Mingo, Pilot Knob and Ozark Cavefish

National Wildlife Refuges

Comprehensive Conservation Plan Approval

Submitted by:

Kathleen Burchett — 3/28/2007

Kathleen Burchett
Refuge Manager

Date

Concur:

Jon Kauffeld — 4/12/07

Jon Kauffeld
Refuge Supervisor, Area 2

Date

Nita M. Fuller — 4.12.2007

Nita M. Fuller
Regional Chief, National Wildlife Refuge System

Date

Approve:

Robyn Thorson — APR 17 2007

Robyn Thorson
Regional Director

Date

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Chapter 1: Introduction and Background

The State of Missouri is bordered and bisected by two of the nation's great rivers – the Missouri and the Mississippi. Missourians are stewards of and visitors to three national wildlife refuges in the southern half of the state that showcase and conserve their native wildlife heritage. The largest of the three – Mingo National Wildlife Refuge – preserves once common, now scarce bottomland hardwood forest and swamp along an ancient, abandoned channel of the Mississippi River, as well as the indigenous wild creatures that walk, hop, crawl, swim, swarm, slide, slither, and fly through these shade-filled sloughs and sluggish waters. The other two refuges – Pilot Knob NWR and Ozark Cavefish NWR – provide much-needed sanctuary to a pair of rare species clinging to existence: the Indiana bat and the Ozark cavefish.

Introduction

Mingo National Wildlife Refuge

Established in 1944 under authority of the Migratory Bird Treaty Act, the 21,592-acre Mingo NWR is located in Stoddard and Wayne counties in southeast Missouri, approximately 150 miles south of St. Louis. The Refuge serves as a resting and wintering area for migratory waterfowl, and peak waterfowl populations of 125,000 Mallards and 75,000 Canada Geese have been recorded. A shallow basin, the Refuge lies in an abandoned channel of the Mississippi River bordered on the west by the Ozark Plateau and on the east by Crowley's Ridge. The Refuge contains approximately 15,000 acres of bottomland hardwood forest, 5,000 acres of marsh and water, 1,275 acres of cropland and moist soil units, and 700 acres of grassy openings.

Recreational activities on the Refuge include fishing, hunting of waterfowl, squirrel, turkey, and deer,

Historic entrance sign, Mingo NWR. USFWS

canoeing, and wildlife observation. Annual visitation to the Refuge has averaged about 100,000 visits over the past 5 years. Public facilities include a Visitor Center, a bookstore, a 1-mile self-guided Boardwalk Nature Trail, a 19-mile self-guided Auto Tour Route, six overlooks, picnic tables, and a picnic shelter. A 7,730-acre portion of the Refuge is designated by Congress as Wilderness protected under the 1964 Wilderness Act.

Pilot Knob National Wildlife Refuge

Pilot Knob NWR was established in 1987. The 90-acre Refuge, a donation of the Pilot Knob Ore Company, is located on top of Pilot Knob Mountain in Iron County, Missouri. The Refuge contains abandoned iron mine shafts excavated in the mid-1800s

Figure 1: Location of Mingo, Pilot Knob and Ozark Cavefish National Wildlife Refuges

that have since become critical habitat for the federally-listed endangered Indiana bat. Bats enter the shafts in the fall to hibernate and exit in the spring. The numbers have varied, but at one point up to a third of the known world population of Indiana bats were believed to hibernate in the old mine. In the interest of public safety and to avoid disturbance to the bats, the Refuge is closed to public use. The Refuge is managed by Mingo NWR staff located approximately 75 miles away.

Ozark Cavefish National Wildlife Refuge

Ozark Cavefish NWR was established in 1991 to protect the federally-listed endangered Ozark cavefish. The 40-acre Refuge is located in Lawrence and Newton counties, Missouri, 20 miles west of Springfield. Turnback Creek Cave Spring is located on the Refuge. The spring is the outlet of an underground stream that contains a population of the Ozark cavefish. Human access to the underground stream is through Turnback Cave, which has openings on adjacent Missouri Department of Conservation land. The Refuge includes a separate 1.3-acre parcel located several miles away along Hearrell Spring in Neosho, Missouri. It adjoins the Service's Neosho National Fish Hatchery. The Refuge is closed to public use. Ozark Cavefish NWR is also managed by Mingo National Wildlife Refuge staff.

Mingo National Wildlife Refuge

The U.S. Fish and Wildlife Service

The Refuges are administered by the U.S. Fish and Wildlife Service (Service), the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife populations and their habitats. The Service oversees the enforcement of federal wildlife laws, management and protection of migratory bird populations, restoration of nationally significant fisheries, administration of the Endangered Species Act, and the restoration of wildlife habitat such as wetlands. The Service also manages the National Wildlife 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 over 545 refuges covering more than 95 million acres of public lands and waters. Most of these lands (82 percent) 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, and insects. As a result of international treaties for migratory bird conservation as well as other legislation, such as the Migratory Bird Conservation Act of 1929, many refuges have been established to protect migratory waterfowl and their migratory flyways from their northern nesting grounds to southern wintering areas. Refuges also play a vital role in preserving endangered and threatened species. Among the most notable is Aransas National Wildlife Refuge in Texas, which provides winter habitat for the whooping crane. Likewise, the Florida Panther Refuge protects one of the nation's most endangered predators, and the Mississippi Sandhill Crane Refuge an endangered, non-migratory species of the sandhill crane.

Refuges also provide unique opportunities for people. When it is compatible with wildlife and habitat conservation, they are places where people can enjoy wildlife-dependent recreation such as hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Many refuges have visitor centers, wildlife trails, automobile tours, and environmental education programs. Nationwide, approximately 30 million people visited national wildlife refuges in 1997.

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 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 mission of the System is to:

> Administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Refuge System's goals 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 a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- 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.

Refuge Purposes

Mingo National Wildlife Refuge

Beginning in 1944, land was acquired for Mingo NWR with the approval of the Migratory Bird Conservation Commission. The purpose of the Refuge derives from the Migratory Bird Conservation Act, "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d). In acquiring the first tract for the Refuge, the land was identified as "urgently needed for the protection and conservation of migratory waterfowl and other wildlife." In a 1954 presentation to the Migratory Bird Conservation Commission, the Refuge was described as an "important unit in the Mississippi Flyway" and "an important wintering ground for many species of waterfowl."

One tract of the Refuge was acquired with Bureau of Outdoor Recreation funds. The purpose associated with this funding derives from the Refuge Recreation Act and includes lands "...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 460k-1 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).

An additional purpose was acquired when Congress designated the 7,730 acre Mingo Wilderness in 1976. The establishing legislation for the Wilderness (Public Law 94-557) states that "wilderness areas designated by this Act shall be administered in accordance with the applicable provisions of the Wilderness Act…." The purposes of the Wilderness Act are additional purposes of that part of the Refuge that is within the Mingo Wilderness. The purposes of the Wilderness Act are to secure an enduring resource of wilderness, to protect and preserve the wilderness character of areas within the National Wilderness Preservation System (NWPS), and to administer the NWPS for the use and enjoyment of the American people in a way that will leave these areas unimpaired for future use and enjoyment as wilderness.

Pilot Knob National Wildlife Refuge Purpose

Pilot Knob NWR protects critical habitat for the Indiana bat. The area was acquired by donation as authorized by The Endangered Species Act of 1973 (16 U.S.C. 1534(a)(2)). The Endangered Species Act establishes the purpose of the Refuge: "to conserve (A) fish or wildlife which are listed as endangered species or threatened species...." Although not part of the Refuge purpose, additional reasons cited for establishing PilotKnob NWR were to:

Secure the land where mine entrances were located to prevent unauthorized use of the area and eliminate human disturbance of hibernating bats.

Prevent the loss of bat habitat.

Help maintain and increase the existing bat population with the goal of eventually delisting the Indiana bat.

Ozark Cavefish National Wildlife Refuge Purpose

Ozark Cavefish NWR protects essential habitat for the Ozark cavefish, gray bat, and other unique species associated with Turnback Creek Cave. The area was acquired by purchase under authority of the Endangered Species Act of 1973. The Endangered Species Act establishes the purpose of the Refuge "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ...." The particular purpose noted in the Environmental Assessment pertaining to the acquisition of Turnback Creek Cave Springs was: "to insure the biological integrity of this cave ecosystem that provides essential habitat for the threatened Ozark Cavefish, the endangered Gray Bat, and other cave-adapted amphipods, isopods, cave snails, pseudoscorpions, millipedes, and other cave organisms."

Refuge Visions

Mingo National Wildlife Refuge

Preamble

Mingo National Wildlife Refuge protects a remnant of the bottomland hardwood and cypress-tupelo swamp ecosystem that once formed a 2.5 million-acre contiguous natural landscape throughout the Mississippi River basin. The 21,592-acre Refuge represents the largest area in southeast Missouri of remaining habitat for numerous native and threatened plant and animal species. The Refuge touches the southeast boundary of the Ozark Plateau and slopes abruptly from an upland oak-hickory forest to bottomland hardwood forest, lower marsh, and expansive swamp and ditch system. Since the beginning of the 20th century, these lands have been drained and deforested for agricultural purposes, which has highly modified the natural landscapes and ecosystem functions. Guided by legal mandates, the Refuge has successfully pioneered techniques that maintain a delicate balance of preservation and active management strategies for reforestation and hydrological integrity of the natural systems for the benefit of migratory birds, other wildlife, and wildlife-dependent public use. The Refuge is located in a community that appreciates both the natural diversity and the rich biological integrity of the Refuge and the surrounding public and private lands that add to the core network of the natural landscape.

Vision Statement

Applying proven and innovative management practices, Refuge personnel will continue to ensure the protection of the Refuge ecosystems, including the preservation of the 7,730-acre Wilderness Area, designated in 1976. Active management of non-Wilderness lands will utilize proactive strategies to maintain a high quality, sustainable, and highly diverse ecosystem. Proactive adaptive strategies will include traditional and accepted practices to protect the Refuge and surrounding lands from additional threats to the system, such as air quality and hydrological threats. The Refuge staff will continue to develop regeneration techniques and manage water levels to ensure the health and vitality of Refuge habitats.

Adaptive strategies will also assure continued consideration of the values and preservation of cultural resources where appropriate and consistent with natural resources management. Priority public-use opportunities will be provided and enhanced for the more than 90,000 annual visitors, in harmony with healthy habitats and sustainable wildlife populations.

This vision will be accomplished by continuing and expanding efforts to partner with state and federal agencies and the surrounding community, including neighboring landowners, stakeholders, supporters, and friends.

Stanley Creek, Mingo NWR. USFWS

Pilot Knob National Wildlife Refuge

Vision Statement

In cooperation with others, Pilot Knob NWR will protect and maintain critical habitat that contributes to the recovery of the federally-listed endangered Indiana bat and gray bat. Visitors will enjoy scenic beauty and learn about the Refuge and the surrounding area in ways that are safe and that do no harm to the habitat or the bats that depend on it.

Ozark Cavefish National Wildlife Refuge

Vision Statement

In cooperation with others, Ozark Cavefish NWR will contribute to the recovery of the federally-listed threatened Ozark cavefish and other subterranean species through habitat conservation, landowner education, and watershed protection within the Springfield Plateau.

Purpose and Need for Plan

This Comprehensive Conservation Plan (CCP) articulates the management direction for the Refuges for the next 15 years. Through the development of goals, objectives, and strategies, this CCP describes how the refuges also contribute to the overall mission of the National Wildlife Refuge System. 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 – hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation – are priority public uses of refuges. We will facilitate these activities when they do not interfere with our ability to fulfill the refuges' purpose or the mission of the Refuge System.

Other uses of the refuge will only be allowed when determined appropriate and compatible with refuge purposes and mission of the Refuge System.

The plan will guide the management of the refuges by:

Providing a clear statement of direction for the future management of the refuges.

Providing refuge neighbors, users, and the general public with an understanding of the Service's management actions on and around the refuge.

Ensuring the refuges' management actions and programs are consistent with the mandates of the National Wildlife Refuge System.

Ensuring that refuge management considers federal, state, and county plans.

Establishing long-term continuity in refuge management.

Providing a basis for the development of budget requests on the refuges' operational, maintenance, and capital improvement needs.

Existing Partnerships

Working with others via intra- and interagency partnerships is important in accomplishing the mission of the Service as well as assisting Mingo, Pilot Knob and Ozark Cavefish national wildlife refuges in achieving their purposes. Partnerships with other federal and state agencies and with a diversity of 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.

Within the Ozark Plateau Ecosystem that encompasses all three refuges, the Service partners with a number of other agencies and institutions, both governmental and non-governmental. These include:

State agencies, including the Missouri Department of Conservation and the Missouri Department of Natural Resources;

Federal agencies, including the U.S. Forest Service, U.S. Environmental Protection Agency, National Park Service, U.S. Geological Survey Biological Resources Division, and U.S. Department of Agriculture;

Local governments;

Universities;

Local landowners;

Non-governmental conservation organizations, such as The Nature Conservancy, the Trust for Public Land, and Bat Conservation International; Caving Clubs and Spelunkers.

Besides the partnerships that the Fish and Wildlife Service holds on the national and regional (eco-

system) level, Mingo NWR maintains informal partnerships with the following agencies:

- Missouri Department of Conservation
- Missouri Department of Natural Resources
- Missouri Department of Transportation
- Missouri Highway Patrol
- USDA Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service or SCS)
- Ducks Unlimited
- U.S. Navy Seabees
- U.S. Army Corps of Engineers
- Farm Services Agency
- U.S. Forest Service
- Gaylord Laboratory, University of Missouri

Volunteers and Friends Group

The Refuge also relies on the selfless dedication of volunteers to extend the efforts of staff. Volunteers play a vital role in the management and maintenance of the fish and wildlife resources on Mingo NWR. In an era of flat or declining budgets, it is more important now than ever that volunteers step forward to help protect and preserve our natural resource heritage for present and future generations to enjoy.

Mingo NWR is especially fortunate in enjoying the support of a particularly committed group of volunteers, the Friends of Mingo Swamp. The Friends have raised tens of thousands of dollars to fund projects like butterfly gardens, benches, food plots and interpretive signs (McCarty, 2004).

Museums and Repositories

The Refuge museum collections include primarily archeological materials. The Refuge has no collections of artwork, Service history paraphernalia (e.g., signs, equipment), botany, zoology, geology, paleontology. The archeological collection consists of more than 47,000 items, 22 of which are on display at the Refuge Visitor Center. Collections are stored under terms of a curatorial cooperative agreement with the University of Missouri at Columbia.

History and Establishment

About 25,000 years ago, the Mississippi River ran between the Ozark Mountains and Crowley's Ridge.

Friends member Leroy Romine maintaining ADA hunting blinds on Mingo NWR. USFWS

Approximately 18,000 years ago, the river shifted, slicing its way through Crowley's Ridge to join the Ohio River farther north. The abandoned river bed developed into a rich and fertile swamp (USFWS, no date-b).

Native Americans were attracted to the swamp because of the abundant wildlife. Most likely, Native American occupation was seasonal and related to hunting opportunities in the swamp. Water-loving animals, such as beaver, river otter, raccoons, and rabbit thrived. White-tailed deer, Wild Turkey, Ruffed Grouse and timber wolves were common on the edges of the swamp and nearby bluffs.

In 1804, the Louisiana Purchase acquired this territory for the United States. At that time, the population of Missouri's entire Bootheel was very low and the swamp area that is now the Refuge was considered inaccessible. When Missouri became a state in 1821, all of the counties in southeast Missouri had settlers, except Stoddard and Dunklin counties, although Cape Girardeau was one of the most important river towns in Missouri.

Settlers first approached the swamp because of its extensive old-growth cypress and tupelo forests.

The giant cypress trees were the first to be felled and converted into railroad ties and building lumber. The T.J. Moss Tie Company was a large Bootheel lumbering operation headquartered in Puxico. By 1888, T.J. Moss was the largest tie contractor in the state, and many of their ties were cut from trees taken from Mingo Swamp. A large sawmill was operated just north of Puxico on land now within Mingo NWR. Production of the Bootheel lumber industry peaked between 1900 and 1910. During its peak, the Bootheel was consistently the leading lumber-producing area of Missouri. However, by 1935 most of the large operations had ceased. The giant trees had been removed and it was necessary to find suitable lumber in other places.

