandpiper	<i>Calidris himantopus</i>
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
Whip-poor-will	<i>Caprimulgus vociferus</i>
Piping plover	<i>Charadrius melodus</i>
Piping plover – Great Lakes Population	<i>Charadrius melodus</i>
Piping plover – Northern Great Plains Population	<i>Charadrius melodus</i>
Snow Goose	<i>Chen caerulescens</i>
Northern harrier	<i>Circus cyaneus</i>
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
Northern flicker	<i>Colaptes auratus</i>
Acadian flycatcher	<i>Empidonax virescens</i>
Rusty blackbird	<i>Euphagus carolinus</i>
Common moorhen	<i>Gallinula chloropus</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Wood thrush	<i>Hylocichla mustelina</i>
Orchard oriole	<i>Icterus spurius</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Short-billed dowitcher	<i>Limnodromus griseus hendersoni</i>
Swainson's warbler	<i>Limnothlypis swainsonii</i>
Marbled godwit	<i>Limosa fedoa</i>
Hudsonian godwit	<i>Limosa haemastica</i>
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Whimbrel	<i>Numenius phaeopus</i>
Kentucky warbler	<i>Oporonis formosus</i>
Wilson's phalarope	<i>Phalaropus tricolor</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
King rail	<i>Rallus elegans</i>

RCP Species for the Lower Missouri River Ecosystem

Louisiana waterthrush	<i>Seiurus motacilla</i>
Dickcissel	<i>Spiza americana</i>
Field sparrow	<i>Spizella pusilla</i>
Least tern - Interior population	<i>Sterna antillarum</i>
Forster's tern	<i>Sterna forsteri</i>
Western meadowlark	<i>Sturnella neglecta</i>
Bewick's wren	<i>Thryomanes bewickii</i>
Greater yellowlegs	<i>Tringa melanoleuca</i>
Buff-breasted sandpiper	<i>Tryngites subruficollis</i>
Barn owl	<i>Tyto alba</i>
Blue-winged warbler	<i>Vermivora pinus</i>
Bell's vireo	<i>Vireo bellii</i>
Rusty crayfish	<i>Orconectes rusticus</i>
Lake sturgeon - Inland population	<i>Acipenser fulvescens</i>
Crystal darter	<i>Ammocrypta asprella</i>
Grass carp	<i>Ctenopharyngodon idella</i>
Blue sucker	<i>Cycleptus elongatus</i>
Niangua darter	<i>Etheostoma nianguae</i>
Western silvery minnow	<i>Hybognathus argyritis</i>
Plains minnow	<i>Hybognathus placitus</i>
Sturgeon chub	<i>Hybopsis gelida</i>
Flathead chub	<i>Hybopsis gracilis</i>
Sicklefin chub	<i>Hybopsis meeki</i>
Bighead carp	<i>Hypophthalmichthys nobilis</i>
Paddlefish	<i>Polyodon spathula</i>
Pallid sturgeon	<i>Scaphirhynchus albus</i>
Shovelnose sturgeon	<i>Scaphirhynchus platorynchus</i>

Appendix E: Swan Lake NWR Priority Refuge Operations and Maintenance Costs

Monitor & Research Invasive and Endangered Species, & Migratory Bird Resources

This includes hiring one full time Wildlife Biologist to assist with monitoring and management of Refuge resources. Swan Lake NWR contains approximately 12,000 acres of habitat important to migratory birds and threatened/endangered species (Indiana Bat/Massasagua Rattlesnake). These Refuge habitats are utilized by over 400,000 migratory birds and numerous resident wildlife species. This requires management coordination with the State of Missouri and other agencies. The Refuge is also located in the hydrologically complicated ecosystem of the Grand River Riparian Zone. This intensive management in a complicated system requires scientifically supported decision making with the ability to adapt to changing circumstances such as the effects of Climate Change. This project would provide the science to support adaptive management decision with a special emphasis to Climate Adaptation. It would provide the scientific research for decision making and monitoring to make better decisions within the adaptive management process.

Estimated cost: \$118,458 annually

Restore/Maintain 3,100 acres of managed wetland moist soil habitat.

This includes funding for one half-time temporary worker. Swan Lake NWR currently has 1,075 acres of managed moist soil wetland units. Refuge staff is working with private partners and the Missouri Department of Conservation on a project that would add an additional 300 acres of habitat into managed moist soil units with private funding. This project would ensure the proper resources to maintain 3,100 acres of wetland moist soil and an addi-

tional 1,800 acres of emergent Marsh as called for in the station CCP. Adequate wetland conditions are necessary to support the more than 1,000,000 migrating birds (Geese, ducks, and shorebirds) that utilize the Refuge. It also requires the assistance of seasonal employees over and above permanent staff levels during peak work times. This funding would fully allow the Refuge to meet its responsibilities in the long term upkeep of these habitats restored through private partnerships as well as maintain over 1,800 acres in emergent marsh and additional wet meadow habitats. Estimated first year cost: \$247,181

Estimated recurring annual cost: \$45,000

Provide Conservation Education & Land Stewardship Opportunities to Landowners, Schools, & Rural Communities.

Swan Lake NWR is located in Chariton County, Missouri. With approximately 20,107 acres enrolled, Chariton County has more acres of wetlands enrolled in the Wetland Reserve Program (WRP) than any county in Missouri. There are an additional 29,937 WRP acres in the surrounding counties as well. The first part of this project would be to forge an educational partnership between Swan Lake NWR and private landowners who hold over 50,000 acres of WRP easements. This partnership would allow Swan Lake to be utilized as a learning site for private landowners to learn how to properly manage and maintain their wetlands to meet habitat objectives of migratory birds. The second part of this project would enhance outdoor learning opportunities at Swan Lake NWR for area schools. There are 12 schools with over 6,000 enrolled students within a 25 mile radius of the Refuge that could make use of

Swan Lake as an outdoor learning destination.

Estimated first year cost: \$105,901

Estimated recurring annual cost: \$55,000

Manage Satellite Properties and Assist With Daily Refuge Operations

This includes hiring and Assistant Refuge Manager. Swan Lake National Wildlife Refuge is responsible for overseeing 12,000 acres of on Refuge property and 53 units (4,058 acres) of off-Refuge property. This involves the complex oversight of wetland moist soil management and managed hunt programs requiring much of the staffs time. The Refuge is located in the wetland riparian zone of the Gran River requiring extensive permitting for project work. In addition to the on Refuge work load there is an extensive work load for off Refuge fee title properties and easements, which are currently not receiving the needed management attention due to lack of Refuge staff. This project would allow the Refuge to meet management obligations on off-Refuge responsibilities and provide needed relief to the current staff for on-Refuge management activities.

Estimated cost: \$118,458 annually

Partner With Landowners to Improve Water Quality and Watershed Resources

This includes hiring one full time Private Lands Biologist. Swan Lake National Wildlife Refuge is supplied with water from four separate watersheds; Elk Creek, Turkey Creek, Tuff Branch, and Yellow Creek. Over 90% of these drainages which covers thousands of acres are in private land. The water quality of these watersheds carries significant sediment loads. This project would allow the Refuge to work more closely with private landowners in these drainages to improve the water quality of incoming water onto the Refuge. It would enhance wetland acres surround the Refuge and allow private landowners an opportunity to preserve the biological integrity of their properties.

Estimated cost: \$97,911 annually

Maintain On/off Refuge Wetland Resources and Visitor Services Facilities

This includes hiring one full time Maintenance Worker. Swan Lake NWR currently has 1,998 acres of managed moist soil wetland units. Refuge staff is working with Ducks Unlimited, the Friends of Swan Lake NWR, and the State of Missouri on a project that would add an additional 1,370 acres of habitat into managed moist soil units with private funding. This project would ensure the proper resources to maintain 3,368 acres of wetland moist soil. Adequate

wetland moist soil conditions are necessary to support migrating birds that utilize the Refuge as a rest area. This requires the operation of farm equipment to adequately maintain. The addition of these 1,998 acres of moist soil will expand maintenance responsibilities. In addition, the Refuge has 53 units (4,058 acres) of off-Refuge fee title and easement properties that are currently not receiving maintenance attention. This project would ensure maintenance attention to the wetland moist soil units and the off-Refuge properties in addition to Refuge visitor services facilities.

Estimated cost: \$72,371 annually

Develop a Comprehensive Conservation Plan (CCP) Mandated Refuge Hunting Plan

This includes funding for one half-time temporary worker. The Swan Lake Comprehensive Conservation Plan calls for the development of a Refuge Hunting Plan. Within that Hunting Plan it calls to expand hunting opportunities to include duck hunting and provide some opportunities for small game hunting. This will require writing a plan and all the necessary public input and planning strategies for the new hunting programs. The project will provide the necessary resources to develop and write a new hunting plan for the Refuge.

Estimated first year cost: \$35,951

Estimated recurring annual cost: \$7,000

Restore Moist Soil Capabilities and Shrub Swam Habitat of Wetland Units 12 and 14

This project would involve restoring the management integrity of two moist soil units, MSU 12 and 14. These units both total 1,000 acres of wetland habitat. They are managed for moist soil to provide migration habitat for waterfowl, geese, and shorebirds. In recent years due to a lack of staff much they have been encroached by undesirable plants. This encroachment has limited the Refuges ability to manage much of the unit as moist soil. This has tremendous impacts on managing the unit for mudflats around the edges for shorebird migrations. This project would be a two year project to dry the unit out and remove this woody vegetation through mechanical treatments. The Swan Lake CCP calls for some of these areas to provide Shrub Swamp habitat as well. This project will enhance the shrub swamp type habitat by removing undesirable species and thinning areas that have become too thick with vegetation creating a mosaic of shrub swam with moist soil habitat.

Estimated first year cost: \$85,000

Estimated recurring annual cost: \$5,000

Design a Comprehensive Conservation Plan (CCP) Mandated Refuge Visitors Brochure

Swan Lake NWR is located in rural North Central Missouri and provides a significant economic impact to the area by attracting visitors from all over the US. The Refuge is scheduled to have completed its Comprehensive Conservation Plan in 2009. Once the CCP is completed, the Refuge will need a new Brochure for the public. The Refuge does not have a current brochure and with changes made from the CCP process a new brochure will be necessary to properly orient the public as to opportunities on the Refuge.

Estimated Cost: \$18,000

Forge Educational Partnerships With Schools and Private Landowners

This includes hiring one full time Park Ranger. Swan Lake NWR is located in Chariton County, Missouri. With approximately 20,107 acres enrolled, Chariton County has more acres of wetlands enrolled in the Wetland Reserve Program (WRP) than any county in Missouri. There are an additional 29,937 WRP acres in the surrounding counties as well. The first part of this project would be to forge an educational partnership between Swan Lake NWR and private landowners who hold over 50,000 acres of WRP easements. This partnership would allow Swan Lake to be utilized as a learning site for private landowners to learn how to properly manage and maintain their wetlands to meet habitat objectives of migratory birds. The second part of this project would enhance outdoor learning opportunities at Swan Lake NWR for area schools. There are 12 schools with over 6,000 enrolled students within a 25 mile radius of the Refuge that could make use of Swan Lake as an outdoor learning destination.

Estimated cost: \$97,911 annually

Manage/maintain 3,400 Acres of Wetlands and Migratory Bird Resources

This includes hiring on full time Biological Science Technician. The Refuge Comprehensive Conservation Plan calls for over 3,000 acres of moist soil management on Swan Lake NWR. This project would ensure field support in management and monitoring of wetland conditions on the Refuge. There are over 200,000 migratory birds that utilize the Refuge as well and that number is expected to increase with habitat enhancements on the Refuge. This project would ensure field support in wildlife population and disease monitoring, surveys, and censuses.