Yet the powerful and wealthy lumber companies had not lost interest in the Bootheel. If the swampy land could be drained it could once more become an important source of revenue. The size of the projects remained small because of the expanse involved. The lumber companies had considerable capital to invest, but demanded large grants of land for the drainage and were frequently more interested in the land than in efficiency of their drainage ditches. The State Legislature passed an act that allowed the formation of drainage districts, financed by long-term bonds. For the first time, drainage projects could be adequately financed and many drainage districts were created in the Bootheel.

In 1914, more than 20 drainage districts existed in Stoddard County. One of them was the Mingo Drainage District, a small district in the Advance Lowlands near Puxico. More than $1 million was spent to make Mingo Swamp suitable for farming. A system of seven major north-south ditches was constructed to drain water from the swamp into the St. Francis River, about 10 miles south of Puxico. Except for the narrow southern extension of the district south of Puxico, the District's boundary and the Mingo NWR boundary are essentially the same. The ditches constructed by the District are used today by the Refuge for water control and management.

Sweet's Cabin, Mingo NWR. USFWS

During the Great Depression, land values plummeted and many of the large landholders (lumber companies) defaulted on payment of taxes rather than continue to maintain unprofitable investments in the land. Throughout the Bootheel, many drainage districts were unable to meet financial obligations and defaulted on bond payments, largely because they couldn't absorb the loss of revenue created by the large landholders. Mingo District was one of these.

Drainage attempts at Mingo had not been completely successful, at least in part because of the overflow from the St. Francis River. Also, the soil was not as productive as in other areas of the Bootheel. During the 1930s, Mingo District became insolvent.

The remaining timber was cut by anyone without regard to ownership. The area had become open range country, with cattle and hogs roaming freely across the entire swamp. To maintain this grassy condition, the land was burned frequently, as much as several times a year. Hogs and cattle became so numerous that they overflowed into the small towns near the swamp. Indiscriminate shooting of waterfowl was common. Other wildlife species were also not faring well. Beaver and deer had disappeared and Wild Turkey had nearly been extirpated from the swamp.

In 1944, the U.S. Fish and Wildlife Service purchased 21,592 acres of the Mingo Swamp and established the Mingo National Wildlife Refuge. The condition of the land and its living resources was deplorable. Over the previous half-century, humans had reduced a beautiful swamp, lush with the growth of plants and alive with animals, into a burned and eroded wasteland. Through careful management, most of the natural plants and animals were restored. Native trees have replaced much of the brush and briers, and a canoe trip down the Mingo River will now reveal little to the casual observer of the abuses to which this land was subjected in years past. Deer, Wild Turkey, bobcat and beaver are once again plentiful. The Refuge is now able to pursue its primary purpose: providing food and shelter for migratory birds.

Legal Context

In addition to the Refuge's establishing legislation and the National Wildlife Refuge System Improvement Act of 1997, several Federal laws, executive orders, and regulations govern administration of the Refuge. Appendix F contains a partial list of the legal mandates that guided the preparation of this plan and those that pertain to Refuge management activities.

Chapter 2: The Planning Process

Preparation of the CCP

The comprehensive conservation plan (CCP) and environmental assessment (EA) for Mingo, Pilot Knob and Ozark Cavefish national wildlife refuges will guide management decisions on wildlife, habitat and visitor services management for the next 15 years. This document is intended to give everyone interested in the refuges' future an opportunity to both to see how the Service plans to manage the refuges and to offer comments on the proposed management direction.

Work on the Draft CCP for the three refuges began in September 2003 with a kickoff meeting for planners, biologists and Refuge staff who toured Mingo NWR. The group reviewed its purpose, history, ecology and management, and discussed the issues and challenges the Refuge faces and how we might solve them.

An internal scoping meeting was conducted at Region 3 headquarters in Minnesota in April 2004 to learn what issues and opportunities Service leaders perceived at the three refuges. Representatives of various programs within the U.S. Fish & Wildlife Service met to discuss what they thought should be addressed in the planning process.

Public Involvement

Public involvement is the cornerstone of comprehensive conservation planning. The planning process begins with asking neighbors, state and federal agencies, and non government organizations to identify management issues and opportunities that should be addressed in planning. These comments are addressed in the CCP, and stakeholders are invited to review the plan and offer comments that are then addressed in the final plan.

Wood Duck Brood on Mingo NWR. USFWS

Planning for Mingo, Pilot Knob and Ozark Cavefish national wildlife refuges began with a series of public open houses in the areas surrounding the refuges. Citizens, non-governmental conservation organizations (NGOs), and employees of tribal, state, and local agencies have all contributed time and expertise in addressing a variety of issues. This participation is vital and the ideas offered have been valuable in determining the future direction of the three refuges. Refuge and regional staff – indeed, the entire U.S. Fish and Wildlife Service – are grateful to all of those who have contributed time, expertise and ideas throughout the comprehensive conservation planning process. We appreciated the enthusiasm and commitment expressed by many for the lands and living resources administered by Mingo NWR.

Mingo National Wildlife Refuge

Two public scoping meetings were held to provide an opportunity for neighbors, local communities, and representatives of state and federal agencies to discuss issues and opportunities with Refuge and planning staff. The first open house was conducted on January 8, 2004, from 4 p.m. to 8 p.m. at the Puxico High School gymnasium. Refuge staff made a

presentation on the planning process and NEPA at 7 p.m. More than 50 people attended the meeting.

A second open house was held on January 9, 2004, at the Three Rivers Community College in Poplar Bluff from 4 p.m. to 8 p.m. No one attended.

The Refuge hosted a meeting of surrounding State and Federal organizations on January 9, 2004. Representatives from USDA Rural Development, Missouri Department of Conservation, the U.S. Army Corps of Engineers, Mingo Job Corps, and the University Forest attended. Participants provided an overview of opportunities available on the various ownerships and discussed opportunities for cooperation.

In addition, a 1-day focus group meeting was held at the Refuge Visitor Center on January 10, 2004. Refuge staff invited representatives of state agencies, conservation groups as well as individuals interested in the future of Mingo NWR. A morning session focused on public use issues, and the afternoon session on habitat management issues. Approximately 25-30 people in total attended with some overlap between the two sessions.

We heard a variety of issues. Some people urged the Refuge to improve habitat for waterfowl and swamp rabbit by reducing forest cover. Some people urged the Refuge to concentrate on controlling deer numbers. Many views were expressed on hunting-related issues. Some people said that opportunities for bow hunting should be expanded, and others said that bow hunting should be rotated from the east side of the Refuge to the west side. Some people said that modern firearms should not be permitted on the Refuge, and others said that more open areas should be provided for bow hunting. Some people said that hunting opportunities should be provided for non-traditional user groups, such as women and disabled people. Related to this issue, some people said that the Refuge should plant more crops and open up more farming on the Refuge. In discussing this comment with people, we heard that interest in farming generally relates to interest in improving hunting opportunities.

Bottomland hardwood forest on Pool 5 at Mingo NWR, USFWS

Some people asked that the Refuge consider creating multi-use trails that would accommodate horse-back riding, and other people said that horseback riders would be willing to help with developing and maintaining multi-use trails.

Some people said that fishing should be restored on the Refuge, and others specified that Red Mill Pond should be enhanced/restored for fishing purposes.

Other participants suggested that the Refuge repair and update signs and fences and clean out ditches. Some said that grass should be managed so it does not interfere with wildlife viewing.

Some people said that Rockhouse Marsh should be cleaned and rehabilitated.

Pilot Knob National Wildlife Refuge

An open house for Pilot Knob NWR was conducted on January 13, 2004, from 1 p.m. to 4 p.m. at the Fort Davidson Café in Pilot Knob, Missouri, and was attended by 17 people. A suggestion for additional public involvement opportunities made at this first event prompted a second open house held on February 26, 2004, at the Fort Davidson Historic Site Visitor Center from 6 p.m. to 8 p.m. It was attended by 10 people.

Opening the Refuge was the theme of several comments. Some encouraged the Service to make the Refuge more accessible with roads and trails, and possibly enter into an agreement with other agencies. Others said that the Refuge should be opened to hunting and other public uses. Others said that the Refuge should balance protection of the

federally-listed endangered Indiana bat and allow for some level of accessibility for the public.

Some people suggested specific approaches to public use. One idea voiced in the meeting was to place an observation platform to take advantage of a 360-degree vista that is unique in the area. The Refuge was encouraged to explore alternative fencing techniques for keeping people away from the mine entrance to protect the bats and for public safety, but that still allows access to the rest of the Refuge. Others said that the Refuge presents an opportunity to educate people about the area's geology. Some people said that the Refuge should consider seasonal closure of the Refuge to accommodate public use of the sites while others said that any public use plan would have to consider the bats and public safety.

The Service was encouraged to consider a cooperative agreement with the Missouri Department of Conservation to better police the Refuge and reduce illegal use. Others suggested that the Service consider an interagency agreement with the Department for management of Pilot Knob NWR. Another suggestion offered was for the Service to develop a local body to assist in the management of the Refuge. Others said that the Refuge should be added to the State's natural area system.

Ozark Cavefish National Wildlife Refuge

An open house meeting for Ozark Cavefish NWR was held on January 12, 2004, from 1 p.m to 4 p.m. at the Southwest Center of the University of Missouri Agricultural Experiment Station near Mount Vernon, Missouri. The meeting was attended by 15 people, most representing state or federal agencies.

We heard many comments urging the Service to work more closely with the Missouri Department of Conservation on Ozark cavefish conservation, specifically to consider leasing property to the Missouri DOC through a Memorandum of Agreement, explore cooperative management options with the Department, work with the Department's private lands program, and review the DOC's Ozark cavefish action plan. Some people said that state-listed crayfish and amphipod may also occur on the Refuge.

Some people said that the Refuge should consider adding Sercoxie Cave as part of the Refuge. The Refuge was encouraged to conserve recharge areas as part of the effort to protect the Ozark cavefish. Others suggested that the Service expand the Refuge to include other Ozark cavefish sits and to provide protection of the adjoining watersheds. Some people also encouraged the Service to add staff who would be available to focus on Ozark Cavefish NWR and the surrounding area and others said the Service should consider establishing a field station in the area.

Some participants said that hazardous material spills along Highway 44 are a threat to the Refuge and the Refuge should look for ways to mitigate spills along highways within recharge areas

Some people said that the Refuge should be open to public use while others said that it should remain closed. Some people said that vehicular and foot traffic should be kept away from the spring and its spring branch. A lack of law enforcement presence makes it challenging to enforce Refuge closure, others said. Some people said that the Refuge should use environmental education to improve public awareness of the hazards to Ozark cavefish. The Refuge was encouraged to consider placing interpretive signing regarding the Refuge.

Summary of Issues, Concerns and Opportunities

Based on what we heard from the public as well as from representatives of various Service programs, we have developed a list of issues for each of the three refuges. The management alternatives explored in the draft EA addressed these issues.

Mingo National Wildlife Refuge

Issue Statement: Waterfowl, deer, and turkey are not visibly concentrated on the Refuge.

Background

A number of people commented that they do not see as much wildlife, especially waterfowl, deer, and turkey, as in past years. They attribute the decline to a lack of cropland, and support planting more crops to attract and feed wildlife. Wildlife viewing and hunting are popular activities at Mingo NWR, and wildlife drawn into the open by crops is more visible than wildlife within the surrounding forest. But cropland is not native habitat, it requires intensive management, and it provides little value to wildlife for much of the year. Presently, there are 411 acres of cropland maintained through cooperative agreements with local farmers, and an additional 95 acres of food plots maintained by Refuge

staff and volunteers. Service policy supports converting cropland to native habitats that are more valuable to wildlife.

> Issue Statement: Vegetation changes in former grazing and haying areas and Rockhouse Marsh are reducing viewing opportunities and food availability for wildlife.

Background

Open habitats such as fields and marshes provide unobstructed opportunities for wildlife viewing. Many of the 474 acres of open fields popular with wildlife watchers are former grazing and haying areas. Grazing was phased out on the Refuge beginning in 2000 and eliminated entirely in 2002. Most haying was eliminated by 2004. Fescue planted in these areas as forage for livestock is now overtaking many of these sites, reaching heights of 2 to 5 feet, reducing their value to wildlife and obscuring visitors' views. Similarly, visitors are accustomed to Rockhouse Marsh being an open area where wildlife is easily seen. Since 2000, maintenance efforts have focused largely on removing sediment from the drainage ditches, meaning much less time spent mowing or removing brush within the marsh. Woody vegetation, especially willow, is now more abundant, reducing visibility for wildlife viewing. Also, some believe that the disappearance of these open areas, and the easily seen wildlife along with it, means there is insufficient food and less wildlife. A number of people supported eliminating the fescue and woody vegetation to keep the fields and marsh open. Service policy supports restoring these areas to native habitat, which in most cases would be bottomland forest, canebrakes, or grassy openings like those seen along Crowley's Ridge.

> Issue Statement: Otter and beaver numbers and distribution affect management activities and wildlife-dependent public uses.

Background

Although a small number of river otters survived in the southeastern portion of the state, including within the Refuge, habitat degradation and unregulated harvest eliminated them from much of Missouri by the 1930s. In the 1980s, the Missouri Department of Conservation began reintroducing otters into streams where they had been absent for more than 40 years. Fish numbers declined on the Refuge at about the same time, and although otters were present long before the decline, some believe they contributed to the decrease. Across Missouri otter numbers climbed and in some places reached nuisance levels, especially for those raising fish. By 1996, the population was sufficient to support a trapping season. Fish numbers and angling success are improving on the Refuge, probably because of ditch cleaning, but some support otter trapping as an additional means of increasing fish numbers. Presently otter trapping is not allowed on the Refuge.

Beaver are common across the Refuge and a number of comments supported trapping to reduce their numbers. Beaver routinely burrow dens, weakening areas along the roads and levees that cut across the Refuge. Beaver dams cause flooding that sometimes hampers access and kills bottomland hardwoods. Presently, beaver trapping is not allowed on the Refuge. If necessary, nuisance animals and dams are removed by Refuge staff.

> Issue Statement: There is demand for expansion of existing public uses on the Refuge. Some of the uses are not wildlife-dependent.

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, Mingo NWR provides opportunities for canoeing, kayaking, horseback riding, biking, hiking, jogging, berry and mushroom gathering, and picnicking. Careful zoning of these uses in both duration and extent helps avoid conflicts between user groups. At present, nearly all of the Refuge is open to some type of use throughout the year. A number of comments supported increasing the duration, available area, or number of facilities for one or more of the existing uses. These uses and any others must not interfere with fulfilling the Refuge purposes or the goals of the Refuge system.

> Issue Statement: The amount of early successional habitat is decreasing, making the Refuge less favorable to wildlife and wildlife-dependent uses associated with these habitats.

Background

A number of comments supported increasing the amount of younger forest within the Refuge. Young forest gets its start when older forest is disrupted either naturally or through active management such as timber harvesting. Many wildlife species, especially those popular with wildlife watchers and hunters, favor younger forest. At 80 to 100 years old, the forests that cover much of the Refuge are middle-

aged or beyond. This older forest favors wildlife different than that prized by many hunters and wildlife watchers. Forest aging is normal, so is forest renewal. Tree falls caused by flooding or wind usually create openings that allow more sunlight to reach the forest floor. This encourages seed germination as well as growth of tree seedlings and other plants wildlife feed on. Prolonged flooding within Refuge bottomlands drowns the young forest that normally grows in such openings.

Some people supported increasing other types of early successional habitat. Early successional habitat occurs where plants colonize treeless areas such as abandoned farm fields, beaver meadows, or bare soil created by river action. Soon vines, shrubs, and trees begin growing, creating a thicket of low growing habitat favored by wildlife like quail and swamp rabbits. In some places these thickets remain for years, but without natural disturbance or management action such as mowing, burning, or brushing many eventually revert to forest. The amount of this habitat is decreasing within the Refuge.

> Issue Statement: Prolonged annual flooding is killing mature trees, preventing regeneration of young trees, and threatening the long-term existence of the bottomland hardwood forest.

Background

Bottomland forests are well suited to floods that recede within weeks. Floods lasting longer kill mature trees and seedlings, threatening the future of the forest and its wildlife. Floodwaters once flowed across the entire basin, wending their way over and around the shallow ridges that interrupt the otherwise flat bottomland. More than a century of alterations including roads, dikes, and levees narrowed or blocked drainage pathways, slowing water movement. Ditches totaling more than 50 miles, most dug in the 1920s, adequately channeled floodwaters for years, but did not play the same role as sprawling flow across the basin. Eventually, drainage grew sluggish as the ditches filled with sediment, causing longer floods. Ditch dredging, underway since 1997, clears sediment and improves channel flow, but is time consuming, expensive, and does not restore widespread flow across the basin. Recent changes to several dikes along the ditch system slowed sediment build up, but more than 30 miles of ditches are still clogged.

Mingo National Wildlife Refuge

> Issue Statement: There are threats to the ecological integrity of Refuge ecosystems as well as restoration opportunities.

Background

Service policy supports maintaining and restoring where appropriate, biological integrity, diversity, and environmental health. There are a number of threats to these elements including the introduction and spread of invasive plant and animal species, mercury deposition and accumulation, and rising amounts of atmospheric pollutants. There are also opportunities to restore drainage pathways and reintroduce species that formerly existed within the Refuge.

> Issue Statement: Mingo NWR's designated Wilderness Area requires special management to maintain its integrity.

Background

Congress designated the western portion of the Refuge as the Mingo Wilderness Area in 1976. Wilderness policy allows hiking, backpacking, fishing, wildlife observation, and environmental education and interpretation. It generally prohibits motorized activities. Ditches and levees, specifically excluded from the Wilderness designation, help approximate water level fluctuations that once happened naturally. All Wilderness Areas established before 1977 and greater than 5,000 acres are Class I air quality areas, which implies a legal obligation to preserve or restore their outstanding air quality, including visibility. Diminishing air quality is a growing concern within the Mingo Wilderness Area in part because of proposed coal-burning power plants in the region that could further aggravate problems with haze and deposition of contaminants like mercury, nitrates, and sulfates emitted from their smokestacks.

Issue Statement: The amount of maintenance needs exceeds existing maintenance capacity.

Background

The Refuge maintenance staff is responsible for maintaining more than 60 miles of roads and levees, 52 miles of ditches, 57 water control mechanisms, and various other facilities. Additionally, they regularly assist with habitat management activities such as mowing and brushing. In recent years, with increased emphasis on removing ditch sediment, less time is available to complete other maintenance tasks. This is compounded by the loss of two full-time and two part-time maintenance positions through the years as well as aging infrastructure that requires more frequent attention. A number of people commented that more maintenance workers are needed.

Issue Statement: Automobiles on Bluff Road cause high seasonal reptile and amphibian mortality when snakes, toads, and frogs are migrating.

Background

The Refuge is endowed with an abundance of reptiles and amphibians. At certain times of the year, large numbers of reptiles or amphibians migrate across Refuge roads from bottomlands to peripheral bluffs and back again. At these times, they are particularly vulnerable to being run over and killed by motorists on certain Refuge roads.

Issue Statement: Current management activities do not emphasize habitat for King Rail and Black Rail, two migratory bird species that are rare or decreasing in number.

Background

Providing habitat for migratory birds is the primary purpose of the Refuge. King Rail and Black Rail are migratory birds that are rare or decreasing in number that would benefit from alternative management strategies within Refuge moist soil units. These species are known to migrate through the area and may be able to nest on the Refuge under different habitat conditions.

Issue Statement: Some visitor services programs and facilities do not meet U.S. Fish and Wildlife Service standards or Refuge System goals.

Background

With few improvements since the 1980s, visitor services infrastructure and programming including information kiosks, entrance, directional, and boundary signing, and trails, boardwalks, and observation sites are outdated or in poor condition. A number of sites are potentially hazardous or do not meet federal accessibility standards, notably a portion of the popular Boardwalk Nature Trail. The Visitor Center, built in 1975, requires renovation and repairs throughout the building. Many exhibits are faulty, outdated, or do not effectively communicate the Refuge System mission. Present environmental education and interpretive programming as well as outreach activities do not contain information on the unique resources found on the Refuge.

Issue Statement: Many of the cultural resource sites on the Refuge are not adequately identified or protected.

Background

There are more than 140 known cultural resource sites within the Refuge, but specific locations are lacking for many sites and it is likely there are undiscovered sites. The National Historic Preservation Act as well as other laws and regulations require the Service to avoid disturbing cultural resource sites and to work in coordination with the State Historic Preservation Officer. Specifically, a number of people commented that Sweet's Cabin, a Depression era homestead, should be restored and made more accessible to visitors.

Issue Statement: The Refuge faces funding and staffing challenges to meet existing and predicted future demands.

Background

The number of Full Time Equivalents (FTEs), a measure indicating the amount of available workforce, averaged 10.1/year throughout the 1990s, but dropped to an average of 8.7/year since 2000. Infrastructure and facilities as well as habitat management and visitor services programs, built with a comparatively larger workforce, today challenge a Refuge staff with fewer FTEs. Creative partnerships and volunteer assistance, although helpful, are not a complete or always reliable solution. Consequently, less gets done with a corresponding decline in Refuge programs, infrastructure, and facilities. Visitor numbers and associated demands are expected to increase in coming years.

Issue Statement: The effects of some management activities as well as public use are not well understood.

Background

Sustaining wildlife populations is central to the mission of the National Wildlife Refuge System, but in many cases information is lacking regarding the success of management activities or the effect of public uses on Refuge wildlife. This hampers the ability of managers to adapt habitat management practices or modify public uses in ways that best sustain wildlife numbers.

Pilot Knob National Wildlife Refuge

Public Use

Issue Statement: There is demand for public use of the Refuge. Public use may harm the Indiana bat and expose visitors to hazards.

Background

There is support in the local communities for allowing public use of the Refuge. The summit of Pilot Knob, where the Refuge is located, has a number of unique geological features and provides a 360-degree vista of the surrounding area including a view of a Civil War battlefield. Supporters feel it is possible to allow access in a way that protects the bats and maintains public safety. Fencing of hazardous sites and those important to the Indiana bat, seasonal closure of the Refuge, road and trail access, geological interpretation, and an observation platform near the summit of Pilot Knob are among the considerations for public use of the site. Local elected officials and citizens are willing to work with the Service to develop a mutually agreeable public use plan. Information on hazards and sites important to the bats is lacking. Funding for information gathering, analysis, planning, and construction associated with any facilities or infrastructure must also be addressed.

Issue Statement: Refuge administrators are not visible in the local community. Low visibility contributes to lack of community support and coordination on local issues.

Background

A number of local citizens, including several elected officials, want greater input into the administration and management of the Refuge. It has been administered by the staff at Mingo NWR, 90 miles away, from the time it was established in 1987.

Refuge employee Jack Richmond inspects a water control structure on Mingo NWR. USFWS

A number of comments indicated that the Refuge lacks public visibility or support largely because it is not administered locally. Local people want a local contact or individual they can work with regarding issues associated with the Refuge. Some people suggested that the Service enter into a cooperative agreement with the Missouri Department of Conservation or some other local agency to assist with management and law enforcement of the Refuge. Others suggested developing a local body of citizens to provide input into the management and administration of the Refuge.

Ozark Cavefish National Wildlife Refuge

Habitat Management

Issue Statement: Actions beyond the Refuge's established boundaries are necessary to adequately protect Ozark cavefish.

Background

Presently the Refuge includes 40 acres along Turnback Creek in Lawrence County. It has been suggested that the Refuge expand to include other Ozark cavefish sites, such as Sercoxie Cave, and

provide protection for their surrounding watersheds. It also was noted that a 10-acre parcel to the north of the Refuge, which contains the federally listed threatened Missouri bladder pod, may have a willing seller. Other comments noted that protecting and conserving recharge areas for streams known to contain Ozark cavefish would provide the greatest protection for the species. Still others observed that hazardous material spills along Highway 44 within the recharge area for Turnback Creek posed the greatest threat to the Ozark cavefish on the Refuge. A spill could contaminate surface water and have adverse effects on the Ozark cavefish and other subterranean species. Placing highway signs, developing mitigation for potential spills, working with private landowners, and environmental education were suggested as ways to conserve and protect recharge areas, and ultimately Ozark cavefish.

Public Use

Issue Statement: The Refuge suffers from unenforced regulations and possibly unrealized public use potential.

Background

A number of comments from the public suggested the Refuge would benefit if it were locally administered and managed. The Refuge has been administered by the staff at Mingo NWR, 240 miles away, from the time it was established in 1991. Because of the distant location, the Refuge is visited infrequently and little management or law enforcement activities are carried out on the property. Suggested changes included establishing a field station in the local area, adding staff to focus on the Refuge and surrounding area, and exploring cooperative management of the Refuge with the Missouri Department of Conservation.

One comment from the Missouri Department of Conservation suggested opening the Refuge to public use. This would make it consistent with access to the Paris Springs, an adjoining state-owned property that contains the entrance to Turnback Cave. The Refuge contains the resurgence of Turnback Creek, but no access to the cave. With no local personnel, the closure is difficult to enforce. A number of comments noted that the subterranean nature of the Ozark cavefish and lack of access to the cave make it unlikely that public use of the Refuge would cause adverse effects.

Issue Statement: The Refuge contains a number of federal and state listed rare species, and there are currently no provisions for managing and protecting these species.

Background

The Refuge has restoration potential for the federally-listed threatened Missouri bladder pod. Controlling exotic species, placing interpretive signing, working with The Nature Conservancy, restoring the Missouri bladder pod, improving and expanding riparian habitat, and restoration of wet prairie are various management options.

Preparation, Publishing, Finalization and Implementation of the CCP

The Mingo NWR, Pilot Knob NWR and Ozark Cavefish NWR CCP was prepared by a contractor with a great deal of input, review, and support from Refuge staff and the Service's Regional Office. The CCP was published in two phases and in accordance with the National Environmental Policy Act (NEPA). The Draft Environmental Assessment presented a range of alternatives for future management and identified the preferred alternative, which is also the Draft CCP. The alternative that was selected has become the basis of the Final CCP. This document then, becomes the basis for guiding management on the Refuges 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 Refuge Operating Needs System (RONS) and Maintenance Management System (MMS). Most importantly, it lays out the general approach to managing habitat, wildlife, and people at Mingo, Pilot Knob and Ozark Cavefish national wildlife refuges that will direct day-to-day decision-making and actions.

The Draft CCP/EA was released for public review and comment in June 2006. A Draft CCP/EA or a summary of the document was sent to more than 276 individuals, organizations, and local, state, and federal agencies and elected officials. Three open houses, one for each Refuge, were held in June 2006 following release of the draft document. Eleven people attended the open house for Mingo NWR; two people attended the open house for

Ozark Cavefish NWR; and three people attended the open house for Pilot Knob NWR.

By the conclusion of the comment period we received 37 responses and identified more than 200 individual comments within those responses. We consolidated similar comments, reducing the total to 160 comments.

Appendix K of the CCP summarizes these comments and our responses. Several of the comments resulted in changes in the CCP.

Chapter 3: Refuge Environments and Management

Introduction

Established in 1944 under authority of the Migratory Bird Treaty Act, the 21,592-acre Mingo National Wildlife Refuge covers portions of Stoddard and Wayne counties in southeast Missouri, approximately 150 miles south of St. Louis. It contains 15,000 acres of bottomland hardwood forest, the largest remnant of the 2.5 million acres that once enveloped southeastern Missouri, and serves as a resting, breeding, and wintering area for migratory birds. The Refuge also includes 3,500 acres of marsh and water, 411 acres of cropland, 704 acres of moist soil units, and 474 acres of grassy openings.

Clearing of the region's bottomland hardwood forests for lumber and railroad ties began in the 1880s and continued into the 1930s, feeding the demand of a growing nation. Conservation and sustainable yield – notions still in their infancy – lost out to short-term economic gain, and the once expansive bottomland forests disappeared. Timber companies looking to reap additional revenue from the cleared landscape funded projects aimed at dewatering the swamp. Ultimately, legislation passed allowing the formation of drainage districts financed by long-term bonds. In 1914 more than 20 such districts existed in Stoddard County, including the Mingo Drainage District near Puxico.

The Mingo Drainage District struggled. Overflow from the St. Francis River thwarted permanent drainage, and soils proved less productive than those in other areas of the Missouri Bootheel. When land values plummeted during the Great Depression many drainage district land owners defaulted on tax payments rather than maintain unprofitable investments. The financially strapped Mingo Drainage District defaulted on bond payments and went bankrupt. Unregulated land uses followed until the U.S. Fish and Wildlife Service acquired the property in 1945. By that time the lands had been deforested, drained with an extensive system of ditches, burned by wildfires, and grazed indiscriminately by livestock.

Stanley Creek on Mingo NWR. USFWS

Through time and careful stewardship the land recovered, and along with it the flora and fauna once common to the swamp. Today the ditches and levees intended to drain Mingo Swamp allow Refuge staff to control and manage water levels, mimicking once natural water fluctuations. Drainage districts throughout the remainder of the Missouri Bootheel survive to this day, rendering it suitable for agriculture and human habitation. This widespread conversion of the bottomland forest with its intermingled streams, lakes, swamps, bayous, and sloughs to an

agricultural landscape with roads, dikes, and levees permanently altered drainage patterns and seasonal flooding regimes.

Mingo Wilderness Area

Congress designated the western portion of the Refuge as the Mingo Wilderness Area in 1976. The 7,730-acre wilderness is one of 71 such areas managed by the U.S. Fish and Wildlife Service. In 1964, Congress passed and the president signed the Wilderness Act, which established the National Wilderness Preservation System. The legislation set aside certain federal lands as wilderness areas. The act says that they are areas, "…where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Four federal agencies of the United States government administer the National Wilderness Preservation System, which includes 662 designated areas and more than 105 million acres.

Wilderness policy permits hiking, backpacking, fishing, wildlife observation, and environmental education and interpretation. It generally prohibits motorized activities, although tools like chainsaws may be used in wildland fire management, after a MIST (Minimum Impact Suppression Tactics) analysis. Ditches and levees, specifically excluded from Wilderness designation, help approximate water level fluctuations that once happened naturally.

Special Management Areas

There are seven research natural areas on the Refuge; six are within the Mingo Wilderness Area (Table 1). Each research natural area is part of a national network of reserved areas under various ownerships intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations. The designation is employed by a number of federal land management agencies including the U.S. Fish and Wildlife Service, Forest Service, Bureau of Land Management, and National Park Service.

In research natural areas, as in designated wilderness, natural processes 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. Research natural areas may be closed to all public use if such use is determined to be incompatible with primary Refuge purposes.