Estimated cost: \$80,046 annually

Restore/maintain 2,600 Acres of Native Grasslands and Bottomland Hardwood Forest

This includes hiring one full time Rangeland Management Technician. The Swan Lake NWR currently has 921 acres of native grasslands on the Refuge. The Comprehensive Conservation Plan calls for the Refuge to eventually convert approximately 327 more acres of Refuge property to grasslands. This would give the Refuge over 1,200 acres of grassland units to manage in addition to the 1,400 acres of native bottomland hardwood forest in need of management. This project would ensure the necessary management activities are carried out to these habitats on Swan Lake National Wildlife Refuge.

Estimated cost: \$80,046 annually

Provide Visitor, Resource, and Facility Protection (Law Enforcement)

Provide one full-time law enforcement officer to protect wildlife, lands, facilities, employees and the general public on Swan Lake National Wildlife Refuge and its outlying Fee Title properties. The Directors Order #155 requires the Service to reduce dependency on dual-function Refuge officers and progress towards a full-time officer workforce. This officer will assist in fulfilling these needs by placing an officer in the field full time to protect wildlife resources. Service wetland easement violations, trespass farming, hunting violations and off-road vehicle use are increasing on Refuge lands. Protection is the most basic form of wildlife management and this project will dedicate a full-time law enforcement officer to preserve and protect wildlife and wildlife habitats. Currently the Refuge depends on State Game Wardens for LE support which puts an additional strain on them and the Refuge cannot depend upon them to make Refuge enforcement a priority.

Estimated cost: \$150,000 annually

Appendix F: References and Literature Cited

- Austin, Jane E., Dale D. Humburg, and Leigh H. Fredrickson. 1998. Habitat Management for Migrating and Wintering Canada Geese: A Moist-Soil Alternative. Pages 291-297 in D.H. Rusch, M.D. Samuel, D.D. Humburg, B.D. Sullivan, eds. *Biology and management of Canada geese*. Proc. Int. Canada Symp., Milwaukee, Wis. Jamestown, ND: Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/birds/cangeese/index.htm> (Version 8OCT99).
- Boyd, Roger. 1982. An Intensive Cultural Resource Survey of Lands to Be Affected by Levee Construction and Improvements in Swan Lake National Wildlife Refuge, Chariton County, Missouri. Order No. 33570-0054.
- Bray, Robert T. 1980. An Archaeological-Historical Survey of Lands to Be Affected by Construction of Levee System in Swan Lake National Wildlife Refuge.
- Brown, C. 1971. *Fishes of Montana*. Big Sky Books. Montana State University Bozeman.
- Carver, Erin and James Caudill. 2007. *BANKING ON NATURE 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*, Division of Economics, U.S. Fish and Wildlife Service, Washington, DC.
- Cleland, D.T.; Avers, P.E.; McNab, W.H.; Jensen, M.E.; Bailey, R.G., King, T.; Russell, W.E. 1997. *National Hierarchical Framework of Ecological Units*. Published in, Boyce, M. S.; Haney, A., ed. 1997. *Ecosystem Management Applications for Sustainable Forest and Wildlife Resources*. Yale University Press, New Haven, CT. pp. 181-200.
- Department of Energy (DOE). 1999. *Carbon Sequestration Research and Development*. Washington, D.C.: U.S. Department of Energy, Office of Science and Office of Fossil Energy.
- Dobrovolny, 2008. Department of Interior, U.S. Fish and Wildlife Service. February 26, 2008. Personal communications with John Dobrovolny, Regional Historic Preservation Officer.
- Dunn, E.H. and D.J. Argo. 1995. The Birds of North America, No. 147. Poole A. and F. Gill, eds. *The National Academy of Natural Sciences, Philadelphia and the American Ornithologists' Union*, Washington, D.C.
- Durbian, Francis E., Richard S. King, Trisha Crabbill, Heather Lambert-Doherty, and Richard A. Seigel. *Massasauga Home Range Patterns in the Midwest*. *Journal of Wildlife Management* 72(3):754-759. 2008
- Federal Geographic Data Committee. 1997. *Vegetation classification standard, FGDC-STD-005*.
- Gibbs, J. P., S. Melvin, and F. A. Reid. 1992. *American Bittern (Botaurus lentiginosus)*. In *The Birds of North America*, No. 18 (A. Poole, P. Stettenheim, and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Indiana Business Research Center. *Stats Indiana: Counties in Profile-Chariton County*. Accessed December 2009 at: http://www.stats.indiana.edu/uspr/a/us_profile_frame.html.

- Laubhan, M.K., and L.H. Fredrickson. 1992. Estimating seed production of common plants in seasonally flooded wetlands. U.S. Geological Survey, Fort Collins Science Center. *Journal of Wildlife Management*, Vol. 56(2) pages 329-3.
- Mississippi Flyway Council Technical Section. 2006. A Management Plan for the Eastern Prairie Population of Canada Geese 2006 Update.
- Missouri Department of Conservation. Undated. Grand River Watershed Inventory and Assessment. Available URL: <http://mdc.mo.gov/fish/watershed/grand/hard-copy/>
- Missouri Department of Natural Resources. Missouri State Parks and Historic Sites, Northeast Region. Accessed February 2008 at: <http://www.mostateparks.com/neregion.htm>.
- Molitor, G. 2006. Biomonitoring of Environmental Status and Trends Program, Contaminant Assessment Process for Swan Lake NWR. U.S. Fish and Wildlife Service, Ecological Services - Rock Island Field Office.
- National Park Service. No date provided. National Historic Landmarks Program. Accessed February 2008 at: <http://tps.cr.nps.gov/nhl/default.cfm>.
- National Park Service. 2007. National Register Information System. Accessed February 2008 at: <http://www.nr.nps.gov/>.
- NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Accessed January 2004 at: <http://www.natureserve.org/explorer>.
- Nelson, J. S. 1994. *Fishes of the World*. Third edition. John Wiley and Sons, New York.
- Pflieger, W. L. 1997. *The Fishes of Missouri*. Missouri Department of Conservation, Jefferson City.
- Potter, B. A., R. J. Gates, G. J. Soulliere, R. P. Russell, D. A. Granfors, and D. N. Ewert. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Shorebird Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN. 102pp.
- Schroeder, W.A. 1982. Pre-settlement prairie of Missouri. Missouri Department of Conservation. Natural History Series #2, Jefferson City, Missouri.
- Scott, W. B., and E. J. Crossman. 1973. *Freshwater Fishes of Canada*. Bulletin 184 Fisheries Research Board of Canada, Ottawa.
- Sheaffer S.E., Rusch D.H., Humburg D.D., Lawrence J.S., Zenner G.G., et al. (2004) Survival Movements, and Harvest of Eastern Prairie Population Canada Geese. *Wildlife Monographs*: Vol. 156, No. 1 pp. 1-54. Available URL: <http://www.wildlifejournals.org/archive/0084-0173/156/1/pdf/i0084-0173-156-1-1.pdf>
- Soulliere, G. J., B. A. Potter, D. J. Holm, D. A. Granfors, M. J. Monfils, S. J. Lewis, and W. E. Thogmartin. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Waterbird Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN. 68pp.
- Soulliere, G. J., B. A. Potter, J. M. Coluccy, R. C. Gatti, C. L. Roy, D. R. Luukkonen, P. W. Brown, and M. W. Eichholz. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Waterfowl Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota, USA. 117pp.
- Szymanski, J. A. 1998. Range-wide status assessment for the eastern massasauga (*Sistrurus c. catenatus*). U.S. Fish and Wildlife Service. Ft. Snelling, Minnesota, USA.
- Terres, J. 1980. Audubon Society: Encyclopedia of North American Birds. New York. page 1109.
- UMRGLR JV. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Implementation Plan (compiled by G. J. Soulliere and B. A. Potter) U.S. Fish and Wildlife Service, Fort Snelling, Minnesota, USA. 75pp.
- U.S. Fish and Wildlife Service. No date provided. Swan Lake National Wildlife Refuge. Accessed February 2008 at: <http://www.fws.gov/Refuges/profiles/index.cfm?id=33570>.
- U.S. Fish and Wildlife Service. 1995. An ecosystem approach to fish and wildlife conservation: concept document. Available URL: http://www.fws.gov/policy/npi95_03.pdf
- U. S. Fish and Wildlife Service. 1997. National Outreach Strategy: a Master Plan for Communicating in the U. S. Fish and Wildlife Service. Washington D.C., USA. Available URL: http://library.fws.gov/Pubs/outreach_strategy.pdf

- U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>
- U. S. Fish and Wildlife Service. 2005. National Wildlife Refuge System Strategic Plan for Biological Monitoring and Adaptive Management: Fiscal Years 2006-2010. Biological Monitoring Team Regions 3 and 5.
- U. S. Fish and Wildlife Service. 2006a. General Guidelines for Wildlife-Dependent Recreation. 605 FW 1. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw1.html>
- U. S. Fish and Wildlife Service. 2006b. Wildlife-Dependent Recreation: Hunting. 605 FW 2. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw2.html>
- U. S. Fish and Wildlife Service. 2006c. Wildlife-Dependent Recreation: Fishing. 605 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw3.html>
- U. S. Fish and Wildlife Service. 2006d. Wildlife-Dependent Recreation: Wildlife Observation. 605 FW 4. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw4.html>
- U. S. Fish and Wildlife Service. 2006e. Wildlife-Dependent Recreation: Wildlife Photography. 605 FW 5. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw5.html>
- U. S. Fish and Wildlife Service. 2006f. Wildlife-Dependent Recreation: Environmental Education. 605 FW 6. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw6.html>
- U. S. Fish and Wildlife Service. 2006g. Wildlife-Dependent Recreation: Interpretation. 605 FW 7. National Wildlife Refuge System, Department of Interior. Available URL: <http://www.fws.gov/policy/605fw7.html>
- United States Census Bureau. Chariton County QuickFacts. Accessed December 2009 at: <http://quickfacts.census.gov/qfd/states/29/29041.html>.
- Watkins, W.I., et. al. 1921. Soil survey of Chariton County, Missouri. U.S. Department of Agriculture, Washington, D.C.

Appendix G: Compliance Requirements

Rivers and Harbor Act (1899) (33 U.S.C. 403)

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

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

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

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

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

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

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

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

Requires that the Fish and Wildlife Service and state fish and wildlife agencies be consulted whenever water is to be impounded, diverted or modified under a federal permit or license. The Service and state agency recommend measures to prevent the loss of biological resources, or to mitigate or compensate for the damage. The project proponent must take biological resource val-

ues into account and adopt justifiable protection measures to obtain maximum overall project benefits. A 1958 amendment added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs. It also authorized the Secretary of Interior to provide public fishing areas and accept donations of lands and funds.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Land and Water Conservation Fund Act of 1965, 16 U.S.C. 460 et seq.

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

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

Defines the National Wildlife Refuge System and authorizes the Secretary to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The Refuge Improvement Act 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, or environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of Interior for managing and protecting the System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

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

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

Executive Order 11988 (1977)

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

Executive Order 11990

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

Executive Order 12372 (Intergovernmental Review of Federal Programs)

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

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

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

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

Improves the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary 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.

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

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

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

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

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

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

Federal Noxious Weed Act of 1974, 7 U.S.C. 2801 et seq.

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

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

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

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

Prohibits discrimination in public accommodations and services.