Table 1: Mingo NWR Research Natural Areas

Research Natural Area	Primary Cover Type	Acres
Cherrybark	Cherrybark Oak-Swamp Chestnut Oak	60
Cypress-Tupelo	Bald Cypress-Water Tupelo	80
Elm-Ash-Maple	Black Ash-American Elm-Red Maple	80
Oak-Hickory	White Oak-Red Oak-Hickory	140
Overcup Oak	Overcup Oak	45
Pin Oak	Pin Oak-Sweet Gum	180
Willow Oak	Willow Oak-Sweet Gum	40
Total		625

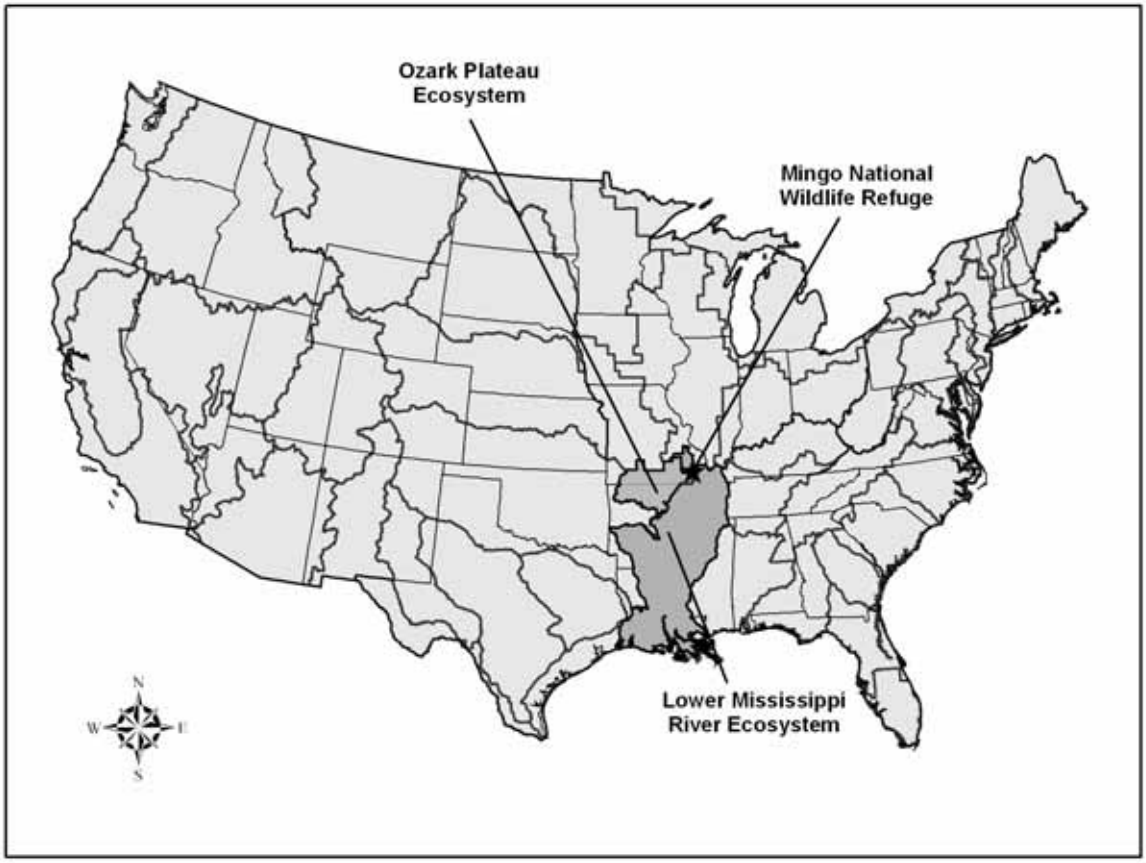
Geographic/Ecosystem Setting

Mingo National Wildlife Refuge is located in an area known as the Bootheel region of southeast Missouri. Once an expansive swamp of bottomland hardwoods, the Bootheel was converted to agriculture during the last century and today is largely farmed for row crops. The Refuge is bordered to the west by the Missouri Ozarks and to the east by Crowley's Ridge, a prominent landform in the otherwise level Mississippi floodplain. Waters from the Refuge flow south to the St. Francis River via Mingo Creek and a series of drainage ditches.

U.S. Fish and Wildlife Service Ecosystems

In 1994 the Service adopted an ecosystem approach as a framework and extension of its ongoing conservation efforts. An ecosystem approach demands looking beyond administrative boundaries to develop strategies that address threats and challenges to the conservation of natural resources. The Service recognizes 53 ecosystems across the United States, Puerto Rico, and the Virgin Islands (see Figure 2). Each of these ecosystems is a grouping of watersheds as defined by the U.S. Geological Survey's Hydrologic Unit Map. Teams of Service employees work with cooperating partners throughout each ecosystem to identify and address conservation issues that consider biological resources as well as the economic health of communities within each watershed.

Figure 2: U.S. Fish & Wildlife Service Ecosystems of Contiguous States



Mingo National Wildlife Refuge lies at the northern tip of the Lower Mississippi River Ecosystem where it meets the Ozark Plateau Ecosystem. The forested wetlands found across the Mingo basin are characteristic of the Lower Mississippi River Ecosystem, while the upland forests found along the bluffs are characteristic of the Ozark Plateau Ecosystem.

The Lower Mississippi River Ecosystem was a 25-million-acre complex of forested wetlands that extended along both sides of the Mississippi River from Illinois to Louisiana. The extent and duration of seasonal flooding from the Mississippi River fluctuated annually, recharging aquatic systems and creating a diversity of dynamic habitats that supported a vast array of fish and wildlife. Today less than 20 percent of the bottomland hardwood forest remains and most is fragmented or in scattered patches throughout the region. Conservation and restoration of these forests is a top priority for the Service.

The Ozark Plateau is a dome-shaped uplift approximately 50,000 square miles in size, spread across portions of Arkansas, Oklahoma and Missouri. It is characterized by limestone-based karst geology that includes horizontal bedrock, caves, sink holes, and natural springs. The main vegetation communities are upland oak-hickory forest and bottomland hardwood forest in the floodplains of large rivers. The Ozark Plateau Ecosystem is home to numerous rare and declining species, unique endemics, neotropical migrant birds, and other species that are of concern to the Service.

Migratory Bird Conservation Initiatives

Over the last decade, bird conservation planning has evolved from a largely local, site-based focus to a more regional, landscape-oriented perspective. Significant challenges include locating areas of high-quality habitat for the conservation of particular guilds and priority bird species, making sure no species are inadvertently left out of the regional plan-

ning process, avoiding unnecessary duplication of effort, and identifying unique landscape and habitat elements of particular tracts targeted for protection, management and restoration. Several migratory bird conservation initiatives have emerged to help guide the planning and implementation process. Collectively, they comprise a tremendous resource as Mingo NWR engages in comprehensive conservation planning and its translation into effective on-the-ground management.

The North American Waterfowl Management Plan

Signed in 1986, the North American Waterfowl Management Plan (NAWMP) outlines a broad framework for waterfowl management strategies and conservation efforts in the United States, Canada, and Mexico. The goal of the NAWMP is to restore waterfowl populations to historic levels. The NAWMP is designed to reach its objectives through joint ventures of private, state, and federal entities focusing effort within defined geographic areas, or on particular species.

The Refuge is in the Lower Mississippi Valley Joint Venture, one of 12 habitat-based joint ventures. Its focus has expanded beyond the Mississippi Alluvial Valley to include the West Gulf Coastal Plain, encompassing portions of Missouri, Arkansas, Oklahoma, Texas, Louisiana, Mississippi, Tennessee, and Kentucky. The goal of this Joint Venture is to increase populations of waterfowl and other wetland wildlife by protecting, restoring and enhancing wetland and associated upland habitats within the Joint Venture region.

The Lower Mississippi Valley Joint Venture strives to provide habitat for over-wintering waterfowl in the Mississippi Alluvial Valley and West Gulf Coastal Plain Bird Conservation Regions. As such, the Joint Venture assumes that the availability of foraging habitat is the most important factor affecting the number of dabbling ducks that can be accommodated during winter. Based on a "step-down" process, the LMVJV established habitat objectives that link continental waterfowl populations to on-the-ground habitat objectives. Habitat objectives are apportioned among three categories: public managed, private managed, and natural flooding within each state (in the LMVJV administrative boundaries). By doing so, each national wildlife refuge (e.g., Mingo NWR) is responsible for contributing to some portion of the habitat objectives.

Partners In Flight

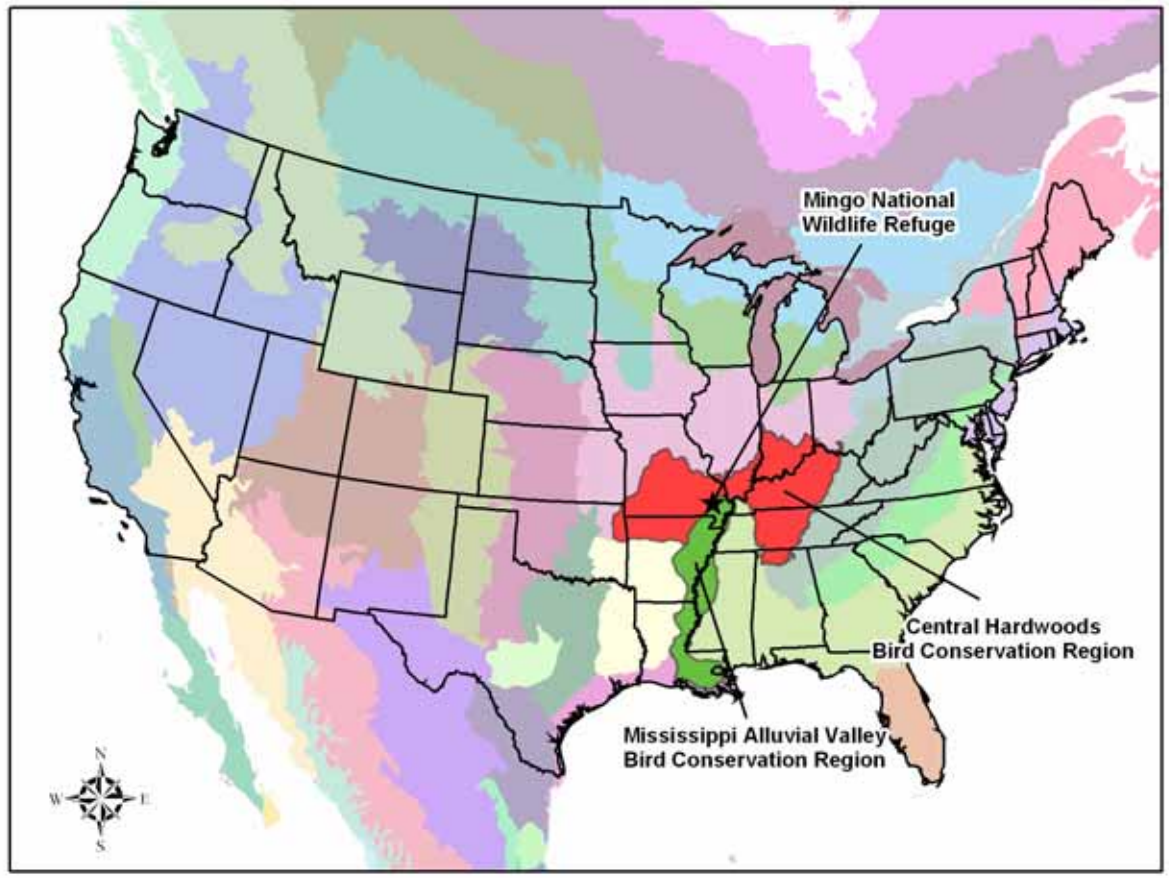
Formed in 1990, Partners In Flight (PIF) is concerned primarily with landbirds and has developed Bird Conservation Plans for numerous *Physiographic Areas* across the U. S. (see http://www.partnersinflight.org). These plans include priority species lists, associated habitats, and management strategies. Mingo NWR lies within PIF Physiographic Area (PA) 05, the Mississippi Alluvial Valley Physiographic Area.

The U. S. Shorebird Conservation Plan and the North American Waterbird Conservation Plan are plans that address the concerns for shorebird and waterbirds. These larger scale plans identify priority species and conservation strategies.

In a continental effort, PIF, NAWMP, U. S. Shorebird Conservation, and the North American Waterbird Conservation plans are being integrated under the umbrella of the North American Bird Conservation Initiative (NABCI). The goal of NABCI is to facilitate the delivery of the full spectrum of bird conservation through regionally-based, biologically-driven, landscape-oriented partnerships. The NABCI strives to integrate the conservation objectives for all birds in order to optimize the effectiveness of management strategies. NABCI uses Bird Conservation Regions (BCRs) as its planning units. BCRs are becoming increasingly common as the unit of choice for regional bird conservation efforts; Mingo NWR lies at the interface of two regions: BCR 24 Central Hardwoods, and BCR 26 Mississippi Alluvial Valley (see Figure 3).

Each of the four bird conservation initiatives has a process for designating conservation priority species, modeled to a large extent on the PIF method of calculating scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance (at a particular scale, e.g. PA or BCR), and population trend. These scores are often used by agencies in developing lists of bird species of concern; e.g., the U. S. Fish and Wildlife Service based its assessments for its 2001 list of nongame Birds of Conservation Concern primarily on the PIF, shorebird, and waterbird status assessment scores.

Figure 3: Bird Conservation Regions



Region 3 Fish and Wildlife Resource 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:

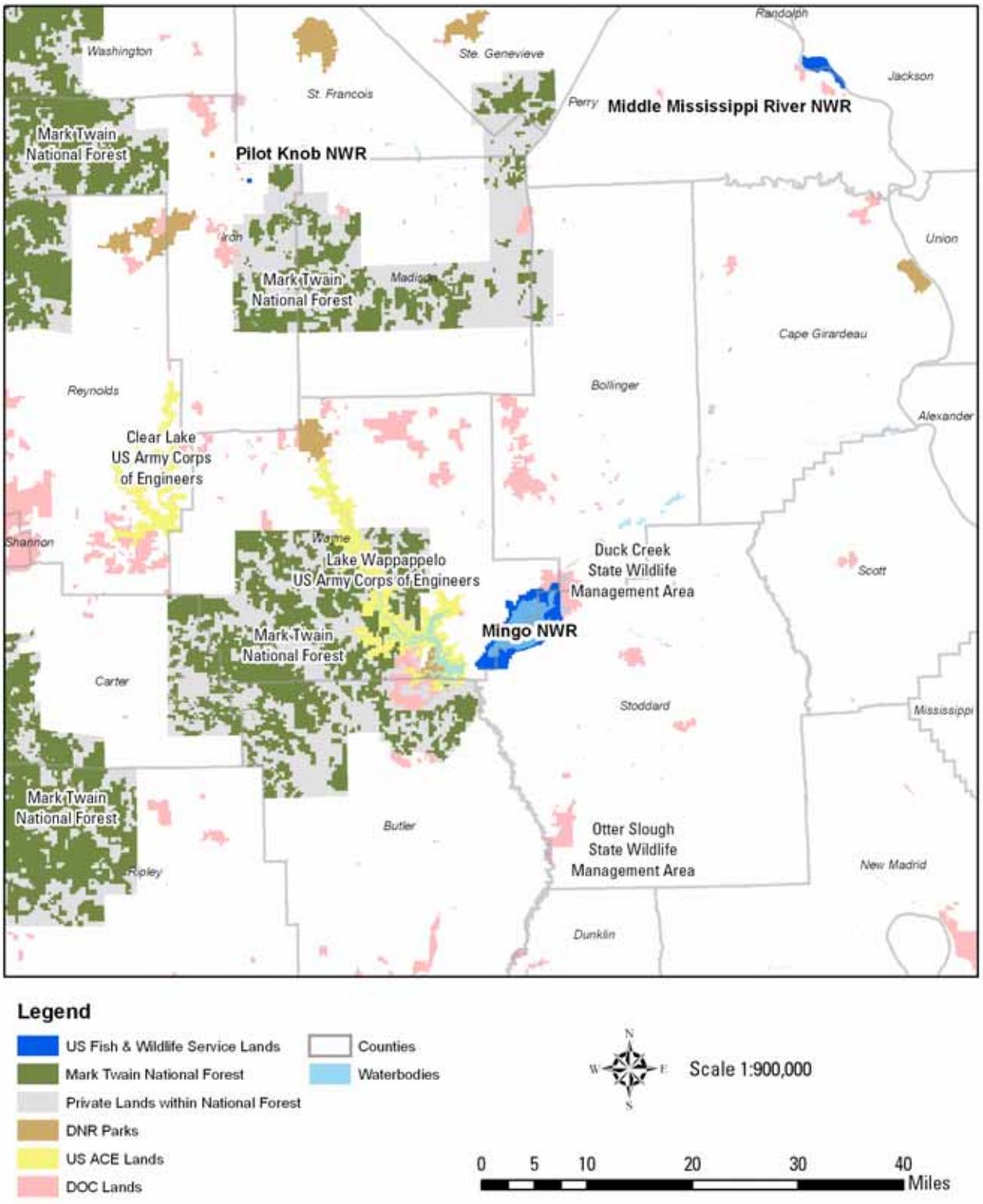
- all federally listed threatened and endangered species and proposed and candidate species that occur in the Region
- migratory bird species derived from Service wide and international conservation planning efforts
- rare and declining terrestrial and aquatic plants and animals that represent an abbreviation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

Appendix J lists 52 Resource Conservation Priority species relevant to the Refuge.

Other Recreation and Conservation Lands in the Area

Figure 4 displays other ownerships surrounding the Refuge. The 6,190-acre Duck Creek Conservation Area managed by the Missouri Department of Conservation adjoins the Refuge to the northeast. The Poplar Bluff Ranger District of the 1.5-million-acre Mark Twain National Forest lies several miles southwest of the Refuge. Wappapello Lake, a 44,000-acre reservoir along the St. Francis River, and much of the surrounding land is managed by the U.S. Army Corps of Engineers. Wappapello State Park, which is administered by the Missouri Department of Natural Resources, borders a portion of the reservoir.

Figure 4: Other Conservation Lands in the Vicinity of Missouri National Wildlife Refuges



Socioeconomic Setting

Mingo National Wildlife Refuge is located in Wayne and Stoddard counties, and is adjacent to Bollinger and Butler counties. Compared to the State of Missouri, this four-county area has a smaller population growth rate and is less racially and ethnically diverse. The area's population has a lower average income, and less high school and college education than the state's population as a whole.

Population and Demographics

The total population of the four counties was 95,861 in the 2000 Census. The population increased 6.9 percent during the 1990s while the State's population increased 9.3 percent. Wayne County grew the most at 14.9 percent, and Stoddard County grew the least at 2.8 percent. The four-county population was 95.2 percent white in 2000; the State population was 84.9 percent white. In Missouri, 5.1 percent of the people 5 years and older speak a language other than English at home; in the four-county area it is 2.5 percent.

Employment

In 2000 there were a total of 47,522 full- and part-time jobs in the four-county area. Farm employment accounted for 8.0 percent of the jobs across the area. Bollinger County had the highest proportion of farm employment, 19.9 percent. Other sectors with sizable proportions of jobs are the services, retail, and manufacturing sectors.

Income and Education

Average per-capita income in the four-county area was $14,814 in 1999; in Missouri it was $19,936. The median household income in the four-county area was $27,114 in 1999; in the state it was $37,934.

In the four-county area, 9.9 percent of persons over 25 years of age hold a bachelor's degree or higher. The comparable figure in the state is 21.6 percent.

Potential Refuge Visitors

In order to estimate the potential market for visitors to the Refuge, we looked at 1998 consumer behavior data for an area within an approximate 60-mile radius. The data were organized by zip code areas. We used a 60-mile radius because we thought this was an approximation of a reasonable drive to the Refuge for an outing.

The consumer behavior data 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.

We looked at potential participants in birdwatching, photography, freshwater fishing, hunting, and hiking. In order to estimate the general environmental orientation of the population we also looked at the number of people who potentially might hold a membership in an environmental organization.

The consumer behavior data apply to persons more than 18 years old. For the area that we included in our analysis, out of a total population of 673,773 people, the number of persons more than 18 years old was 504,913. The estimated maximum participants in the 60-mile radius for each activity are: birdwatching (37,280), photography (50,452), hunting (48,602), freshwater fishing (83,537), and hiking (43,791). The number of persons who might hold a membership in an environmental organization is estimated at about 9,300. The projections represent the core audience for repeated trips to the Refuge. On days with special events or major attractions

Monopoly Marsh from Ditch 6 Road on Mingo NWR. USFWS

such as when large numbers of birds are at the Refuge, visitors can be expected to travel longer distances.

Climate

This discussion is modified from the climate section of the Stoddard County Soil Survey. Long, hot summers and rather cool winters characterize the climate of the Refuge and surrounding area. An occasional cold wave brings near freezing or subfreezing temperatures but seldom much snow. Precipitation is fairly heavy throughout the year, and prolonged droughts are rare. Summer precipitation falls mainly in the form of afternoon thunderstorms.

In winter the average temperature is 37 degrees Fahrenheit, and the average daily minimum temperature is 28 degrees. In summer the average daily temperature is 78 degrees, and the average daily maximum temperature is 90 degrees. Total annual precipitation is 48 inches. Of this, about 25 inches, or 50 percent, usually falls between April and September. In 2 years out of 10, the rainfall between April and September is less than 20 inches. Thunderstorms occur on about 55 days each year, mostly in summer. The average annual snowfall is 11 inches. On average, 9 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in mid afternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. The average wind speed is at its highest, 12 miles per hour, in March. Severe local storms, including tornadoes, may strike occasionally. These are usually of short duration, and damage is variable and spotty.

Geology and Soils

The Refuge lies in an abandoned channel of the Mississippi River known as the Advance Lowlands, bounded by the limestone bluffs of Crowley's Ridge to the south and east, and the Ozark Escarpment to the north and west. The St. Francis River flows from the Ozark Hills into the Advance Lowlands just south and west of the Refuge. When the Mississippi River shifted course, joining the Ohio River farther north approximately 18,000 years ago, an alluvial fan built up where the St. Francis River entered the lowlands. The Castor River, north and east of the Refuge, developed a similar alluvial fan. These alluvial fans act as natural levees, slowing drainage through the basin.

Several small sand ridges interrupt the otherwise level basin. The ridges, which vary in shape, may be ancient sand bars deposited by the Mississippi River or sand forced to the surface by earthquakes. The Refuge is in the heart of the New Madrid seismic zone, the source of some of the most powerful earthquakes in North America.

Bottomland Soils

The most extensive soil type is Waverley Silt Loam, with a grayish brown silt loam surface layer and gray silt loam subsoil that is mottled throughout. A poorly drained acidic soil formed under wet conditions and a high water table, it occupies approximately 50 to 60 percent of the Refuge. Falaya Silt Loam occupies a small part of the bottom in areas such as Stanley Creek and Lick Creek. It also borders the upland and the channel of Mingo Creek. Falaya soils have brown silt loam surface layers over grayish brown silt loam underlain at about 40 inches by fray silty clay loam. This soil is somewhat poorly drained, acidic, and subject to flooding or ponding. Organic soils occupy 800 to 900 hundred acres in Rockhouse and Monopoly marshes and consist of dark colored soils derived from organic matter. They were formed under wet marshy conditions in some of the lowest elevations.

Upland Soils

The cherty soils of the steep slopes and stone outcropping along the west side of the Refuge are of the Doniphan series. Doniphan soils have light brown cherty silt loam surface layers and red clay subsoils. The ridgetops above Doniphan cherty silt loam are narrow and undulating and have about three feet of loess deposits. The soil is Union Silt Loam. The moderately well-drained Union soils have dark grayish brown silt loam surface horizons that are underlain by brown silty clay loam subsoils. They have fragipan layers at depths of 2.0 or 3.0 feet. On the moderate slopes of the uplands, especially along Highway 51 north of Puxico, there are deep, well-drained soils developed in thick lows. These soils are Loring Memphis Silt Loams and have brown silt loam surface layers and brown silt loam subsoils.

Water and Hydrology

Accumulation, movement, and drainage of water drive the ecology of Mingo NWR. The Refuge is within the lower portion of the St. Francis River basin, and acts as a reservoir during periods of flooding. Water enters from all directions until run-off is complete and water levels stabilize. Water flow within the Refuge is complex and varies depending on water depths within each of the pools. Poor drainage within the basin is slowed further by the dikes, levees, and ditches across the Refuge. Water exits the Refuge and flows south to the St. Francis River.

The St. Francis River flows 225 miles from Iron County in Missouri to the Arkansas/Missouri border, and another 207 miles through Arkansas until it joins with the Mississippi River. Hydrology of the St. Francis River and entire Bootheel region has been drastically altered. Extensive networks of ditches and levees drain the floodplain, and control seasonal flooding that once predominated.

Figure 5 shows the ditch system that dominates the surface hydrology of Mingo NWR.

Refuge Resources

Plant Communities

Refuge vegetation may be broadly divided into wetlands, comprised mainly of bottomland mixed hardwood forests, and upland forest. Figure 6 displays the principal plant communities at Mingo NWR.

Wetlands

With the exception of the bluffs on either side of the Refuge, most of the area is subject to seasonal flooding and is wet during at least a portion of each year (see Figure 5 and Figure 6). Vegetation varies along a narrow elevational gradient that corresponds to duration of flooding. Four community types are delineated within the Refuge based on dominant species, elevation, and inundation.

Terrace Bottoms Community – Terrace or second bottoms are located at the base of lower slopes, flat banks, and watercourse margins. These well-drained and rarely flooded transitional areas support a mixture of upland and flood plain woody species. Major trees are:

Sugar Maple (*Acer saccharum*)
Northern Red Oak (*Quercus rubra*)
Shagbark Hickory, Bitternut Hickory (*Carya cordiformis*)
Sweetgum (*Liquidambar styraciflua*)
American Elm (*Ulmus americana*)
Hackberry (*Celtis occidentalis*)
Box Elder (*Acer negundo*)
Chinkapin Oak, Blackgum (*Nyssa sylvatica*)
Black Walnut, Butternut (*Juglans cinerea*)
Black Cherry (*Prunus serotina*)
Bur Oak (*Quercus macrocarpa*)
Southern Red Oak (*Quercus falcata*).

Oak Hardwood Bottoms Community – The most extensive bottomland forest type is the Oak Hardwood Bottoms. These Pin Oak flats occupy shallowly inundated areas along the banks between drainage ditch levees, and the low floodplains surrounding Rockhouse and Monopoly Marshes. Major trees are:

Pin Oak (*Quercus palustris*)
Willow Oak (*Quercus phellos*)
Overcup Oak (*Quercus lyrata*)
Green Ash (*Fraxinus pennsylvanica* var. *subintegerrima*)
Slippery Elm (*Ulmus rubra*)
American Elm, Red Maple (*Acer rubrum*)
Sweetgum, Cherrybark Oak (*Quercus pagoda*)
Swamp Chestnut Oak (*Quercus michauxii*)
Swamp White Oak (*Quercus bicolor*)
Box Elder, Sugarberry (*Celtis laevigata*)
Persimmon (*Diospyros virginiana*)

Mixed Soft-Hardwood Levees Community – This community type exists along drainage ditch levees, stream margins, roadside embankments, and other watercourse borders. Tree species include:

Black Willow (*Salix nigra*)
Cottonwood (*Populus deltoides*)
Silver Maple (*Acer saccharinum*)
Sycamore (*Platanus occidentalis*)
River Birch (*Betula nigra*)

Later successional species occurring in this community are similar to the Oak Hardwood Bottoms community.

Shallow Swamp Community – This community type occupies inundated areas such as Monopoly Marsh, Rockhouse Marsh, Mingo Creek, and Stanley Creek. The predominant species in these wooded swamps are:

Figure 5: Hydrologic Features of Mingo National Wildlife Refuge

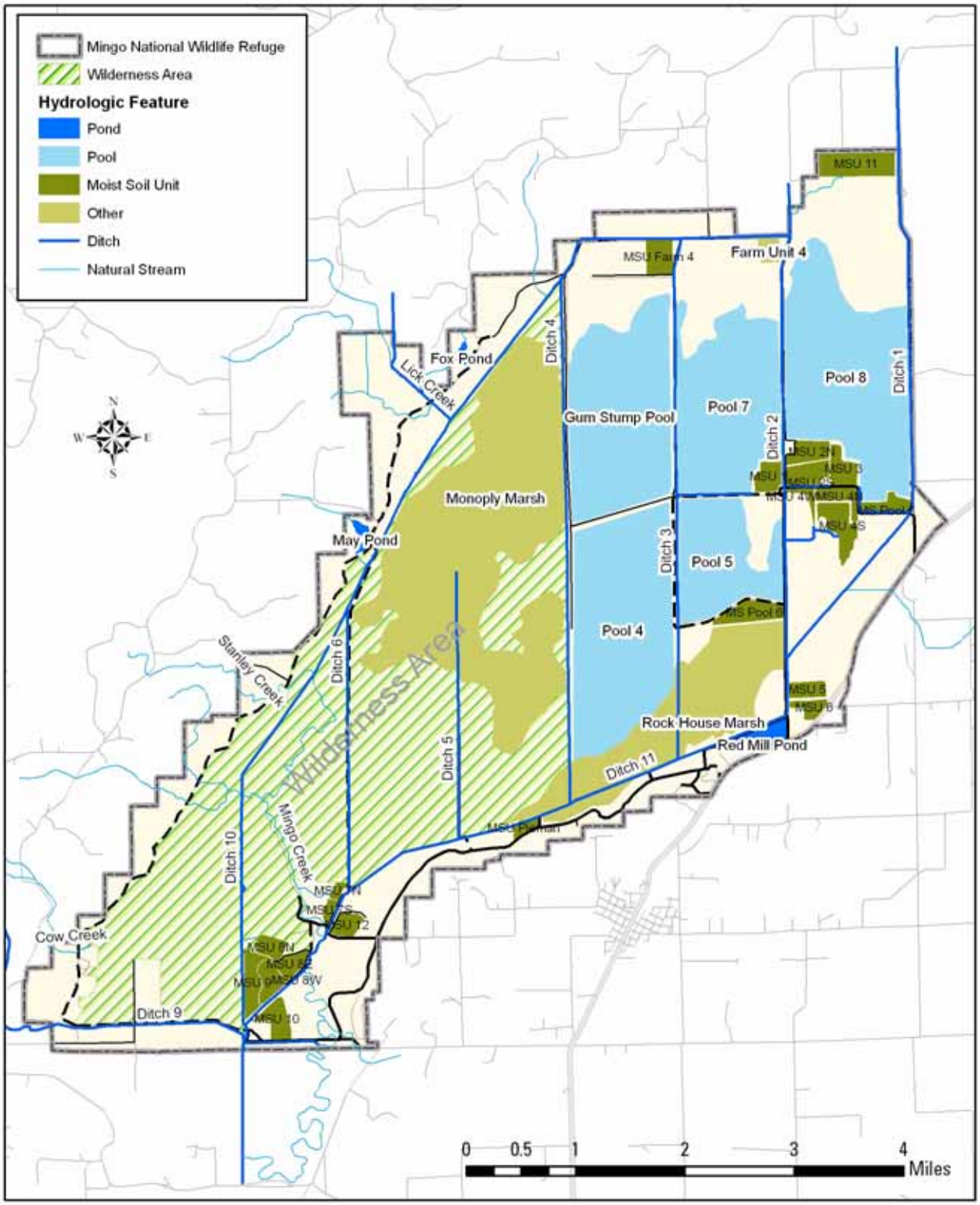
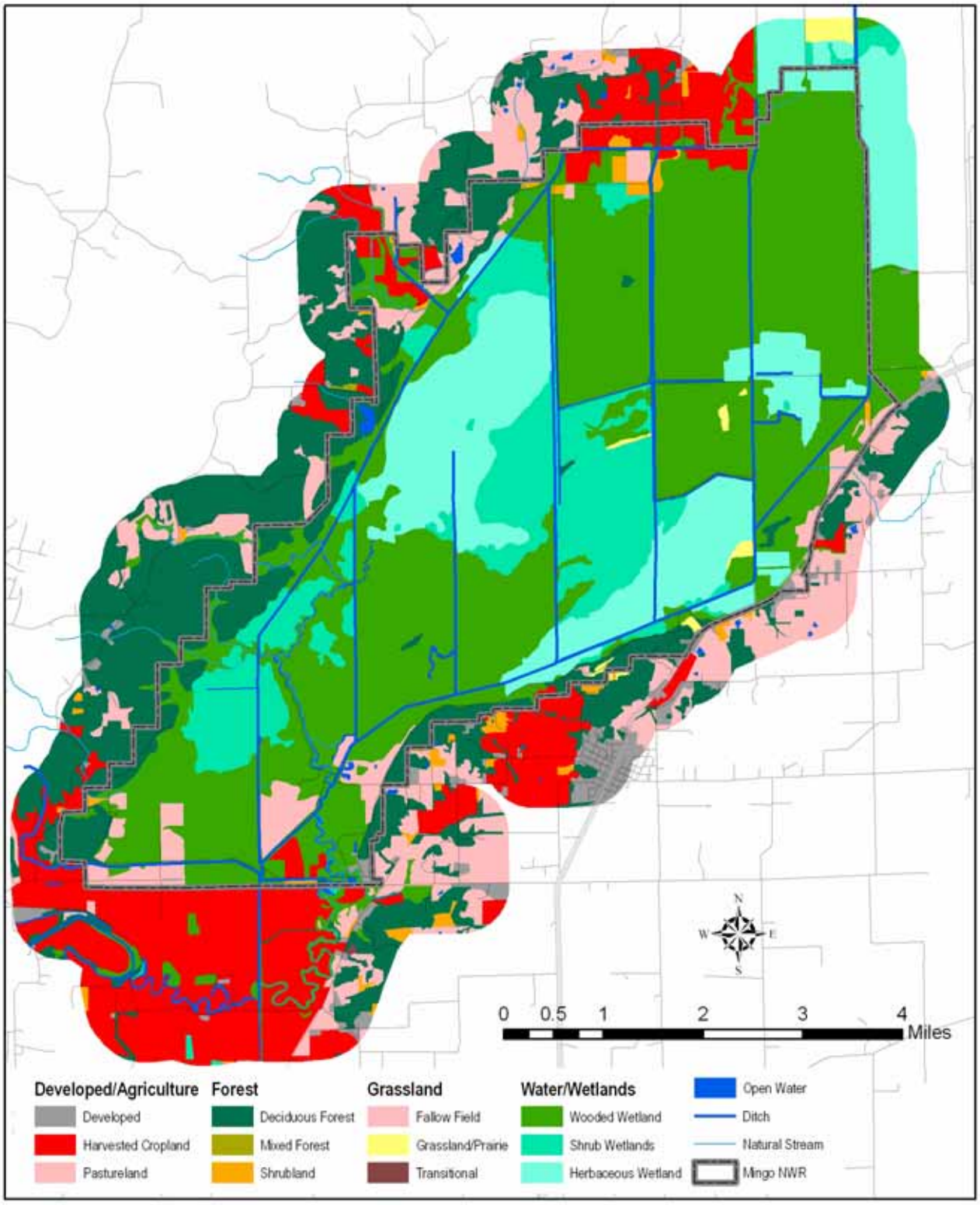