Executive Order 12898 (1994)

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

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

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

Executive Order 13007 Indian Sacred Sites (1996)

Directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners,

avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

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

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

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

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

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

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

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

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

In December 2002, Congress required federal agencies to publish their own guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information that they disseminate to the public (44 U.S.C. 3502). The amended language is included in Section 515(a). The Office of Budget and Management (OMB) 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.

Cultural Resources and Historic Preservation

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

The National Historic Preservation Act (NHPA), Section 106, requires federal agencies to consider impacts their undertakings could have on historic properties; Section 110 requires federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; Section 101 requires federal agencies consider Indian tribal values in historic preservation programs, and requires each federal agency to establish a program leading to inventory of all historic properties on its land.

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

requires archeological investigations on federal land be performed in the public interest by qualified persons.

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

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

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

Appendix H: Mailing List

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

Federal Officials

- U.S. Senator Christopher Bond
- U.S. Senator Claire McCaskill
- U.S. Representative Sam Graves
- U.S. Representative Ike Skelton
- U.S. Representative Blaine Luetkemeyer

Federal Agencies

- U.S. Army Corps of Engineers, Kansas City District
- USDI/Fish and Wildlife Service, Albuquerque, New Mexico; Anchorage, Alaska; Atlanta, Georgia; Denver, Colorado; Fort Snelling, Minnesota; Hadley, Massachusetts; Portland, Oregon; Sacramento, California; Washington, D.C.
- U.S. Department of Agriculture/NRCS, Columbia, Missouri
- U.S. Fish and Wildlife Service, Ecological Services, Columbia, Missouri

State Officials

- Governor Jay Nixon
- Representative Therese Sander
- Senator Bill Stouffer

State Agencies

- Missouri Department of Natural Resources
- Missouri Department of Conservation
- University of Missouri, Extension Services

- State Historic Preservation Officer

City/County/Local Governments

- Chariton County
- City of Chillicothe
- City of Sumner

Libraries

- Livingston County Library
- Brookfield Public Library
- Carnegie Library
- Hale Library and Museum
- Carrollton Library

Organizations

- Audubon Society of the District of Columbia
- Chillicothe Chamber of Commerce
- Conservation Federation of Missouri
- Defenders of Wildlife
- Friends of Swan Lake National Wildlife Refuge
- Grand River Audubon Society
- Mississippi Valley Duck Hunters Association
- National Trappers Association, Inc.
- National Wildlife Federation - Great Lakes Field Office
- National Wildlife Refuge Association
- National Wild Turkey Federation
- Northwestern University
- Public Employees for Environmental Responsibility (PEER)
- Sierra Club – Midwest Office

- The Conservation Fund
- The Humane Society of the United States
- The Wilderness Society
- Wilderness Watch
- Yellow Creek Chapter Ducks Unlimited

Media

- Local Radio and TV Stations; Refuge Media Contacts

Individuals

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

Appendix I: Draft Compatibility Determinations

Antler, Nut, Berry and Mushroom Collecting.....	142
Environmental Education, Interpretation and Special Events	145
Farming	148
Fishing	152
Haying.....	155
Hunting.....	158
Research	162
Trapping	165
Tree Harvest by Third Parties	168
Wildlife Observation.....	171

COMPATIBILITY DETERMINATION

Use: Gathering Antlers, Nuts, Berries, or Mushrooms

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission: “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.”

Description of Use:

Is the use a priority public use?

No. Gathering (antlers, nuts, berries, and mushrooms) is not a priority public use of the National Wildlife Refuge System.

Where would the use be conducted?

Gathering is permitted in any portion of the Refuge open to the public. Mushroom and berry gathering is typically concentrated along roadsides and foot paths and is limited to one gallon per person per day. Antler gathering does occur over the entire refuge but is typically carried out during the first couple weeks of March and is limited to four antlers per person and restricted to shed antlers only (antlers that have been sawed or still attached to the skull are prohibited from being gathered).

When would the use be conducted?

Gathering of antlers, nuts, berries, or mushrooms would occur during daylight hours from early March (once the refuge is opened to the public) through late October (when the refuge is closed to public access).

How would the use be conducted?

Antlers, nuts, berries and mushrooms are seasonally collected on the Refuge for personal use. This occurs without ground disturbance along road sides, edges of fields, and bottomland forests. Harvest of nuts, berries and mushrooms typically occurs during a stretch of several days in early spring and summer as particular items ripen. These foods are hand harvested by picking the products from the plant or gathering what has fallen to the ground. Mushrooms are picked by hand in the spring. Most antler collecting occurs in March after the Refuge opens to the public. Harvest is during daylight hours and generally involves individuals or small groups. Access to harvest sites is typically accomplished by walking from a parking area or along the side of Refuge roadways.

Why is this use being proposed?

This use has historically been allowed on the Refuge and has become a custom of the local community. The refuge is open to the public during the time periods that the use is allowed so no additional disturbance is created by allowing this use. Gathering allows the public to build a connection to the Refuge through personal outdoor experiences that engage the senses and foster an appreciation of the outdoors. The Refuge along with Yellow Creek State Conservation Area and Fountain Grove State Conservation Area are the only public lands located in the area that provide the public this type of use. Otherwise opportunities exist on private lands where access is limited for the public.

Availability of Resources:

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

Staff is needed to post regulations regarding these activities which are accomplished in conjunction with posting other refuge regulations. Law Enforcement is needed to ensure access at allowed times is adhered to which is done in conjunction with other refuge access. Law Enforcement is also peri-

odically necessary to check gatherers to ensure compliance with the restrictions placed on gathering limits.

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

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

Anticipated Impacts of the Use:

How does gathering affect Refuge purposes and the NWRs mission?

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

How does gathering affect Fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the refuge/NWRs?

Wildlife disturbance and removal of wildlife foods are the direct impacts associated with this activity.

Disturbance

In *Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations* DeLong (2002) includes a summary of effects on wildlife from disturbance from various forms of recreation. The author documents that disturbance can alter behavior (e.g. foraging time), population structure, and distribution patterns of wildlife. It is probable that gathering would cause some or all of these effects to some degree on Refuge wildlife, but at present and expected future levels is not expected to adversely affect wildlife populations on the Refuge. A number of measures mitigate these effects.

Habitat

No adverse impacts to Refuge habitats are expected from this activity. Presently, the level of this use is estimated at 50 visits annually and is not expected to increase much above present rates in the future. The use occurs for short durations during spring and summer when nuts, berries, mushrooms, or antlers are most likely available. Gathering occurs in the same areas as other public uses and practiced at prescribed levels is not expected to harm Refuge habitats.

Biological Integrity, Diversity, and Environmental Health

Gathering of nuts, berries, mushrooms, or antlers conducted in accordance with Refuge regulations is

not expected to adversely affect fish and wildlife populations or the biological integrity, diversity, and environmental health of the Refuge as it is defined in Service policy (USFWS 2001). Historically, public participation in the collection of nuts, berries, mushrooms, and antlers on the Refuge is estimated at about 50 visits per year, and future participation is also expected to be at or slightly above the current level. Individuals gathering wild edibles are limited to 1 gallon per day of mushrooms, 1 gallon per day of nuts or berries, and 4 shed antlers per day. This is not anticipated to adversely impact the biological integrity, diversity, or environmental health of the Refuge. Archeological evidence from within the Refuge shows it has been inhabited by humans for more than 12,000 years. Many of the early inhabitants relied heavily on wild plants for food. It is reasonable to conclude that individual gathering today is consistent with the historic conditions of the area.

Other Uses and Public Safety

Gathering is not expected to adversely affect other Refuge uses or public safety. As public use levels on the Refuge expand across time, unanticipated conflicts between user groups may occur. The Refuge's Visitor Services programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities which include promoting public safety. Experience on many National Wildlife Refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of gathering on priority wildlife-dependent recreation activities or public safety at Swan Lake NWR is expected to be minor.

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

Determination:

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Digging of plants or their roots is prohibited.

2. Plant products are for personal use only and cannot be sold or traded.
3. Quantities are restricted to the gathering of 1 gallon per day of nuts, berries, or mushrooms and 4 shed antlers per day
4. Damaging trees, shrubs or any other vegetation is prohibited.
5. The host plant can not be destroyed or removed for berry picking.
6. Shed Antlers are only allowed to be gathered (those with a bur that indicates it was shed and not forcibly removed). Antlers that have been sawed or still attached to the skull are prohibited from being gathered.

Justification: The use has little impact to wildlife or habitat since it is non-motorized, involves few visitors, and disturbance is local and short-duration. Little harvest occurs in the fall which is the beginning of the peak of the waterfowl migration. Due to the relatively small number of visitors for this activity and the personal use only stipulation, the amount of plants or parts harvested will not create any shortage of wild foods for any particular wildlife species. Refuge infrastructure and law enforcement staff already in place will be sufficient to facilitate and administer this use into the future. In view of the above and with the stipulations previously described, gathering nuts, berries, mushrooms, and antlers will not materially interfere with or detract from the purposes of the Refuge or the mission of the Refuge System. These uses also foster an appreciation of our natural resources by the public and are a means of allowing the refuge to more effectively connect people to nature as per the Region 3 “Lets Go Outside-Connecting People With Nature” Initiative.

Refuge Manager: _____

(Signature and Date)

Regional Chief Concurrence: _____

(Signature and Date)

Mandatory 10- or 15-year Re-evaluation Date: 2018

DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds — a literature review of impacts and mitigation measures — prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) *in* Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary

revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR. Available URL: <http://www.fws.gov/stillwater/lit-review.pdf>

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

Draft Compatibility Determination

Use: Environmental Education, Interpretation, Special Events, and other programs

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

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

Description of Use:

Is the use a priority public use?

Environmental Education and Interpretation are priority public uses of the National Wildlife Refuge System as stated in the 1999 National Wildlife Refuge Improvement Act.

Where would the uses be conducted?

Environmental Education

Environmental education encompasses planned, often sequential, instructional programs and activities aimed at building skills, abilities, and knowledge about wildlife-related environmental topics. This use would primarily occur at an area of the Refuge developed as an environmental education site with an outdoor classroom.

Interpretation, Including Special Events

Interpretation is a communication process that forges emotional and intellectual connections between the audience and the resource. Interpretation is less instructional than environmental education and is usually self-guided or directed. This use would primarily occur at existing interpretive facilities at the visitor center, along a 10-mile auto tour route, and the refuge nature trail.

Other Programs

Other programs include conservation related activities such as outdoor skills classes, landowner workshops, and scouting activities. These activities would occur at the Visitor Center, the Environmental Education site, the Nature Trail and as tours along open Refuge roadways.

When Would the Use be Conducted?

These activities would occur throughout the year with greater activity expected when school is in session.

How would the use be conducted?

Environmental Education

Environmental Education is a priority public use that currently contributes about 500 visits to the Refuge each year. The Environmental Education program will be developed with a focus on partnerships with area schools, clubs, organizations, state and federal agencies and Missouri Department of Conservation all participating in staff/volunteer led and self led Environmental Education activities on the refuge. Programs will be designed to complement the Missouri public schools curriculum that requires students to learn about natural resources in preparation for the annual Missouri Mastery and Achievement Test. Environmental education programs will focus on Refuge specific issues including wildlife, history, archaeology, culture, and habitats. The refuge will also connect and coordinate educational activities with resources at surrounding locations such as Fountain Grove Wildlife Management Area, Pershing State Park, and The Land Learning Foundation all near Swan Lake NWR.

Interpretation including special events

In addition to interpretive facilities, Refuge staff and volunteers will provide guided tours and programs upon request. Special events will be planned

out each year and posted on a refuge calendar of events.