Figure 6: Landcover, Mingo NWR



Bald Cypress (*Taxodium distichum*)
Swamp Blackgum (*Nyssa sylvatica var. biflora*), Swamp Cottonwood (*Populus hetrerophylla*)
Red Maple (*Acer rubrum)*, Pumpkin Ash (*Fraxinus tomentosa*)
Black Willow, Water Locust (*Gleditsia aquatica*)
Green Ash and Water Hickory (*Carya aquatica*)

Upland Forests

Oak-hickory forest type predominates on the cherty upland areas. Three community types are recognized.

Upland Old Fields Community – These areas include scattered woodland clearings, abandoned fields or pastures, and ridge roadsides which are reverting to an oak-hickory forest. Principal trees and shrubs are:

Sassafras (*Sassafras albidum*)
Persimmon (*Diospyros virginiana*)
Honey Locust (*Gleditsia triacanthos*)
Sumac (*Rhus spp.*)
Elm (*Ulmus spp.*)
Black Walnut (*Juglans nigra*)
Red Cedar (*Juniperus virginiana*)
Blackberry (*Rubus allegheniensis*)
Dewberry (*Rubus spp.*)

Great Blue Heron on the shore of May Pond, Mingo NWR. USFWS

Coralberry (*Symphoricarpos orbiculatus*)
Multiflora Rose (*Rosa spp.*).

Xeric Ridge Crests Community – The driest and most exposed forest community exists on ridge crests, bluff tops, and upper slopes on thin, excessively drained soils. Over-story trees include:

Black Oak (*Quercus velutina*)
Post Oak (*Q. stellata*)
White Oak (*Q. alba*)
Black Hickory (*Carya texana*)
Mockernut Hickory (*C. tomentosa*)
Elm and White Ash (*Fraxinus americana*)

Understory trees and shrubs are:

Serviceberry (*Amelanchier spp.*)
Winged Elm (*Ulmus alata*)
Big Tree Plum (*Prunus mexicana*)
Sparkleberry (*Vaccinium arboreum*)
Hawthorn (*Crataegus spp.*)
Southern Blackhaw (*Viburnum spp.*)
Sumac (*Rhus spp.*)
Blueberry (*Vaccinium spp.*)
St. Andrew's Cross (*Ascyrum hypericoides*).

Mesic Slopes Community – Great species diversity occurs on the middle to lower slopes because of improved temperature-moisture conditions. Important trees and shrubs include:

White Oak, Mockernut Hickory, Shagbark Hickory (*Carya ovata*)
Chinkapin Oak (*Quercus muehlenbergii*)
White Ash, Sassafras, Flowering Dogwood (*Cornus florida*)
Mulberry (*Morus spp.*)
Pawpaw (*Asimina triloba*)
Bladdernut (*Staphylea trifolia*)
Spicebush (*Lindera spp.*)
Devil's Walking Stick (*Aralia spinosa*)
Wild Hydrangea (*Hydrangea arborescens*).

Fish and Wildlife Communities

Birds

A total of 279 resident and migratory bird species use Refuge habitats throughout each year. Tens of thousands of Mallards, Canada Geese, and other migrating waterfowl use Refuge wetlands as stopover or wintering habitat. Hooded Mergansers and Wood Ducks are resident breeders on the Refuge.

Monopoly Marsh draws Wood Ducks from a five-state area during molting season. Bald Eagles, Least Bitterns, and Mourning Doves are among the 108 bird species that regularly breed on the Refuge. Appendix F contains a complete list of birds known to occur on the Refuge.

Mammals

Thirty-eight mammal species are found within the Refuge. White-tailed deer, a species popular for hunting and viewing, are abundant at a population density of up to 35 per square mile. There is a wide diversity of small mammals including three species of squirrels, two species of bats, and various mice, rats, and voles. The Refuge is one of the few places in Missouri where the swamp rabbit, a larger relative of the eastern cottontail rabbit, is known to occur. Unlike other rabbits, the swamp rabbit regularly takes to the water to move about and avoid predators. Appendix F contains a complete list of mammals found at Mingo NWR.

Amphibians and Reptiles

Amphibians and reptiles are abundant on the Refuge with more than 30 species of frogs, toads, salamanders, and snakes including the venomous western cottonmouth, southern copperhead, and timber rattlesnake. Many of these species hibernate within the cracks and crevices of the bluffs along the perimeter of the Refuge.

Fish

A complete list of fish species is not available. At least 46 species, including channel catfish, white crappie, spotted bass, and green sunfish, are known to occur in the ponds and ditches of the Refuge.

Threatened and Endangered Species

The Bald Eagle (*Haliaeetus leucocephalus*) occurs as a winter migrant and a summer breeder on Mingo NWR. The wintering Bald Eagle population can reach as high as 50 birds. Three active nesting territories existed in 2004 including one that has fledged 43 young over 19 years. The Bald Eagle is currently listed as a threatened species but is proposed to be delisted.

Threats to Resources

Invasive Species

At least eight invasive species – non-native species of plants and animals that adversely affect native species – are found on the Refuge. (See Table 2)

Contaminants

In 2001, the Missouri Department of Health issued its first fish consumption advisory for mercury. The state-wide advisory includes Mingo NWR. Presently, Refuge waters are not monitored for mercury concentrations. The mercury pathway into the food chain is complex and affected by many factors. But anaerobic conditions found in many wetland soils help convert mercury to its more biologically reactive form that accumulates up the food chain.

In 2002 the Missouri Department of Natural Resources began operation of a mercury monitoring station on the Refuge that serves as one site in the national Mercury Deposition Network (MDN). The station monitors atmospheric mercury deposition. The objective of the MDN is to develop a national database of weekly concentrations of total mercury in precipitation and the seasonal and annual flux of total mercury in wet deposition. The data will be used to develop information on spatial and seasonal trends in mercury deposited to surface waters, forested watersheds, and other sensitive receptors.

Administrative Facilities

The administrative facilities for the Refuge are located 1 mile north of Puxico, Missouri. The Refuge Office includes a visitor center. The maintenance shop, carpentry shop, vacant former Refuge office, eight-stall maintenance building, and four-bayed pole barn are located slightly north of the Visitor Center entrance along the west side of State Highway 51. A storage building containing flammable liquids and other materials is located in the area as well. Two residences housing employees and volunteers are located near the maintenance facilities. No administrative facilities are located at Pilot Knob NWR or Ozark Cavefish NWR. These refuges are administered and managed by Mingo NWR staff and facilities.

Archeological and Cultural Values

As of September 2003, Stoddard and Wayne counties listed seven properties on the National Register of Historic Places, probably not indicative of the kinds of historic places that exist in the two counties. The Refuge contains one of the National Register properties, the Mingo National Wildlife Refuge Archeology District.

Completed archeological surveys of the Refuge, including the Mingo Job Corps campus, have covered almost 7,200 acres. These surveys and other sources have identified more than 140 cultural

Table 2: Invasive Plants and Animals at Mingo National Wildlife Refuge

Species Name	Summary
Nutria	Nutria, a large, dark-colored, semi-aquatic rodent native to southern South America, was introduced into North America as early as 1899. It was first discovered on the Refuge in 2000. The nutria's prolific burrowing weakens dikes, levees, and other structures. The rodent also feeds on native vegetation and crops, and can cause damage when it occurs in higher numbers.
Sericia lespedeza	*Sericea lespedeza* is a native of eastern Asia. It was first introduced in southern United States, and has now become naturalized from Maryland, Virginia, Tennessee, Missouri, and Texas, north to Pennsylvania, Ohio, Michigan, Illinois and Oklahoma. It has been introduced into various areas as a soil cover for erosion control, for soil improvement, as food and cover for bob-white, wild turkey, and other wildlife, and to a lesser extent, for forage and hay. In open areas such as roadsides and levees, it out-competes other species, creating a monoculture and decreasing diversity.
Johnson Grass	Originally native to the Mediterranean, this grass now occurs in all warm-temperate regions of the world. It is found in all the major river bottoms of Missouri, with more than 300,000 acres infested in the Missouri Bootheel alone. It invades riverbanks and disturbed sites crowding out native species and slowing succession.
Bull Thistle	Native to Europe, bull thistle was introduced to North America during colonial times, and is now found in all 50 states. It thrives in fields and disturbed areas, degrading habitat quality.
Reed Canary Grass	This grass is native to lowland areas of northwestern Missouri and has escaped from cultivation in other regions. It is a major threat to marshes and natural wetlands because its hardiness, aggressive nature, and rapid growth allow it to displace native wetland plant species.
Multiflora Rose	Originally introduced to the East Coast from Japan in 1886 as rootstock for cultivated roses. It was widely used to control soil erosion. It is a thorny, bushy shrub that forms impenetrable thickets and out-competes native vegetation.
Feral Hogs	Since the days of open range, a few Missouri counties have had populations of domestic wild hogs. In recent years those hogs have been crossed with the European boar strain to produce animals that reproduce prolifically and have strong survival instincts that make them especially wary. Feral hogs cause damage to livestock, wetlands and wildlife.
Autumn Olive	Autumn olive was introduced into U.S. cultivation in 1830 from its native range in China, Japan, and Korea. Autumn olive crowds out native plant species.

resources sites on the Refuge. These sites represent all Midwest United States cultural periods from the earliest Paleo-Indian through 20th century Western, a period of about 12,000 years. Nevertheless, evidence shows no human presence in the Refuge and vicinity at the time Europeans first entered the region. One standing structure on the Refuge, the Patrol or Sweet's Cabin from the early 20th century, is representative of Depression era homesteads in the region, it is historically significant and may be eligible for the National Register.

The North American Consultation Database run by the Park Service to assist Federal agencies responding to the requirements of the Native American Graves and Protection and Repatriation Act lists no tribes with identified interests in Stoddard and Wayne counties. The database, however, is not a comprehensive list, being based on a limited number of legal sources. Cherokee, Choctaw, Creek, Delaware, Miami, Mingo (Iroquois), Osage, Quapaw, Seneca, and Shawnee may have had limited historic period interest in the Refuge area, the Chickasaw and Tunica may have had protohistoric period interest, and the antecedent Pawnee and Wichita may have had prehistoric interest. Other interest groups that might have a cultural resources concern about the Refuge have not yet been identified.

Cultural resources are important parts of the nation's heritage. The Service preserves 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.

Visitation

In fiscal year 2004, Mingo NWR received 119,439 total visits, including 7,446 visits to the Visitor Center. A total of 71,491 visitors participated in interpretation and nature observation. A total of 2,298 students participated in environmental education programs. In 2004, 3,760 visits to the Refuge were for hunting and 2,324 visits were for fishing. There were 7,446 visits to the Wilderness Area. The Ref-

uge staff reached more than 9,053 people in off-site outreach activities during the year.

Current Management

Habitat Management

Management emphasizes the natural productivity of the swamp. Acorns from oak trees provide an important source of food for dabbling ducks as well as for turkey, deer, and squirrel. Open marsh areas produce seed-bearing moist soil plants such as wild millet as well as large numbers of invertebrates, both of which are important to waterfowl and other waterbirds. Water levels are manipulated through use of water control structures, ditches and dikes, helping produce an annual crop of natural food.

Food for wildlife is also produced by farming about 600 acres. Most of this land is tilled by neighboring farmers on a sharecrop basis. The Refuge's share of the crop is left standing in the field for wildlife.

Wetland Management

Excluding the bluffs along the periphery of the Refuge, elevation across the basin varies less than 10 feet, rising from 335 to 344 feet above mean sea level. Minor changes in water levels result in vast differences in area flooded. Four green tree reservoirs totaling 3,721 acres and two open marsh impoundments totaling 3,305 acres are managed for waterfowl and other wetland associated wildlife. Current management of these areas is described in the following paragraphs.

Green Tree Reservoirs – The presence of live trees and the ability to manipulate water levels define green tree reservoirs (GTR). Flooded annually for no more than 130 consecutive days between November and March, water is drained during the growing season to encourage regeneration and avoid killing trees. Seasonally flooding these lowland forests makes mast available to wintering waterfowl, and mimics flooding that occurred before ditches, levees, and roads altered drainage within the Refuge and surrounding basin.

Open Marsh – Monopoly Marsh is drawn down once every 5 years, shrinking the flooded area from 2,400 acres to 30 acres. Drawdowns aerate the soil, enhance invertebrate populations, decrease rough fish populations, and allow bald cypress and oak regeneration. Upon completion of each drawdown the pool is held at a slightly lower level to avoid killing bald cypress seedlings along the perimeter. This process is slowly restoring the marsh to a bald cypress swamp. When not drawn down, the marsh is maintained at a constant level and is a nursery for young fish. The constant water levels increase the abundance of American lotus, an aquatic plant that out competes other vegetation under stable water levels. American lotus provides habitat for waterfowl, and is of greatest benefit when it covers no more than half of the surface area of the marsh.

Mingo River in July, Mingo National Wildlife Refuge

Rockhouse Marsh is drawn down completely by May 15 every other year to maintain it as an open marsh. During the drawdown, woody vegetation such as willow that competes with bald cypress trees are removed or mowed. Reflooding the marsh begins on October 1.

Open Water – Stanley Creek impoundment takes its name from Stanley Creek, a small tributary that enters the Refuge from the west and intersects Ditch 10 before entering Mingo Creek. Ditches, constructed when the area was a drainage district, divert much of the flow from Mingo Creek. An earthen plug constructed along Ditch 10 and a water control structure at Flat Banks impound water within the former stream channel, helping sustain a fishery. Stanley Creek impoundment floods when runoff overwhelms the water control structure at Flat Banks, sending overflow into adjacent lowland forests. The aim is to keep the flood duration short, maintain the creek within its banks, and sustain the fishery.

Nearly 60 miles of ditches form a drainage network that moves water onto, around, and off the Refuge. These ditches hold water year round and often provide refuge for fish species during low water periods. Years of sediment accumulation

Table 3: Main Habitat Management Units at Mingo NWR

Unit Name	Acres	Description
Pool 4	29	Green Tree Reservoir
Pool 5	501	Green Tree Reservoir
Pool 7	876	Green Tree Reservoir
Pool 8	1191	Green Tree Reservoir
Monopoly Marsh (Pool 1)	2405	Open Marsh
Rockhouse Marsh (Pool 2)	900	Open Marsh
Stanley Creek Impoundment		Flood Control/Fisheries
Pool 3 (Gum Stump)	1021	50% Oaks 40% Scrub/Shrub 10% Cypress/Tupelo
Pool 6	80	40% Moist Soil Unit 60% wood duck brood habitat
MS-1, MS-2S, MS-2N, MS-3, MS-4N, MS-4W, MS-4S, MS-5, MS-6, MS-7N, MS-7S, MS-8E, MS-8W, MS-9N, MS-9S, MS-10, MS-11, MS-12	704	Moist Soil Units
Farm Units	587	Cropland/Food Plots
Haying Units	421	Grassy Openings

decreased the depth of the ditches, reducing their effectiveness for moving water. This hampered the already poor drainage within the Refuge. Lowland forests adapted to short duration flooding held water for most or all of the year, killing large patches of trees. Sediment removal initiated in 1999 improved drainage and water level management across the Refuge.

Red Mill Pond is drawn down once every 5 years from May to October to relieve stress on flooded shrubs, and encourage growth of woody vegetation. This scrub/shrub pond, managed for Wood Duck nesting and brood cover, also contains sunfish that are locally abundant but rare within the State.

May Pond and Fox Pond were built to catch sediment eroded from the bluffs on the west side of the Refuge. Managed for fishing, stocked blue gill and bass populations are now self-sustaining, while more easily caught catfish are restocked every 2-3 years.

Pool 3, also known as Gum Stump, is a natural backwater closely linked to Monopoly Marsh. The pool stores overflow carried by Ditch 3 during high water levels. When not used for storage, water levels rise and fall in conjunction with management of Monopoly Marsh. Oak forest covers half of the pool, a mixture of bald cypress and tupelo about 10 percent, and scrub/shrub the remainder.

Pool 6 is formed by a levee placed along the northern portion of Rockhouse Marsh. About 40 percent of the pool is managed for moist soil habitat. The remainder is managed to provide overhead cover and food for Wood Duck broods. Periodically, taller shrubs are removed to encourage growth of understory shrubs. Removing the taller shrubs increases sunlight to the understory, and eliminates potential perches for avian predators.

Table 3 lists each of the water bodies and other habitat units on the Refuge.

Moist Soil Units

Sixteen moist soil units totaling 704 acres are managed to produce food for migrating waterfowl and shorebirds. Moist soil units (MSUs) are former farm fields developed to impound water through construction of dikes and water control structures. Moist soil management entails manipulating water levels to encourage 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 October or November and proceeds in stages. Initially, one-third of each MSU is flooded. Once waterfowl

deplete the food supply an additional one-third is flooded, and finally the units are entirely flooded. Progressive flooding concentrates feeding waterfowl more fully utilizing moist soil foods. February through April waterfowl feed on invertebrates found in the MSUs. Draining begins in March and by April exposes mud flats attracting migrating shorebirds which also feed on invertebrates. The MSUs remain dry throughout the growing season to produce food for the following year.

Grassy Openings

There are a number of grassy openings mostly located along the perimeter of the Refuge that total 474 acres. These areas provide habitat diversity within the largely forested Refuge.

Forests

Other than water level manipulations described under the wetland management section, the forested areas of the Refuge are not actively managed. The majority of the upland oak/hickory forest lies in or adjacent to the wilderness area, where policy prohibits active management. Until recently, lowland forests were too wet to allow timber harvest operations, but ditch cleaning has improved drainage and water level control throughout the Refuge.

Cropland and Food Plots

Annually, food crops such as corn, milo, and soybeans are planted on 411 acres of cropland maintained through cooperative agreements with local farmers, and on an additional 95 acres of food plots maintained by Refuge staff and volunteers. Tilling prevents trees from reclaiming the ground, maintaining open habitat that adds diversity to mostly forested Refuge. All or a portion of each crop is left as food for wildlife, and is especially important for resident species during severe winters.

Fire Management

Mingo NWR has a Fire Management Plan (FMP), adopted in 2003, which provides a detailed course of action to implement fire management policies for the Refuge (USFWS, 2003a; USFWS, 2003b). The FMP describes the responsibilities of each member of the fire management team, including training, experience, physical fitness requirements, and fire duty assignments.

The general fire management goals for the Refuge FMP are:

Firefighter and public safety is the priority of the program. All Fire Management activities will reflect this commitment.
Protect life, property, and other resources from unplanned fire.
Use prescribed fire where appropriate to accomplish resource management objectives.
Restore fire into the ecological process.
Develop and implement a process to ensure the collection, analysis, and application of fire management information needed to make management decisions.

Mingo NWR's fire management objectives are the following:

Protect from fire all important scientific, cultural, historic, prehistoric, visitor facilities, administrative sites, and Refuge 17 housing.
Restore and perpetuate habitat important to migratory and native wildlife species by maintaining a diversity of plant communities in various successional stages.
Use prescribed fire to the fullest extent possible to restore natural ecological processes, fire regimes, and vegetative communities on the Refuge, including native warm season grasses.
Prevent human-caused wildland fires.
Educate the public regarding the role of prescribed fire within the Refuge.
Maintain and enhance moist soil units by retarding the invasion of woody species and noxious weeds.
Use prescribed fire when it is the most effective and efficient means for achieving management objectives.
Manage the risks associated with hazard fuels. Use prescribed fire near the urban wildland interface, sensitive resources and sensitive boundary areas to reduce risk from wildland fire damage.

All of Mingo NWR is considered as a single Fire Management Unit (FMU) for the purpose of wildland fire suppression. All wildland fires at Mingo NWR are suppressed. In the Refuge's Wilderness Area, wildland fires will be suppressed utilizing Minimum Impact Suppression Techniques (MIST). Prescribed fires on the Refuge are located in one of four prescribed FMUs.

Prescribed fire is currently not used in the Wilderness Area.

Fish and Wildlife Monitoring

A number of surveys, censuses, studies, and investigations are conducted at Mingo NWR that help monitor the status of its fish and wildlife populations (USFWS, 2002).

Surveys

Waterfowl – Geese, ducks, swans, and Great Blue Herons are surveyed from vehicles along roads and levees weekly from October through March. Aerial counts are conducted biweekly by the Missouri Department of Conservation.

Bald Eagle – Annual roadside surveys are conducted to determine peak populations (about 30) and locations of wintering Bald Eagles. Three active nest sites are monitored during the breeding season to determine activity and success.

Mourning Dove – Two 25-mile off-Refuge routes assigned by the Service's Office of Migratory Bird Management are conducted annually. The Refuge Biologist runs the routes in late May to early June. Survey consists of driving 1 mile, stop, listen and count birds and coos for 3 minutes, then repeat for each mile on the route.

Mid-winter Waterfowl Survey – This is an annual survey conducted throughout the nation by the Service in cooperation with state conservation agencies. During the specified week, all waterfowl on the Refuge are counted and reported on a supplied datasheet to the Missouri Department of Conservation. Simultaneous surveys occur across the nation during this same time period. The objective of the survey is to estimate the distribution and habitat utilization of waterfowl throughout the country.

Christmas Bird Count – The East Ozark Audubon Chapter from Farmington, Missouri sponsors this annual survey, which has about 30 participants. The survey includes the entire Refuge.

Breeding Bird Count – This survey is based on observations within 25 meters from each of 60 points spaced 150 meters apart in a grid pattern. Observers record visual and audible observations to determine presence or absence of species. It takes about 4 days to complete the count, which averages 41 species.

Deer – Three counts are conducted in December and three in January (Pre- and post-hunting season). Counts are made along a 25-mile transect at night using held lights from an auto; the driver does not assist the observer. Counts are made during the dark of moon to assure maximum deer activity. The driver maintains 10 mph in wooded areas and 15 mph in open habitat. The observer counts all deer seen within 30 yards in wooded areas and 300 yards in open areas. Data have been used to modify hunts and habitat management at least seven times in recent years. Deer density is about 40 per square mile, down from an overpopulated density of 63 per square mile in the 1970s.

Mingo NWR Refuge Biologist Charley Shaiffer assessing habitat conditions on Mingo NWR. USFWS

Deer Habitat Exclosures – Three exclosures, fenced areas that exclude deer, are monitored annually to assess browse rates. There has been no significant difference in habitat quality inside and out of the exclosures. Evaluations are made once a year.

Bottomland Hardwood Regeneration – This is an annual cooperative study with MDC Forestry to determine senesce dates of mast tree seedlings in order to avoid flood-kills of seedlings during fall flooding of moist soil and green tree reservoir units.

Scent Post Surveys – This is an annual survey involving 15 stations with a 3-foot sand base circle. There have been no surprise visitors.

Moth Survey – This is an annual survey done by a private individual.

Mushroom Survey Assessment – The Mycological Society of St. Louis conducts a survey annually to inventory mushroom species.

Vegetation Transects on Moist Soil Units – This an annual survey is conducted three times in the spring on moist soil units immediately after germination. Random plots are used to determine species, density, germination dates to determine management needs for the moist soil units for the year.

Studies and Investigations

Least Bittern Nesting Ecology – Mingo NWR is one of three study areas established by the University of Missouri Gaylord Lab to study the nesting ecology of the Least Bittern. The giant cutgrass patches in Monopoly Marsh are continually searched by Lab students for nests between June through August. This study should result in a better definition of the breeding ecology of this species.

Tree Frog Surveys – A University of Missouri graduate student visits the Refuge once a year to listen for calls of the green and grey tree frogs. Call counts are used for population density estimations. This survey is to be done for 2 years.

Woodcock/Radio Tagged Birds – This is a Migratory Bird Office (MBO) study to track migrating Woodcocks. Non-Refuge personnel visit the Refuge in the fall to see if any tagged birds are using the Refuge. This is an ongoing study likely to continue to 2006.

Wood Duck and Hooded Merganser – Annually, 100 nest boxes are checked to determine estimated day of hatching and young are banded on the day of hatching. Plasticine bands are stainless steel with a clay-base liner that deteriorates as a ducking grows, leaving only the steel portion by the time the bird is full grown. The banded birds are often recaptured during Wood Duck banding, giving a reference for estimating the ratio of box nesters versus natural cavity nesters. The nest box checks are completed in conjunction with student helpers from Gaylord Lab.

Swamp Rabbits – This is a search for droppings to identify location of existing populations. MDC did this survey one year.

Mussel Survey – This was a monitoring survey to compare long-term species composition and location. Larvae movements and recruitment are inhibited by the outlet structure at end of Ditch 11. This was a repeat of an earlier survey and will not likely be repeated unless there is an identified need.

Bottomland Hardwood Bird Community Study – A Southeast Missouri State graduate student conducts forest bird surveys in Pools 3 and 7 to determine changes in the forest bird community relative to a hydrologic gradient, determine changes in forest bird activity relative to a hydrologic gradient, identify habitat characteristics related to high bird species richness, and determine if modifications in management would create a more desirable habitat for bird species. This study was initiated in 2005.

Region 3/5 Impoundment/Shorebird Study – This study involves numerous Refuges in Regions 3 and 5 and is focused on the timing of impoundment drawdowns and impact on waterbird, invertebrate, and vegetation communities within managed wetlands. Refuge biological personnel conduct waterbird/shorebird surveys, vegetation survey, and invertebrate surveys to contribute to the larger database collected from all participating refuges. Two moist-soil impoundments were selected for this study and will be manipulated according to study protocol for the duration of the study. This study was initiated in 2005 and will continue at least two years.

Spotted Skunk Survey – A University of Missouri graduate student conducted surveys on the Refuge to determine presence of spotted skunks. Scent stations were set up in Pools 8 and 7, with both track detection and photo devices to document presence of spotted skunks. No spotted skunks were detected in 2005.

Fisheries Assessment – The Refuge, in coordination with the Missouri Department of Conservation, is assessing fisheries populations on the Refuge with a focus on the Mingo Wilderness Area.

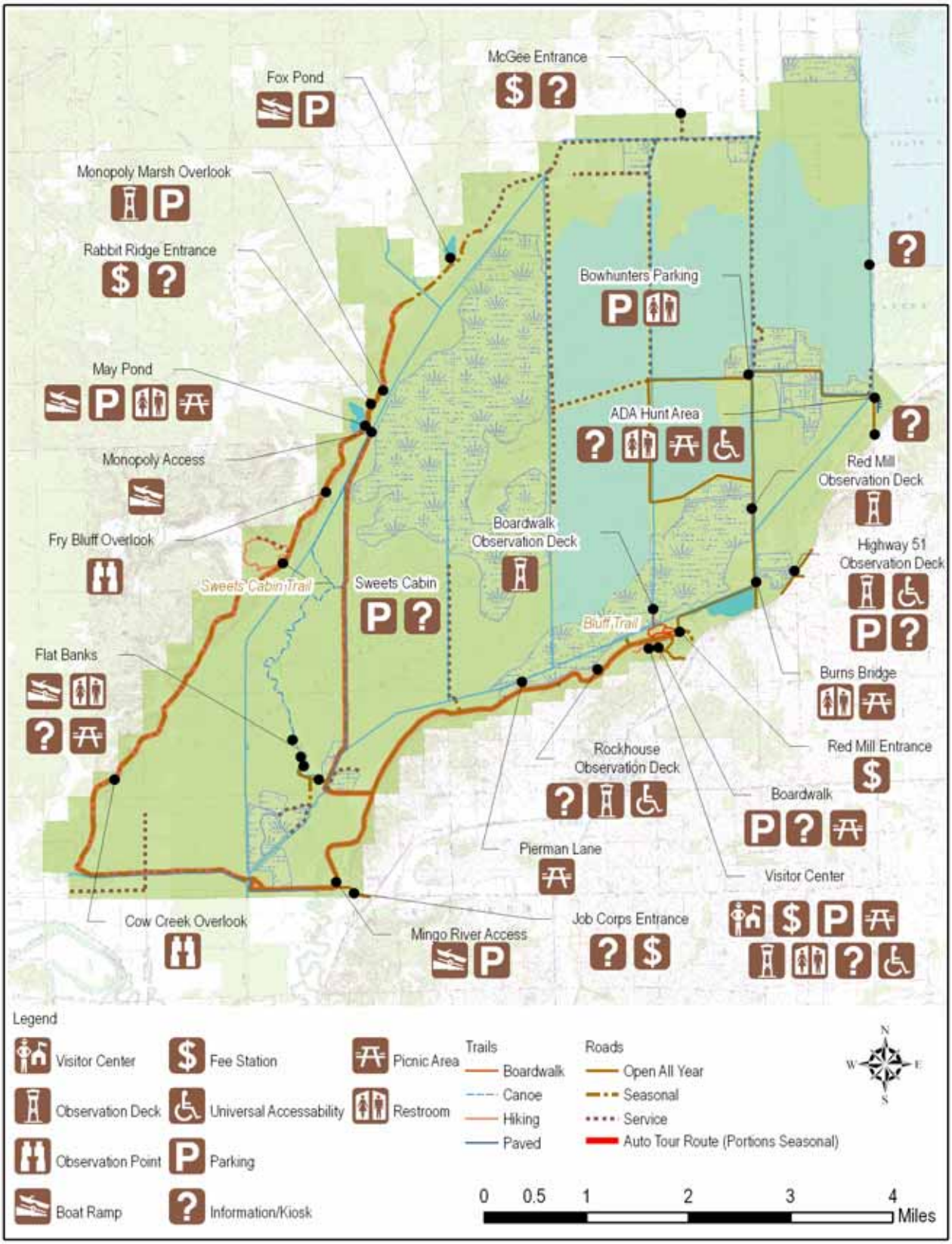
Visitor Services

Each year thousands of people visit Mingo NWR (119,439 visits in 2004) to enjoy the resources found there. The Refuge provides opportunities for six wildlife dependent public uses: hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. Additionally, the Refuge provides opportunities for canoeing, kayaking, horseback riding, biking, hiking, jogging, berry and mushroom gathering, and picnicking. At present, nearly all of the Refuge is open to some type of use throughout the year. A variety of facilities are available to enhance visitor experiences (see Figure 7).