Other Programs

Other conservation related programs would be led by Refuge staff, volunteers, or others from State agencies or conservation organizations.

Why is this Use Being Proposed?

Environmental education and Interpretation are priority general public uses of the National Wildlife Refuge System. These programs promote understanding and appreciation of natural and cultural resources and their management on all lands and waters of the Refuge System.

Availability of Resources:

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

Existing Refuge staff will be utilized when necessary to assist the environmental education, interpretation, and other programs in addition to their normal duties. The refuge volunteer program will be utilized to carry the bulk of environmental education, interpretation, and other related duties through the use of volunteers, work campers, and interns. If funding is sufficient, seasonal employees or an additional permanent employee may also be used to carry out these programs.

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

At the present level of use there are adequate Refuge resources to administer programs for environmental education, interpretation and other events. There is an opportunity to provide increased services through expansion of the Refuge volunteer program.

Anticipated Impacts of the Use:

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

The Refuge was established to provide for the needs of migratory birds and other wildlife. Environmental education, interpretation, and other programs and events do not adversely affect the ability of the Refuge to fulfill this purpose. Environmental education and interpretation are priority general public uses of the National Wildlife Refuge System and supports two of the goals the NWRS.

How does environmental education affect fish, wildlife, plants, and their habitats; and the biological

integrity, diversity, and environmental health of the refuge/NWRS?

Migratory Birds

Environmental education, interpretation, and other similar activities are not expected to adversely affect migratory bird populations that occur on the Refuge.

Disturbance

In *Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations* DeLong (2002) includes a summary of effects on wildlife from disturbance from various forms of recreation. The author documents that disturbance can alter behavior (e.g. foraging time), population structure, and distribution patterns of wildlife. It is probable that outdoor environmental education, interpretation, or other similar activities would cause some or all of these effects to some degree on Refuge wildlife. A number of measures mitigate these effects, and they are not expected to occur at levels that would interfere with the purposes of the refuge. The area most directly impacted would be the environmental education site located along the perimeter of the Refuge at the site of the existing hunting headquarters building. School buses and personal vehicles would utilize developed roads and parking areas to access trails which are already in place. Self-guided interpretation would be sporadic use by small groups of people at established trails and kiosks. This may cause short term disturbance as well, but again would have minimal impact.

Habitat

Environmental education, interpretation and other similar activities may cause minor habitat disturbance, but are not expected to adversely affect Refuge habitats.

Biological Integrity, Diversity, and Environmental Health

Environmental education, interpretation and other similar activities are not expected to adversely impact the biological integrity, diversity, and environmental health of the Refuge.

Other Uses and Public Safety

Environmental education, interpretation and other similar activities are not expected to adversely affect other Refuge uses or public safety. As public use levels on the Refuge expand across time, unanticipated conflicts between user groups may occur. The Refuge's Visitor Services program would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent rec-

reational opportunities which include promoting public safety. Experience on many National Wildlife Refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of environmental education, interpretation and other similar activities on other wildlife-dependent recreation or public safety at Swan Lake NWR is expected to be minor since it is concentrated in a few locations.

Public Review and Comment:

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

Determination (check one below):

- Use is Not Compatible
- Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Use of motorized vehicles is limited to maintained roads and parking areas except for extenuating circumstances approved by the refuge manager.
2. Environmental education activities not led by Refuge staff would require verbal approval or a Special Use Permit by the Refuge Manager to minimize conflicts with other groups, safeguard students and resources, and to allow tracking of use levels.
3. Harassment of wildlife or excessive damage to vegetation is prohibited.
4. Educational groups are required to have a sufficient number of adults to supervise their groups, a minimum of 1 adult per 10 students.
5. Visitors involved in environmental education or interpretive activities are to adhere to all refuge regulations unless approved by the refuge manager.

Justification:

In view of the above and with the stipulations previously described, environmental education, interpretation and other similar programs will not

materially interfere with or detract from the NWRS mission or purposes of the Refuge. Environmental education and interpretation are priority public uses of the Refuge System and providing these programs contributes to achieving one of the Refuge goals. Well-designed environmental education and interpretation tools that provide an opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service and to influence visitor behavior when visiting units of the Refuge System.

Refuge Manager: _____
(Signature and Date)

Regional Chief Concurrence: _____
(Signature and Date)

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

Draft Compatibility Determination

Use: Farming

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission: 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.

Description of Use:

Is the use a priority public use?

Farming is not a priority public use of the National Wildlife Refuge System.

Where would the use be conducted?

Presently, farming occurs on up to 1,365 acres or about 12 percent of presently owned (11,473 acres as of 2008) Refuge lands annually.

When would the use be conducted?

Spring planting can begin as early as April and fall harvest may occur until late October.

How would the use be conducted?

The Refuge will allow farming by private individuals for the purpose of habitat management. Cooperative farming is the term used for cropping activities (growing agricultural products) conducted by a third party on land that is owned by or managed as part of the Refuge. Cooperative farming is

conducted under the terms and conditions of a Cooperative Farming Agreement or Special Use Permit issued by the Refuge Manager. The terms of the Agreement or Permit ensure compliance with Service policy and area-specific stipulations to meet management objectives and safeguard resources. In most circumstances where farming is permitted, the use agreement will require a portion of the area be planted to a mixture of species specified by the Refuge. This portion is left unharvested in the field for the benefit of wildlife.

Farming entails the use of mechanical equipment such as tractors, disks, and seeders. Each site is tilled prior to spring planting, once ground conditions permit the use of heavy equipment without damage to the soil. Tilling requires 1-2 days per site. Some sites may also be treated with herbicide prior to planting. Next, crops such as corn, milo, wheat, and soybeans are planted. Typically, planting is completed in one day or less on any individual site and planting on all sites usually begins as early as mid April and is completed as late as early July depending on soil conditions and type of crop planted.

The Refuge encourages the use of no-till farming, also known as conservation tillage. This method is practiced on about half of the sites annually. It is a way of growing crops from year to year without disturbing the soil through tillage. Tillage is the preparation of the soil to receive seeds, usually done with equipment such as a plow, disk, or harrow that is pulled behind a tractor. Tilling can lead to unfavorable effects like soil compaction from heavy machine traffic and erosion caused by pulverizing the soil and removing plant cover, allowing topsoil to easily blow away or run off in rainwater. In no-till farming the soil is left intact and crop residues—stalks, stubble, leaves, and seed pods left after harvesting—are left in the fields. Despite the advantages to soils, no-till farming usually requires planting herbicide-resistant crop plants and then chemically weeding with herbicides. All herbicide-resistant crops will be carried out within the guidelines of Regional Policy regarding genetically modified organism. Herbicide may be applied up to two times annually on each site. This is usually done with a tractor-drawn sprayer or self-propelled sprayer and requires up to one day per site for each application.

Traditional farming which uses tillage, and often herbicide as well, is practiced on about half the sites annually. It entails disking the site one or more

Heavy Equipment Use Days Per Site for No-till and Conventional Farming

Activity	No-till Farming	Conventional Farming
Spring tilling		1-3 days
Spring planting	1 day	1 day
herbicide application	2 days	
Herbicide application or mechanical weeding		1 day
Harvesting	1 day	1 day
Total	4 days/year	4-6 days/year

times before spring planting to remove competing vegetation. This requires 1-3 days per site. Later in the growing season herbicide is applied to reduce the amount of weedy competition. This takes up to one day per site for each application. A harrow or other tractor-drawn implement may be used in place of herbicide to reduce the amount of weedy competition. This also would require about one day per site. This practice may also be utilized in areas managed for moist soil as a maintenance tool. The moist soil units are mechanically disturbed every 4-6 years to maintain their vitality and the refuge may utilize farming as a cost effective means of managing the moist soil units.

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

Why is this use being proposed?

At Swan Lake NWR, farming is used as a low cost means to maintain open habitats and reduce the amount of undesirable herbaceous and woody vegetation within moist soil management units. On some sites it is used to provide supplemental food for waterfowl and other wildlife. Farming may also occur if parcels containing currently farmed land are purchased as additions to the Refuge. However, over the long term we expect the amount of farmed Refuge lands will decrease as permanent native habitat is established on these areas.

Availability of Resources:

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

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

The needed staff time for development and administration of a cooperative farming program is available. Most of the needed work to prepare for

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

Anticipated Impacts of the Use:

How does farming affect Refuge purposes, the NWRS mission, as well as fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the refuge/NWRS?

Refuge Purposes and NWRS mission

Since its establishment, the Refuge has fulfilled its purposes by providing for the needs of migratory birds and other wildlife, with an emphasis on waterfowl. Farming is one tool used to accomplish this. It does this in two ways: 1) the residual crops left in the fields provide food, primarily for waterfowl, and 2) farming is used as a disturbance agent on some moist soil units to prevent the encroachment of woody vegetation. Although moist soil management is known to provide a greater diversity of foods with higher nutritive value than cereal grains produced by farming, it is not suited to all sites because it requires levees and water level control. Row crops are planted on a portion of the Refuge to ensure adequate food is available for migrating waterfowl.

Fish, Wildlife, Plants, and their Habitats

On sites where farming occurs there would be periodic short-term disturbance and displacement typical of any noisy heavy equipment operation. These sites may be used by wildlife for feeding and resting at times equipment is not operating, but successful nesting is unlikely because of soil and habitat disturbance. Soil disturbance from farming would reduce undesirable plant species in moist soil units allowing native species that provide dense cover and foods of high nutritive value to flourish in years the

sites are not farmed. The crops left on-site as well as other crop residue would provide supplemental food, attracting wildlife to sites, where at some locations, it could be easily viewed by Refuge visitors. Any herbicide application would be done with products approved by the Service for such use and in compliance with label instructions. No short-term or long-term adverse impacts are expected. Farming and any associated impacts are expected to occur on no more than 12 percent of Refuge lands annually.

Biological Integrity, Diversity, and Environmental Health

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes (U. S. Fish and Wildlife Service 2001). Retaining up to 1,365 acres of cropland departs substantially from the prairies that likely once occurred on these sites according to maps of pre-settlement vegetation, or the potential vegetation identified in soil surveys (USDA) but it helps fulfill refuge purposes by providing food for migratory waterfowl.

Public Review and Comment:

This compatibility determination was posted at the Refuge Visitor Center for a two week period and was displayed during the monthly Refuge First Friday program which is attended by more than 200 people. It was also posted in the local US Post Office public bulletin board. There were no comments received during this period.

Determination (check one below):

- Use is Not Compatible
- Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Cooperative Farming Agreements will be issued on a three year cycle and will be highly regulated to minimize damage to natural resources and provide supplemental food source. Each year of the Cooperative Farming Agreement the Refuge Manager will issue the cooperator a annual crop plan that specifies the crops to be planted for that year. Agreements will be awarded to the highest bidder based upon a per acre dollar figure or a crop share left unharvested.

1. Cooperating farmers will be subject to Service policy and regulation regarding use of chemicals. Herbicide and pesticide use is restricted by type and to the minimum necessary amount applied.

2. Special conditions of Cooperative Farming Agreements will address unique local conditions as applicable.
3. Farming must meet specific habitat and related wildlife objectives and contribute to the purposes of the Refuge.
4. Planting and harvest activities are restricted to minimize disturbance of wildlife species.

Justification: In view of the above and with the stipulations previously described, farming will not materially interfere with or detract from the NWRS mission or purposes of the Refuge. As practiced at Swan Lake NWR, farming contributes to the achievement of Refuges purposes and the National Wildlife Refuge System mission because it provides food resources for migratory waterfowl.

Refuge Manager: _____
(Signature and Date)

Regional Chief Concurrence: _____
(Signature and Date)

Mandatory 10- or 15-year Re-evaluation Date:

de Szalay, F.A., D. Helmers, D. Humberg, S.J. Lewis, B. Pardo, M. Shieldcastle. 2000. Upper Mississippi Valley / Great Lakes Regional Shorebird Conservation Plan. Technical report prepared for the U.S. Shorebird Conservation Plan, Manomet, Massachusetts. Available URL: <http://www.fws.gov/shorebirdplan/RegionalShorebird/downloads/UMVGL5.doc>

Helmers D.L. 1992. Shorebird management manual. Western Hemisphere Shorebird Reserve Network, Manomet, Mass. 58 p.

Parker, George R.; Ruffner, Charles M. 2004. Current and historical forest conditions and disturbance regimes in the Hoosier-Shawnee ecological assessment area Gen. Tech. Rep. NC-244. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 267 p. Available URL: http://ncrs.fs.fed.us/pubs/gtr/gtr_nc244/gtr_nc244_ch3.pdf

USDA—Natural Resources Conservation Service website <http://www.nrcs.usda.gov/programs/wrp/states/in.html> .

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

Draft Compatibility Determination

Use: Fishing

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission: 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.

Description of Use:

Is the use a priority public use?

Fishing is a priority public use of the National Wildlife Refuge System.

Where would the use be conducted?

All Refuge waters are open to fishing consistent with State and Refuge regulations. Most fishing occurs on Silver Lake, but some fishing also occurs on Refuge streams.

When would the use be conducted?

Refuge regulations (2008) permit fishing during daylight hours from early March through late October. The area known as Taylor point is open to fishing year round during daylight hours. The area can be accessed by a refuge gravel road that comes off State Highway E. Bank fishing is all that is allowed along the shore of Silver Lake that is adjacent to the

refuge road and 200 yards up or down Elk Creek from the parking area at the end of the refuge road.

How would the use be conducted?

Three fishing piers and a boat launch provide fishing access to Silver Lake. Refuge regulations call for no wake on Silver Lake and non-motorized boats on all other Refuge waters. Bank fishing is permitted along all Refuge waters. The Refuge recorded 1,000 fishing visits in 2007.

Why is this use being proposed?

Fishing is a priority general public use of the Refuge System. The Service recognizes fishing as a traditional outdoor pastime, deeply rooted in the American heritage (USFWS 2006b). Fishing programs promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Public fishing opportunities are also available nearby on the 7,100-acre Fountain Grove Conservation Area administered by the Missouri Department of Conservation and at the 3,500-acre Pershing State Park administered by the Missouri Department of Natural Resources.

Availability of Resources

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

The present Refuge fishing program is designed to be administered with minimal Refuge resources. Refuge regulations mirror State regulations in large part which allows Missouri Department of Conservation Officers to assist in law enforcement. There is a small amount of maintenance, mowing, and other upkeep at boat launching facilities that is funded as part of regular Refuge management activities. Approximately \$300 annually is required for labor and materials to update and print maps, and maintain signs.

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

At the present level of fishing use there are adequate Refuge resources to implement the fishing program. Law enforcement is the primary tool necessary to ensure proper and safe administration of this use, and although there is no Law Enforcement Officer stationed at the Refuge, law enforcement services are available through the Regional Law

Enforcement Program. State Conservation Officers also patrol the Refuge and provide additional law enforcement support.

Anticipated Impacts of the Use:

How does fishing affect Refuge purposes and the NWRS mission?

The fishing program on the Refuge helps fulfill the NWRS mission and does not detract from the ability to fulfill Refuge purposes. The Refuge was established to provide habitat for migratory birds and other wildlife. Fishing conducted in accordance with State and Refuge regulations does not adversely affect the ability of the Refuge to fulfill this purpose. Fishing is a priority public use of the Refuge System and allowing fishing on the Refuge helps fulfill the System mission.

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

Fish and Fish Habitat

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

Wildlife and Wildlife Habitat

In *Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations* DeLong (2002) includes a summary of effects on wildlife from disturbance from fishing and other forms of recreation. The author documents that disturbance can alter behavior (e.g. foraging time), population structure, and distribution patterns of wildlife. It is probable that fishing would cause some or all of these effects to some degree on Refuge wildlife. A number of Refuge regulations mitigate these effects. Much of the Refuge is not affected because fishing is limited to lakes and streams. Fishing activity is estimated at 1,000 visits annually on the Refuge and is expected to increase over time.

The cumulative disturbance caused by fishing activity and all other public uses occurring on the Refuge is not expected to adversely affect fish and wildlife populations or their habitats. A number of

factors including: suitable site conditions, presence of facilities, access limitations, and seasonal restrictions or other regulations tend to concentrate uses. At any one time, much of the Refuge is unaffected by these uses and is free of disturbance.

Biological Integrity, Diversity, and Environmental Health

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

Other Uses and Public Safety

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

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

Public Review and Comment:

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

Determination (check one below):

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Fishing must be conducted in accordance with State and Federal regulations and special Refuge regulations.

2. Fishing may be more restrictive than State seasons and regulations to ensure compliance with visitor safety and to reduce wildlife disturbance.
3. Use of air boats is prohibited.
4. Fishing is prohibited within identified areas.

Justification: In view of the above and with the stipulations previously described, fishing will not materially interfere with or detract from the NWRS mission or purposes of the Refuge. Fishing is a priority public use of the Refuge System and providing a fishing program contributes to achieving one of the Refuge goals. Fishing seasons and limits are established by the Missouri Department of Conservation and adopted by the Refuge. These restrictions help ensure the continued well-being of fish populations. Fishing is not expected to adversely affect the biological integrity, diversity, and environmental health of the Refuge or the Refuge System.

Refuge Manager: _____

(Signature and Date)

Regional Chief Concurrence: _____

(Signature and Date)

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

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

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

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

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

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

Draft COMPATIBILITY DETERMINATION

Use: Haying

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission: 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.

Description of Use:

Is the use a priority public use?

No. Haying is not a priority public use of the National Wildlife Refuge System.

Where would the use be conducted?

Presently, haying occurs on up to 100 acres or about 1 percent of presently owned (11,473 acres as of 2008) Refuge lands annually.

When would the use be conducted?

Haying begins in July and takes approximately 7-10 days to complete.

How would the use be conducted?

The Refuge will allow haying by private individuals for the purpose of habitat management. Haying is the cutting and processing (typically baling) of grass and forbs, with subsequent removal to an off-Refuge location. Haying will be conducted by third parties on grassy openings owned by or managed as

part of the Refuge by jurisdictional agreement. Administration of haying programs will be conducted in accordance with a Habitat Management Plan. Haying activities will be subject to the terms and conditions of a Cooperative Farming Agreement or Special Use Permit issued by the Refuge Manager. The terms of the Agreement or Permit ensure compatibility through implementation of Service policy and Refuge specific stipulations.

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

Why is this use being proposed?

At Swan Lake NWR haying is used as a low cost means to prevent encroachment of woody vegetation within grasslands and to provide stubble as a fall and winter food source for migrating waterfowl. Historically, grazing by native wildlife along with periodic fires were the primary disturbance agents that helped retard growth of woody vegetation and maintain plant vigor and diversity within grasslands. Although prescribed fire is in many cases the preferred method of disturbance, its use is not always practical or possible, and it does not produce the same response as disturbance from grazing. Today, native grazers are largely absent from grassland habitats. Haying is used to partially mimic the disturbance once created by grazing.

Availability of Resources:

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

A refuge staff person is required to administer a special use permit and ensure that the haying is done to specifications identified within the permit with regards to safety and timing of haying operations.

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

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

Anticipated Impacts of the Use:

Haying can temporarily remove cover for birds but the long term benefits of preserving habitats in a grassland state out way any short term impacts. By haying after July 15 any negative impacts to ne

How does haying affect Refuge purposes, the NWRS mission, as well as fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the refuge/ NWRS?

Refuge Purposes and NWRS mission

Since its establishment, the Refuge has fulfilled its purposes by providing for the needs of migratory birds and other wildlife, with an emphasis on waterfowl. Haying is one tool used to accomplish this. It does this in two ways: 1) by preventing the encroachment of woody vegetation in grassland habitats attractive to migrating and wintering waterfowl, and by 2) providing green stubble used as a food source by waterfowl and other wildlife during spring and fall migration.

Fish, Wildlife, Plants, and their Habitats

On sites where haying occurs there would be periodic short-term disturbance and displacement typical of any noisy heavy equipment operation. These sites may be used by wildlife for feeding and resting at times equipment is not operating. The sites may also be used by nesting birds because in most years haying would be prohibited until July 15, a time when most birds have fledged young. Despite this it is likely that some nests and pre-fledglings would be destroyed during haying. National Wildlife Refuges are managed first and foremost for wildlife (USFWS 2001). But the focus is on wildlife populations not individuals (USFWS 1992). Haying is likely to cause mortality of some individual animals, but is not expected to affect the perpetuation of wildlife populations.

Biological Integrity, Diversity, and Environmental Health

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes (U. S. Fish and Wildlife Service 2001). The Refuge is located in a transitional area between forest and prairie. Historically, the area was likely a shifting mosaic of prairie and forest driven by disturbance agents like fire and wind. Most native habitats in areas surrounding the Refuge have been converted to agriculture and do not contribute to this large mosaic that existed as part of historic conditions. In lieu of these large scale processes, the Refuge retains some areas in a permanently non-forested condition to maintain this habitat on the landscape. Restoring historic habitats contributes to biological integrity, diversity, and environmental health of the Refuge. Haying is one tool used to maintain these open habitats.

Public Review and Comment:

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

Determination:

Use is Not Compatible

Use is Compatible with Following Stipulations

e is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Begin haying after July 15 to minimize disturbance to nesting migratory birds. In some years it may be necessary for haying to occur before July 15 to prevent seed dispersal of undesirable plant species.
2. Bales must be removed from the Refuge within 7 days of baling.
3. Windrowed grass left lying to dry should remain on the ground no more than 7 days prior to baling.
4. Haying must meet specific habitat and related wildlife objectives and contribute to the purposes of the Refuge.

5. Prohibit haying within known or potential habitat for the eastern massasauga rattlesnake.

Justification: Maintaining open habitats through cooperative farming contributes to the achievement of Refuge purposes and the National Wildlife Refuge System mission because it partially restores historic habitat conditions and provides habitat for migratory waterfowl and other wildlife. Haying is one low cost method used to disturb these sites and temporarily diminish the amount of woody vegetation.

Refuge Manager: _____

(Signature and Date)

Regional Chief Concurrence: _____

(Signature and Date)

Mandatory 10- or 15-year Re-evaluation Date:
DATE

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

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

Draft Compatibility Determination

Use: Hunting

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission: 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.

Description of Use:

Is the use a priority public use?

Hunting is a priority public use of the National Wildlife Refuge System.

Where would the use be conducted?

Goose hunting is permitted at 11 designated blinds and 10 field sites. The preferred alternative in the Environmental Assessment of the Draft Comprehensive Conservation Plan calls for allowing duck hunting and small game hunting which will be designated in a step down hunting plan. All waterfowl hunting will be restricted to within 300 yards of the perimeter of the refuge, leaving the vast majority of the interior of the refuge as a waterfowl sanctuary. Waterfowl hunting will be restricted to 3-5 days a week with rest days being designated on an annual basis by the refuge manager. During the Conservation Order season for Snow Geese, designated areas will be open to hunting seven days a week. If implemented, duck hunting would likely

occur on some or all of the sites where goose hunting is permitted. In past years two muzzle-loader hunts for white-tailed deer were conducted on separate weekends on the eastern and western halves of the Refuge, respectively. White-tailed deer muzzle-loader hunting also occurs at one blind constructed to accommodate physically disabled hunters. In cooperation with the Missouri Department of Conservation (MDC), beginning in 2008 there will be a disabled deer hunt on one weekend, a youth conventional firearm deer hunt on one weekend and a public muzzle-loader hunt on another weekend. Bag limits will be coordinated with the MDC on an annual basis. The refuge will also allow small game hunting as identified in a Refuge Hunting Plan in areas that do not impact other refuge uses or cause undue disturbance to wildlife.

When would the use be conducted?

Goose hunting typically starts on the Refuge November 1 and ends on January 31. As part of a Conservation Order issued to reduce Snow Goose numbers, there is also an additional season with no bag limit for light geese (Snow Geese and Ross's Geese) that starts on February 1 and ends when the Refuge opens to the public on March 1. The preferred alternative in the Environmental Assessment of the Draft Comprehensive Conservation Plan calls for allowing duck hunting. The specific dates and duration of duck hunting season vary annually, but typically occurs between late October and late December.

Two of the white-tailed deer hunts are considered managed hunts and are listed as such in the Missouri Department of Conservation (MDC) hunting season regulations and usually occur on successive weekends in December or January. One of the managed hunts is a youth deer hunt and the second a public deer hunt. The Refuge also offers a hunt for the physically disabled that is not part of the MDC managed deer hunt program. Beginning in 2008 it is scheduled to occur on a weekend prior to the first managed hunt.

How would the use be conducted?

Hunters use harvest methods and firearms consistent with the Wildlife Code of Missouri and Refuge regulations. Waterfowl hunters are required to check in at hunting headquarters located on the northern border of the Refuge. A daily drawing is used to assign no more than four waterfowl hunters to each available blind or hunting site and an associ-

ated parking site. Dogs are allowed for retrieving waterfowl. The number of participants in the two muzzleloader deer hunts is regulated by MDC through their managed hunt program, but is typically around 50 for each of the two hunts. Deer hunters enter the Refuge at times specified in MDC regulations for hunting hours and park on public access roads. The hunt occurs from one-half hour before official sunrise and one-half hour after official sunset each day and hunters must abide by all MDC hunting regulations and refuge specific regulations. Hunters must check in all harvested deer at the hunting headquarters building. Hunters are required to attend a pre-hunt meeting on Friday afternoon before the hunt and are allowed to scout the hunt areas after the meeting on Friday afternoon up until official sunset. Arrangements for physically disabled deer hunters are coordinated by Refuge staff. Typically from 5-10 hunters participate during this two-day hunt, and are provided drive in access to an accessible blind with parking.

The Draft Comprehensive Conservation Plan calls for the addition of squirrel hunting. It would be allowed, with the completion of a hunting plan, in a designated portion along Yellow Creek and be open August 1- October 15. Squirrel Hunting would be conducted in accordance with MDC squirrel hunting regulations and bag limits as well as any additional Refuge specific regulations.

Why is This Use Being Proposed?

Hunting is a priority general public use of the Refuge System that is also an important wildlife management tool. The Service recognizes hunting as a healthy, traditional outdoor pastime, deeply rooted in the American heritage (USFWS 2006). Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs. Hunting programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System. Public hunting opportunities are also available nearby on the 7,100-acre Fountain Grove Conservation Area administered by the Missouri Department of Conservation.

Availability of Resources:

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

Refuge staff will be required to conduct pre-hunt meetings and either staff, volunteers, or contractors will be required to staff the hunter check station. Refuge regulations mirror State regulations in large part which allows Missouri Department of Conservation Officers to assist in law enforcement. There is a small amount of road maintenance, mowing, and

other upkeep performed that is funded as part of regular Refuge management activities. Approximately 1,000 annually is required for labor and materials to update and print maps, and maintain signs.

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

At the present level of hunting use there are adequate Refuge resources to implement the hunting program. Law enforcement is the primary tool necessary to ensure proper and safe administration of this use, and although there is no Law Enforcement Officer stationed at the Refuge, law enforcement services are available through the Regional Law Enforcement Program. Missouri Department of Conservation Officers provides additional law enforcement support.

Anticipated Impacts of the Use:

The Environmental Assessment for the Draft CCP for Swan Lake NWR contains a thorough discussion of the anticipated impacts of hunting. Parts of this analysis are summarized below.

How does hunting affect Refuge purposes and the NWRS mission?

The Refuge was established to provide for the needs of migratory birds and other wildlife. Hunting does not adversely affect the ability of the Refuge to fulfill this purpose. National Wildlife Refuges are managed first and foremost for wildlife (USFWS 2001). But the focus is on wildlife populations not individuals (USFWS 1992). Hunting causes mortality and wounding of individual animals, but is regulated so it does not threaten the perpetuation of wildlife populations. The effects of hunting on wildlife populations are monitored within the State and across the nation and are considered in setting annual hunting bag limits. Hunting is a priority public use of the Refuge System and allowing hunting on the Refuge helps fulfill the System mission.

How does hunting affect Fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the refuge/NWRS?

Migratory Birds

Hunting is not expected to adversely affect migratory game bird populations that occur on the Refuge. The U.S. Fish and Wildlife Service works closely with state and provincial governments, as well as with the public, in a joint effort to establish annual hunting regulations for migratory birds. The Service's Division of Migratory Birds establishes framework regulations to manage all migratory bird hunting in the United States. These regulations

establish limitations by which states can then create season lengths, bag limits and areas of migratory bird hunting.

Regulations on migratory bird hunting are determined through the assessment of annual data (USFWS 1995). Data is obtained through aerial surveys of the North American Flyway which count birds, ponds and nests, and provide information for analyzing population and habitat conditions. Hunter surveys and questionnaires determine the number of hunters participating yearly. Recommendations from the Flyway Council are considered when original rules are created. Rules are presented to the public through the Federal Register and followed by a series of public meetings for any recommendations. The final regulations are assessed based on a collective analysis of all factual information as well as council and public recommendations.

White-tailed Deer

The Missouri Department of Conservation annually reviews hunting seasons and bag limits and modifies them to avoid any long-term population declines. Hunting is not expected to adversely impact deer populations.

Disturbance

In *Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations* DeLong (2002) includes a summary of effects on wildlife from disturbance from hunting and other forms of recreation. The author documents that disturbance can alter behavior (e.g. foraging time), population structure, and distribution patterns of wildlife. It is probable that hunting would cause some or all of these effects to some degree on Refuge wildlife. A number of measures mitigate these effects. Hunting seasons largely occur outside the times when most wildlife species are raising offspring and are most sensitive to disturbance. Also, waterfowl hunting is limited to designated sites leaving much of the Refuge free of hunting disturbance. The number of deer hunters permitted daily is presently limited to 50, and hunting occurs on four days throughout the entire year and is limited to half the refuge on any of the four days. Hunting activity is estimated at about 500 visits annually on the Refuge and is expected to increase over time especially if waterfowl and small game hunting are offered.

Habitat

Hunting is not expected to adversely affect Refuge habitat.

Biological Integrity, Diversity, and Environmental Health

Hunting conducted in accordance with State and Federal regulations is not expected to adversely affect wildlife populations that occur on the Refuge and likely assists in maintaining the biological integrity, diversity, and environmental health of the Refuge. Some species, such as white-tailed deer, today occur at levels well above those thought to occur under historic conditions. Left unchecked high numbers of such species could adversely affect biological integrity, diversity, and environmental health. Hunting is a closely monitored tool that helps regulate wildlife populations.

Other Uses and Public Safety

Hunting is not expected to adversely affect other Refuge uses or public safety. Dogs are permitted for hunting for retrieving. At present levels of use dogs used for this purpose are not expected to adversely impact non-target species or conflict with other uses. As public use levels on the Refuge expand across time, unanticipated conflicts between user groups may occur. The Refuge's Visitor Services programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities which includes promoting public safety. Experience on many National Wildlife Refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of hunting on other wildlife-dependent recreation or public safety at Swan Lake NWR is expected to be minor.

Public Review and Comment

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

Determination (check one below):

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility

1. Hunting must be conducted in accordance with State and Federal regulations and special Refuge regulations.
2. Hunting may be more restrictive than State seasons and regulations to ensure compliance with visitor safety and to reduce wildlife disturbance.
3. Vehicles must remain on designated roadways or parking areas.
4. Hunting is allowed only in designated areas.

Justification: In view of the above and with the stipulations previously described, hunting will not materially interfere with or detract from the NWRS mission or purposes of the Refuge. Hunting is a priority public use of the Refuge System and providing a hunting program contributes to achieving one of the Refuge goals. Hunting seasons and bag limits are established by the Missouri Department of Conservation and adopted by the Refuge. These restrictions help ensure the continued well-being of game populations. Disturbance of wildlife will occur, but limitations on hunting mean much of the Refuge would be free of disturbance. Hunting is not expected to adversely affect the biological integrity, diversity, and environmental health of the Refuge or the Refuge System.

Refuge Manager: _____
 (Signature and Date)

Regional Chief Concurrence: _____
 (Signature and Date)

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

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

U. S. Fish and Wildlife Service. 1995. Migratory Game Bird Hunting: Regulations Development Process. 723 FW 3. Department of Interior. Available URL: <http://www.fws.gov/policy/723fw3.html>

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

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

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

Draft Compatibility Determination

Use: Research projects by third parties

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission: 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.

Description of Use:

What is the use? Is the use a wildlife-dependent use?

The Refuge allows research investigations on a variety of biological, physical, archeological, and social components to address refuge management information needs or other issues not related to refuge management. Studies are or may be conducted by federal, state, and private entities, including the U.S. Geological Survey, state departments of natural resources, state and private universities, and independent researchers and contractors. This is not a wildlife-dependent use.

Where would the use be conducted?

Sites for this use would depend on the particular study being conducted and could occur in a variety of habitat types. Access would be restricted by Special Use Permit to only the study sites needed to meet the objectives of the research.

When would the use be conducted?

The timing of research activities would depend on the individual project. The entire Refuge is open for allowed research activities throughout the year in conjunction with the issuance of a Special Use Permit. The timing and number of visits by researchers may be restricted by Special Use Permit.

How would the use be conducted?

Any research study sites, sampling locations, and transects can be temporarily marked by highly visible wooden or metal posts and must be removed when research ceases. Access to study sites is by foot, truck, all-terrain vehicle, boat, airboat, canoe, and other watercraft. Vehicle use is allowed on Refuge roads, trails, and parking lots normally open to the public.

Why is this use being proposed?

Most research by third parties is done to address refuge management information needs or to contribute to a larger knowledge base about resources of concern to the Refuge and/or the U.S. Fish and Wildlife Service.

Availability of Resources:

Facilities and staff are currently available to provide access, maintain roads, parking lots, secondary access roads, as well as to issue Special Use Permits for research projects. Staff resources are deemed adequate to manage this use at anticipated use levels. Access points, boats, vehicles, miscellaneous equipment, and limited logistical support are available on the Refuge. Housing is available for researchers that are signed up as refuge volunteers.

Anticipated Impacts of the Use:

Short-term Impacts:

Research activities may disturb fish and wildlife and their habitats. For example, the presence of researchers can cause waterfowl to flush from resting and feeding areas, cause disruption of birds and turtles on nests or breeding territories, or increase predation on nests and individual animals as predators follow human scent or trails. Efforts to capture animals can cause disturbance, injury, or death to groups of wildlife or to individuals. To wildlife, the energy cost of disturbance may be appreciable in terms of disruption of feeding, displacement from preferred habitat, and the added energy expended to avoid disturbance.

Sampling activities can cause compaction of soils and the trampling of vegetation, the establishment of temporary foot trails and boat trails through vegetation beds, disruption of bottom sediments, and minor tree damage when temporary observation platforms are built or when tree climbers access bird nests.

The removal of vegetation or sediments by core sampling methods can cause increased localized turbidity and disrupt non-target plants and animals. Installation of posts, equipment platforms, collection devices and other research equipment in open water may present a hazard if said items are not adequately marked and/or removed at appropriate times or upon completion of the project.

Long-term Impacts:

Long term effects should generally be beneficial by gaining information valuable to Refuge management. No long-term negative impacts are expected and the Refuge Manager can control the potential for long-term impacts through Special Use Permits.

Cumulative Impacts:

Cumulative impacts would occur if multiple research projects were occurring on the same resources at the same time or the duration of the research is excessive. No cumulative impacts are expected and the Refuge Manager can control the potential for cumulative impacts through Special Use Permits. Managers retain the option to prohibit research on the Refuge which does not contribute to the purposes of the Refuge or the mission of the Refuge System, or causes undo resource disturbance or harm.

Public Review and Comment:

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

Determination:

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Prior to conducting investigations, researchers will obtain Special Use Permits from the Refuge that make specific stipulations related to when, where, and how the research will be conducted. Managers retain the option to prohibit research on the Refuge which does not contribute to the purposes of the Refuge or the mission of the Refuge System, or causes undo resource disturbance or harm.
2. Researchers must possess all applicable state and federal permits for the capture and possession of protected species, for conducting regulated activities in wetlands, and for other regulated activities. Researchers must demonstrate they have approval from the Animal Care and Use Committee if required by the research institution.
3. Archeological researchers must obtain an Archeological Resource Protection Act permit from the Regional Director prior to obtaining a special use permit from the Refuge Manager.
4. Researchers will submit annual status reports and a final report concerning Refuge research to the Refuge Manager.
5. Researchers will submit an electronic copy of all raw data collected to the Refuge Manager with the understanding that the researcher will have the opportunity to produce publications based on the data.

Justification:

Research by third parties may play an integral role in Refuge management by providing information needed to manage the Refuge on a sound scientific basis. Investigations into the biological, physical, archeological, and social components of the Refuge provide a means to analyze management actions, impacts from internal and outside forces, and ongoing natural processes on the Refuge environment.

Adverse impacts of research that cause localized vegetation trampling or disruption of wetland bottom sediments are often short-term and would be minimized through stipulations above. Any research equipment that remains in the field for the duration of the project would be clearly marked to avoid potential hazards presented to other Refuge users and/or Refuge staff.

Refuge Manager: _____

(Signature and Date)

Regional Chief Concurrence: _____

(Signature and Date)

Mandatory 10-Year Re-Evaluation Date:

Draft Compatibility Determination

Use: Trapping of nuisance wildlife

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission:

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.

Description of Use:

Is the use a wildlife-dependent public use?

No. Trapping is not a priority wildlife-dependent public use of the National Wildlife Refuge System as defined by the Refuge Improvement Act of 1997.

Where would the use be conducted?

Trapping would occur in and around locations where wildlife (such as beaver or muskrats) are hampering efforts to achieve Refuge land and water management objectives. Typically, along roads, levees, and water control structures. Trapping may occur around refuge buildings where wildlife become a nuisance.

When would the use be conducted?

Trapping would be used, at the Refuge Manager’s discretion, whenever necessary to eliminate nuisance wildlife that is hampering efforts to achieve Refuge land and water management objectives.

Trapping could occur whenever a problem arises. Live trapping and relocation is the first preference when dealing with nuisance animals. If lethal trapping is necessary it would occur during Missouri furbearer season if possible, but may occur at other times if necessary to meet refuge management objectives.

How would the use be conducted?

The use would occur whenever necessary and at the discretion of the Refuge Manager through issuance of a Special Use Permit to a qualified trapper. Trapping would be used only in specific locations to remove or eliminate wildlife hampering refuge management objectives. Live trapping and relocation is the first preference when dealing with nuisance animals. This work would be done by Service employees or through contract with qualified individuals. Animals would be relocated to other outlying fee title properties or to other sites with willing landowners and suitable habitat. If live trapping efforts are not successful in removing the nuisance animal, lethal methods will be employed. In most circumstances this would occur during Missouri furbearer season, and would be done by qualified trappers. If lethal trapping is necessary outside of furbearer season the work would be done through a paid contract. The use of snares on the Refuge is prohibited. The approved trapping methods are qualified under State regulation as to trap size and types of allowable sets in order to protect non-target species, and provide for the safe use of the area by others.

Why is this use being proposed?

Some furbearers cause damage to dikes and water control structures through burrowing and in the case of beavers through dam building or associated flooding. Trapping is used as a management tool to remove or eliminate wildlife hampering refuge management activities.

Availability of Resources:

Sufficient staff exists to issue the required permits, and oversee this periodic use. Facilities and staff are currently available to provide access, maintain roads, parking lots, and secondary access roads.

Anticipated Impacts of the Use:

How does trapping affect Refuge purposes and the NWRS mission?

The Refuge was established to provide for the needs of migratory birds and other wildlife. Trapping does not adversely affect the ability of the Refuge to fulfill this purpose, and is employed as a tool to help accomplish Refuge management objectives. National Wildlife Refuges are managed first and foremost for wildlife (USFWS 2001). But the focus is on wildlife populations not individuals (USFWS 1992). Trapping causes mortality of individual animals, but at Swan Lake NWR its use is limited to instances where wildlife are hampering Refuge management objectives, and it does not threaten the perpetuation of wildlife populations.

How does trapping affect Fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the refuge/NWRS?

Wildlife, plants, and habitat

Trapping would be done in support of Refuge management objectives and is expected to improve or help maintain habitats of many wildlife species. Any lethal trapping would cause mortality of targeted species and in some cases is likely to cause mortality of non-targeted species. In either case, mortality of individuals is not expected to adversely affect wildlife populations on the Refuge. Trapping is expected to benefit Refuge habitats in those areas where wildlife (such as beaver) are hampering Refuge management objectives.

Disturbance

In *Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations* DeLong (2002) includes a summary of effects on wildlife from disturbance from various forms of recreation. The author documents that disturbance can alter behavior (e.g. foraging time), population structure, and distribution patterns of wildlife. It is probable that trapping along with all other public uses of the Refuge would cause some or all of these effects to some degree on Refuge wildlife. A number of measures mitigate these effects. The use occurs at the discretion of the Refuge Manager and is limited to specific locations and times when problems occur.

Biological Integrity, Diversity, and Environmental Health

Periodic trapping to remove or eliminate nuisance wildlife is not expected to adversely affect wildlife populations that occur on the Refuge and

likely assists in maintaining the biological integrity, diversity, and environmental health of the Refuge.

Other Uses and Public Safety

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

Cumulative Impacts:

There are no anticipated cumulative impacts.

Public Review and Comment:

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

Determination:

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Trapping will be conducted in accordance with an approved Trapping Plan.
2. Trapping will be conducted under permit by experienced trappers.

Justification:

In view of the above and with the stipulations previously described, trapping will not materially interfere with or detract from the NWRS mission or purposes of the Refuge. Trapping is a tool used to control nuisance wildlife and help fulfill Refuge management objectives. Its use is regulated and at the discretion of the Refuge Manager. It is not expected to adversely affect wildlife populations or their habitats, or conflict with other Refuge uses.

Refuge Manager: _____

(Signature and Date)

Regional Chief Concurrence: _____

(Signature and Date)

Mandatory 10-Year Re-Evaluation Date: 2018

- DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds — a literature review of impacts and mitigation measures — prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) *in* Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR. Available URL: <http://www.fws.gov/stillwater/lit-review.pdf>
- U. S. Fish and Wildlife Service. 1992. Population Management at Field Stations: General. 701 FW 1. Department of Interior. Available URL: <http://www.fws.gov/policy/701fw1.html>
- U. S. Fish and Wildlife Service. 2001. Biological integrity, diversity, and environmental health. 601 FW 3. National Wildlife Refuge System, Department of Interior. Available URL: <http://policy.fws.gov/601fw3.html>

Draft Compatibility Determination

Use: Tree harvest by third parties for personal use, habitat management, or maintenance purposes

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission:

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.

Description of Use:

Is the use a wildlife-dependent use?

No. Tree harvest for habitat management or maintenance purposes is not wildlife-dependent.

Where would the use be conducted?

The use would be conducted in forested areas and in areas where trees are invading otherwise open habitats such as grasslands and moist soil units. Today there are approximately 3,100 acres of bottomland forest on the Refuge.

When would the use be conducted?

Tree harvest could occur any time of year at the discretion of the Refuge Manager.

How would the use be conducted?

Tree harvesting may be done by individuals for personal use at the discretion of the Refuge Manager and under a Special Use Permit. Harvest may include standing and fallen trees for personal-use firewood. Removal of trees that are a hazard to property and human safety would be permitted in specific circumstances. Tree harvest would be considered and may be permitted within most forested areas of the Refuge as a method of habitat management. Tree harvesting within these areas may also be conducted by individuals through a Special Use Permit, or through commercial timber sales carried out by professional loggers. The areas open to tree harvest and management strategies would be specified in a Habitat Management Plan.

Why is this use being proposed?

The Refuge would allow cutting and removal of trees from the Refuge for the purpose of improving forest diversity and health through thinning, creating openings, or removal of invasive tree species. Personal use tree cutting would also be allowed as a means of maintaining public use trails or roads, i.e., remove blow down, hazard trees, road shoulder maintenance, or for trail modification. Tree removal is also sometimes necessary to restore grassland sites and maintain moist soil units that become invaded by trees.

Availability of Resources:

Periodic and small-scale personal use tree harvest operations can be adequately administered with existing staff resources. Any permit fees or timber sale receipts would not off-set costs since these funds are deposited in general accounts and not returned to the Refuge.

Anticipated Impacts of the Use:

How does tree harvesting for personal use affect Refuge purposes, the NWRS mission, as well as fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the refuge/NWRS?

Refuge Purposes and NWRS mission

Since its establishment, the Refuge has fulfilled its purposes by providing for the needs of migratory birds and other wildlife, with an emphasis on waterfowl. Tree harvest would be done to meet Refuge habitat management objectives or to assist with

maintenance of Refuge roads, trails, or other facilities. This would help fulfill Refuge purposes and is consistent with the NWRS mission.

Fish, Wildlife, Plants, and their Habitats

National Wildlife Refuges are managed first and foremost for wildlife (USFWS 2001). But the focus is on wildlife populations not individuals (USFWS 1992). Harvesting trees would alter habitat and associated wildlife, but would be done in compliance with a Habitat Management Plan to meet Refuge objectives. On sites where tree harvesting occurs there would be periodic short-term disturbance and displacement typical of any noisy heavy equipment operation. These sites may be used by wildlife for feeding and resting at times equipment is not operating. Harvest occurring within forested stands would increase the amount of light available within the understory. This is expected to stimulate new growth and change the structure within these stands. This would in turn affect the types of wildlife attracted to these sites.

Biological Integrity, Diversity, and Environmental Health

Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so does not conflict with refuge purposes (U. S. Fish and Wildlife Service 2001). Removal of individual trees for personal use as described above is not expected to adversely affect the biological integrity, diversity or environmental health of the Refuge. Harvesting trees across a larger area would act as a disturbance agent to promote forest renewal. This would alter the composition, diversity, and abundance of plant and wildlife species in the areas it is practiced. Maintaining a mosaic of structure and age class diversity within forested areas of the Refuge is consistent with alternatives discussed in the draft Comprehensive Conservation Plan (CCP) and with what is known about historic conditions of the area. Harvesting trees does remove woody material and associated nutrients and habitats from the site, but this is mitigated by requiring some material be left on site. The location, timing, frequency, and duration of any harvesting activity would be guided by a Habitat Management Plan in support of direction included in the CCP.

Public Review and Comment:

This compatibility determination is part of the Swan Lake NWR Draft Comprehensive Conservation Plan and environmental assessment. Public notification and review includes a notice of availability published in the Federal Register, 30-day comment period, local media announcements, and a public meeting near the Refuge. Comments received and agency responses will be included in

the final version of the Swan Lake NWR Comprehensive Conservation Plan.

Determination:

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Any tree cutting must meet specific habitat and related wildlife/maintenance/safety objectives and contribute to the purposes of the Refuge.
2. Special use permits will be issued by the Refuge Managers and list special conditions that must be met to avoid or minimize adverse impacts to habitat, fish and wildlife resources, cultural resources, and the visiting public.
3. Due to the prevalence of hydric soils, tree harvest will be required to take place when conditions minimize soil compaction, erosion, and impacts to cultural resources.

Justification:

Tree harvest has been determined to be compatible because impacts would be minimal and can be controlled by permits, and the activity would ultimately benefit forest, grassland, and wetland habitats, or public use trails on the Refuge. Adverse impacts from harvest would be short-term in nature and more than off set by the long-term gains in wildlife and plant benefits and/or maintained/improved visitor use facilities. Taken in this long-term context, harvest of trees would contribute to the purposes of the Refuge and the mission of the Refuge System.

Refuge Manager: _____

(Signature and Date)

Regional Chief Concurrence: _____

(Signature and Date)

Mandatory 10-Year Re-Evaluation Date: 2018

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

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

Draft Compatibility Determination

Use: Wildlife Observation and Photography (including the means of access such as automobile driving, hiking, biking, canoeing, kayaking and boating and picnicking incidental to these uses)

Refuge Name: Swan Lake National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities: Executive Order 7563 established Swan Lake National Wildlife Refuge on February 27, 1937.

Refuge Purposes:

“... as a refuge and breeding ground for migratory birds and other wildlife: ...” Executive Order 7563, dated Feb. 27, 1937

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

“... particular value in carrying out the national migratory bird management program.” 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

National Wildlife Refuge System Mission: 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.

Description of Use:

Is the use a priority public use?

Wildlife observation and photography are priority public uses of the National Wildlife Refuge System.

Where would the use be conducted?

Wildlife observation and photography occurs along roads, trails, and waters throughout the Refuge. The refuge nature trail is currently located near the office and roughly ¾ of mile long this compatibility determination will include the use of this trail and extending the trail around the Swan Lake wetland to provide more wildlife viewing opportunities and access to photography blinds with minimal wildlife disturbance.

When would the use be conducted?

Wildlife observation and photography would occur year round along the entrance road and the nature trail near the Visitor Center. The remainder of the Refuge is open for wildlife observation and photography from early March through late October. Permanent photography/observation blinds will be available by reservation only. The blinds will be locked and a key will be issued when reservations are made. The blinds will be accessible for 1 hour before official sunrise and 30 minutes after official sunset by reservation and available on a year round basis with the exception of times during the special deer hunts. Refuge tours can be conducted anytime of the year with the approval of the refuge manager to ensure they do not conflict with other refuge uses or make negative impacts on wildlife.

How would the use be conducted?

Visitors observe and photograph wildlife from vehicles along roads and on foot throughout the Refuge. There is an observation platform and scope along the entrance road that provides wildlife observation opportunities. The refuge will place 2- 4 photography/observation blinds at high quality wildlife viewing locations that will be available by a reservation system. The blinds will be locked and when reservations are made a key will be issued. Wildlife observation can also be conducted by refuge tours either staff lead or self led by various groups approved by the refuge manager at opportune times for wildlife viewing.

Why is this use being proposed?

Wildlife observation and photography are priority general public uses of the Refuge System. Wildlife observation and photography programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System. There are also opportunities to observe and photograph wildlife near the Refuge on the 7,100-acre Fountain Grove Conservation Area administered by the Missouri Department of Conservation and at the 3,500-acre Pershing State Park administered by the Missouri Department of Natural Resources.

Availability of Resources:

Facilities and staff are currently available to provide access, maintain roads, parking lots, secondary access roads, and signage. Maintaining the public use facilities is part of routine management duties

and staff and funding is available. Kiosks and interpretive trail signs may be added to improve visitor information, but are not necessary to support the use.

Anticipated Impacts of the Use:

How does wildlife observation and photography affect Refuge purposes and the NWRS mission?

Wildlife observation and photography do not adversely affect Refuge purposes and they help fulfill the mission of the NWRS.

How does wildlife observation and photography affect Fish, wildlife, plants, and their habitats; and the biological integrity, diversity, and environmental health of the refuge/NWRS?

Wildlife and Wildlife Habitat

In *Managing Visitor Use and Disturbance of Waterbirds: A Literature Review of Impacts and Mitigations* DeLong (2002) includes a summary of effects on wildlife from disturbance from various forms of recreation. The author documents that disturbance can alter behavior (e.g. foraging time), population structure, and distribution patterns of wildlife. It is probable that wildlife observation and photography would cause some or all of these effects to some degree on Refuge wildlife. Much of the Refuge is not affected because wildlife observation and photography tend to be concentrated along roads and trails and at observation facilities. Damage to habitat by walking is minimal and temporary. Large groups typically use established foot trails or roads with little to no impact on vegetation. There is some temporary disturbance to wildlife due to boating and human activities on trails however, the disturbance is generally localized and would not adversely impact overall populations. Wildlife observation and photography is expected to increase over time. In the future measures may be necessary to ensure wildlife disturbance from these wildlife observations and photography as well as other uses is kept to acceptable levels.

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

Biological Integrity, Diversity, and Environmental Health

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

Other Uses and Public Safety

Wildlife observation and photography is not expected to adversely affect other Refuge uses or public safety. As public use levels on Swan Lake NWR expand across time, unanticipated conflicts between user groups may occur. The Refuge's Visitor Services programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities which includes promoting public safety. Experience on many National Wildlife Refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of wildlife observation and photography on other wildlife-dependent recreation or public safety at Swan Lake NWR is expected to be minor.

Public Review and Comment:

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

Determination:

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

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

3. Personal portable photo or viewing blinds must be removed by sunset each day.
4. Trail layout and design will continue to ensure adequate adjacent cover for wildlife and avoid sensitive wildlife areas or habitat.
5. Interpretive signs will include messages on minimizing disturbance to wildlife.
6. Certain modes of access such as motorized vehicles will be limited to designated roads and parking lots.

Justification:

This use has been determined compatible because the level of use for wildlife observation and photography is moderate and generally consolidated to the developed public-use areas (trails, roads, parking lots). The associated disturbance to wildlife is temporary and minor. Wildlife observation and photography are priority public uses and provide visitors with opportunities to enjoy and learn about our lands and wildlife. These uses also help fulfill the mission of the National Wildlife Refuge System. Wildlife viewing and photography would not materially interfere with or detract from Refuge purposes

Refuge Manager: _____

(Signature and Date)

Regional Chief Concurrence: _____

(Signature and Date)

Mandatory 10- or 15-year Re-Evaluation Date: 2025

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

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

Appendix J: Appropriate Use Determinations

Appropriate Refuge Uses

The Service's Appropriate Use policy describes the initial decision process a 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.

This policy clarifies and expands on the compatibility policy (603 FW 2.10D(1)), which describes when refuge managers should deny a proposed use without determining compatibility. If we find a proposed use is not appropriate, we will not allow the use and will not prepare a compatibility determination. By screening out proposed uses not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews. By following the process for finding the appropriateness of a use, we strengthen and fulfill the Refuge System mission. 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.

Background for this policy as it applies to Muscatatuck NWR is found in the following statutory authorities:

National Wildlife Refuge System Administration Act of 1966, as amended by the *National Wildlife Refuge System Improvement Act of 1997* (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 compatible. The Improvement Act provides the Refuge System mission and includes specific directives and a clear hierarchy of public uses on 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."

This policy does NOT apply to:

Situations Where Reserved Rights or Legal Mandates Provide We Must Allow Certain Uses.

Refuge Management Activities. Refuge management activities conducted by the Refuge System or a Refuge System-authorized agent are designed to conserve fish, wildlife, and plants and their habitats. These activities are used to fulfill a refuge purpose(s) or the Refuge System mission, and are based on sound professional judgment.

Uses that have been administratively determined to be appropriate are:

Six wildlife-dependent recreational uses. As defined by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.

Take of fish and wildlife under State regulations. States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. We consider take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

Refuge uses must meet at least one of the following 4 conditions to be deemed appropriate:

It is a wildlife-dependent recreational use of a refuge as identified in the Improvement Act.

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.

The use involves the take of fish and wildlife under State regulations.

The refuge manager 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. Also included under this condition 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. We make appropriateness findings for specialized uses on a case-by-case basis.

Finding of Appropriateness of a Refuge Use

Refuge Name: Swan Lake National Wildlife Refuge

Use: Trapping of Nuisance Wildlife

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
Is the use consistent with applicable Executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
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	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.

Yes X

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: _____

Date:

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Swan Lake National Wildlife Refuge

Use: Tree Harvest by Third Parties

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
Is the use consistent with applicable Executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
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	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.

Yes X

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: _____

Date:

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Swan Lake National Wildlife Refuge

Use: Gathering of Antlers, Nuts, Berries or Mushrooms

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
Is the use consistent with applicable Executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
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	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.

Yes X

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: _____

Date:

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Swan Lake National Wildlife Refuge

Use: Farming

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
Is the use consistent with applicable Executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
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	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.

Yes X

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: _____

Date:

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Swan Lake National Wildlife Refuge

Use: Haying

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
Is the use consistent with applicable Executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
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	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.

Yes X

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: _____

Date:

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Swan Lake National Wildlife Refuge

Use: Research Projects by Third Parties

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
Is the use consistent with applicable Executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
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	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.

Yes X

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: _____

Date:

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Appendix K: List of Preparers and Contributors

Refuge Staff

- Steve Whitson, Refuge Manager
- John Guthrie, Refuge Manager (retired)
- Levi Miller, Maintenance Worker (retired)

Squaw Creek NWR Staff Contributors:

- Frank Durbian, Wildlife Biologist
- Charles Marshall, Park Ranger

Branch of Conservation Planning Staff:

- Dean Granholm, Refuge Planner, Region 3
USFWS
- Jane Hodgins, Technical Writer/Editor, Region 3
USFWS
- Gabe DeAlessio, GIS Specialist, Region 3
USFWS

Regional Office Staff

- Patricia Heglund, Regional Biologist, Region 3
USFWS
- Matt Sprenger, Refuge Supervisor, Region 3
USFWS
- Jon Kauffield, Refuge Supervisor (retired),
Region 3 USFWS
- John Dobrovolny, Regional Historic
Preservation Officer (retired), Region 3
USFWS

Mangi Environmental Group (Contractor):

- Randy Williams, Senior Environmental
Manager
- Meghan Morse, Environmental Specialist