Open Areas and Closed Periods

The Wilderness Area, Red Mill Drive, a portion of the Auto Tour Route, and the Boardwalk Nature Trail are open year-round to visitors. The hunting area is closed to general visitation from October 1 to March 1 and open the rest of the year. The canoe route is open year-round. Boating use is permitted throughout the Refuge except on Ditches 3, 4, 5 and Monopoly Marsh, which are closed from October 1 to March 1. The use of gasoline powered boat motors is prohibited. Electric motors are permitted outside the Wilderness Area but not within it. The

Figure 7: Current Facilities, Mingo NWR



moist soil units, Monopoly Marsh, and Rockhouse Marsh are closed to all entry from October 1 to March 1 during the period of peak waterfowl.

Monitoring

The number of people visiting the Refuge is estimated using car counters, counting visitors entering the Visitor Center, hunter registration stations, and counting participants at special events.

Fees

From March 15 through November 30, all visitors are required to purchase a user fee permit or hold a Federal Duck Stamp, Golden Age or Access Passport. The Refuge began the entrance fee program in 1988. The entrance fee is $3 per vehicle per day or $12 for an annual pass.

Hunting

A public hunting area is designated within the Refuge (Figure 8). Within this area archery deer and turkey hunting, spring firearm turkey hunting, and squirrel hunting are allowed concurrent with the State seasons. All hunters must register at the Hunters Sign-in Station and record the number of hours hunted and any animals harvested upon leaving the Refuge. The Refuge is open for hunters from 1 and a half hours before sunrise to 1 and a half hours after sunset.

Squirrel – Squirrel hunting is permitted from the Saturday preceding Memorial Day through September 30. Squirrel hunters may use a .22 rifle or a shotgun.

Deer and Turkey (Archery) – The archery turkey season opens September 15 and runs through January 15. The archery deer season opens September 15 and runs through January 15. Bow hunters can harvest two deer during the archery season. During the firearms deer season in November hunters with a valid firearms deer permit can archery deer hunt on the Refuge. Tree stands are permitted from 2 weeks before the season until 2 weeks after the season. All stands must be clearly marked with owner name, address, and phone number.

Managed Deer Hunt – A muzzleloading firearms deer hunt is conducted in coordination with the Missouri Department of Conservation on a western portion of the Refuge (Figure 8). Hunters are selected through a lottery system. In 2004, 1,293 people applied for the 135 available permits. A hunter was permitted to take one deer of either sex. During the hunt, the firearms hunt area is closed to other visitors, including anglers, Auto Tour Route users, and canoe trail users.

Turkey (Spring) – A spring turkey hunt is allowed that runs approximately the last week of April through the first 2 weeks of May in the General Hunt Area. The Refuge also participates in the state-wide spring youth turkey hunt that occurs 1 to 2 weeks prior to the regular turkey season.

Waterfowl – Waterfowl hunting is permitted in Pool 8 (Figure 8), a 1,191-acre Green Tree Reservoir, concurrent with the state season. The unit is managed through a cooperative agreement with the Missouri Department of Conservation as a wade-in hunting area. Duck Creek Conservation Area conducts the duck hunt on a draw operation where hunters may choose a blind in the state area or the wade-in hunting area. Many hunters prefer to hunt the flooded timber in the wade-in area. Dogs are permitted for waterfowl hunting only and must be leashed or under voice command.

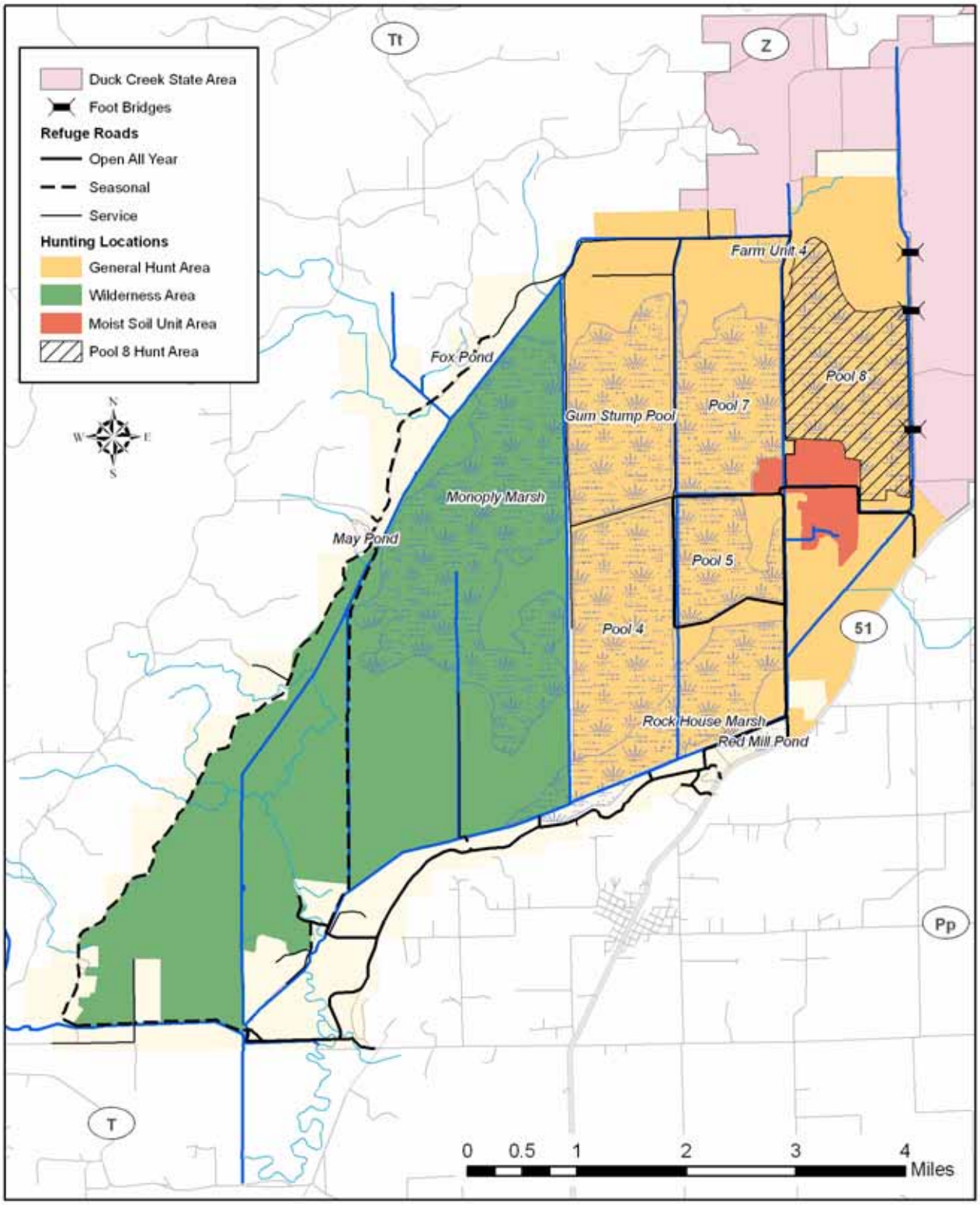
Universally Accessible Hunts – The Refuge manages an area with five blinds that can be reached by an asphalt trail. These blinds are used to hunt squirrels and spring turkeys with firearms and turkey and deer with bows. If hunters have the necessary permit from the State of Missouri, they can also hunt from a parked vehicle on pulloffs along Red Mill Drive. The Refuge has set aside a designated area for an accessible hunt during the Managed Deer Hunt (Figure 8). Five temporary blinds are used during this hunt.

Fishing

Fishing is allowed on the Refuge concurrent with state seasons and regulations. All of the Refuge is open year-round except Ditches 3, 4, 5, the moist soil units, and Monopoly Marsh, which are closed from September 15 to March 1. The road between May Pond and Fox Pond and the road between Ditches 2 and 3 are open to vehicular traffic access from May 15 to September 30. Fishing in the Managed Deer Hunt Area is closed during the weekend of the hunt.

Weather changes and water management objectives cause the fishing conditions to fluctuate greatly throughout the season and from year to year. The species most commonly sought are crappie, bass, bluegill, and catfish. It is permissible to take non-game fish for personal use, but not for commercial purposes, with nets and seines from March 1 to September 15.

Figure 8: Hunting Areas at Mingo National Wildlife Refuge



Observation, and Photography

Although observation and photography occur throughout the Refuge, facilities that support these activities by bringing the visitor closer to wildlife include the Auto Tour Route, eight overlooks and observation platforms, and five trails. The 19-mile Auto Tour Route is open during April, May, October, and November. The trails are open year-round. The primary attraction during the spring on the Auto Tour Route is spring wildflowers. The attractions in the fall are the changing colors of foliage and migrating birds.

Visitors use Bluff Road along the east side of the Refuge to view white-tailed deer and Wild Turkeys, which are commonly seen year-round. Wildlife observation appears to be weather related – the cooler the summer and milder the fall the more visitors. In the fall and winter, visitors come to see concentrations of ducks, geese, swans, and Bald Eagles. Peak months for wildlife observation are May and October.

Interpretation

Interpretation facilities on the Refuge include the Visitor Center, exhibits along the Auto Tour Route, and five trails. The Visitor Center contains an audio-visual program, exhibits, dioramas, and displays on wildlife management, swamp ecology, archaeology, geology, and history. An Auto Tour Route flier interprets points of interest, Refuge management techniques, and wildlife habitat.

Interpretive Foot Trails

The Boardwalk Nature Trail, Hartz Pond Trail, and the Trail to Sweet's Cabin offer visitors to the Refuge an opportunity to view wildlife in three distinct ecological settings.

The Boardwalk Nature Trail attracts the most visits. The trail is constructed of a raised boardwalk traversing bottomland hardwoods and Rockhouse Marsh. It is 0.8-mile long with a 0.2-mile spur leading to an overlook of Rockhouse Marsh. A spotting scope enhances wildlife viewing. The Boardwalk Trail is a highlight of the Refuge for visitors. Many local residents routinely walk the trail for exercise. Monthly tours by school group activities and other environmental education programs were conducted on the Boardwalk Nature Trail this year while taking advantage of easy access into the hardwood swamp and the opportunity to view many different species of flora and fauna.

The Hartz Pond Trail is a 0.2-mile loop around a small pond ecosystem near the Visitor Center. Due to its easy access and proximity to the Visitor Center, the trail remained popular with school groups for aquatic biology studies and other interpretive classes.

Park Ranger Vergial Harp addressing Ecology Day students at Mingo NWR. USFWS

The 1.5-mile Trail to Sweet's Cabin offers wilderness hiking and photography opportunities for the public during the Auto Tour Route months of April, May, October, and November. Winding along a riparian forested environment on the edge of the Ozark Uplands, this trail provides access to Sweet's historic cabin and the serene environment near Stanley Creek. Recent improvements to the trail have also reopened some of the areas that had once been blocked by downed trees from tornado damage in past years.

Interpretive Auto Tour Route

Open the months of April, May, October, and November, the Auto Tour Route provides access for mobility-impaired and other visitors of all ages and outdoor interest. With the assistance of a self-guided interpretive pamphlet available at the entrance kiosks, visitors enjoy a view of the Refuge that denotes key points of interest, Refuge management techniques, and wildlife habitat of many differ-

ent varieties for the 19-mile drive. The autumn foliage attracted an estimated 4,263 visitors in 2004. Spring visitors number as many as 1,761 visitors who came to view the abundance of blooming wildflowers set on a backdrop of hardwood-forested-swamp and riparian environments, Ozark foothills and meadows. The Auto Tour Route is also open during the week of the Puxico Homecoming in early August. In 2004 174 visitors utilized the Auto Tour Route during this period.

Special Events

The Refuge staff participate in two special events each year that bring the Refuge message to large numbers of people. In one event the Refuge cooperates with the Missouri Department of Conservation to provide an exhibit at the Southeast Missouri District Fair. Approximately 25,000 people are contacted each year in this cooperative effort. In the second event the Refuge participates in the Puxico's Community Homecoming Parade and visitors to the community include a visit to the Refuge in their return to the community. In 2004 approximately 2,675 visitors to the Refuge were from the Puxico Homecoming celebration.

Environmental Education

The Refuge hosts Ecology Days for Stoddard and Butler Counties. Fifth grade students from seven schools in Stoddard County and fourth grade students in Butler County participate. Ecology Days reinforces what students learn about Missouri's natural resources in the classroom. The objective of the program is to prepare students for the Missouri Mastery Achievement Test, a statewide test administered in public schools.

In addition, staff conduct environmental education programming throughout the year. In 2004, a total of 2,298 students participated in Refuge environmental education activities.

Non-wildlife Dependent Recreation

Horseback riding is allowed on the Refuge roads that are open to vehicular traffic sometime during the year. The route of the Auto Tour Route, for instance, is open year-round to horseback riding, hiking, and biking.

The canoe trail is open year round. Canoeists are primarily using the trail for bird watching and, to a lesser extent, for fishing.

Berry, mushroom, pokeweed, and nut gathering occurs near the Rockhouse Overlook and along Bluff Drive. These activities are permitted outside the Wilderness Area as long as the ground is not disturbed.

Law Enforcement

Refuge staff members with law enforcement authority work in close cooperation with Missouri Department of Conservation agents and Stoddard County deputies. The number of public contacts far exceeds the citations and warnings issued during a year. Past violations have included trespass, poaching, traffic, and parking. Problems of vandalism and littering exist, but violators are not often caught.

Partnerships

The Mingo Swamp Friends Incorporated was organized as a Refuge Friends group in 2001. The Friends offer support to the Refuge through a number of activities including outreach activities, operation of the cooperative sales unit, and improvement of facilities such as the boardwalk.

The volunteer program supports all aspects of Refuge operations. In 2004, volunteers donated a total of 2,682 hours. Volunteers helped with studies, habitat management, wildlife management, visitor services, infrastructure maintenance and improvements, and outreach.

The 84-acre Mingo Job Corps Center is adjacent to the southeast corner of the Refuge. Built in 1965, it was administered by the Fish and Wildlife Service until it was transferred to the U.S. Forest Service in January 2005. Mingo Job Corps is one of more than 120 Job Corps campuses nation-wide that deliver education and vocational training to help young people ages 16 through 24 find a career. In addition to on-site instruction, students receive on-the-job training by conducting work activities in the local community. The Refuge continues to partner with Mingo Job Corps Center on a variety of projects.

In addition to these groups, the Refuge cooperates on projects of mutual benefit with a number of partners, including:

Duck Creek Management Area
U.S. Army Corp of Engineers (Lake Wapappello Project Area; Regulatory Branch, Memphis)
Ducks Unlimited

Table 4: Invasive Plant Species and Their Control at Mingo NWR

Species Name	Control Method
Sericia lespedeza	Mowing and herbicide application
Johnson Grass	Spot spraying with herbicide
Bull Thistle	Spot spraying with herbicide
Reed Canary Grass	Herbicide application
Multiflora Rose	Tilling if possible otherwise herbicide application
Autumn Olive	Removing trees and saplings

- U.S. Navy SeaBees
- Mark Twain National Forest
- Stoddard County Sheriff
- Missouri Department of Conservation (Protection Branch; Fisheries Office; Environmental Education Branch; Private Lands Biologist)
- Missouri Department of Natural Resources
- USFWS Air Quality Office (Denver, Colorado)
- Butler and Stoddard County Extension Offices
- City of Puxico
- Duck Creek Township
- USDA Natural Resources Conservation Service
- Gaylord Laboratory of the University of Missouri
- University of Missouri, Columbia
- Audubon (Gape Girardeau and St. Louis chapters)

Pest Management

Animal Species

Refuge staff dispose of nutria whenever they are found. This invasive species, which was first discovered on the Refuge in 2000, causes damage to dikes, levees, and vegetation, especially where it occurs in high numbers. Presently, it does not occur in high numbers on the Refuge.

Beaver are native to the Refuge, but can cause problems by undermining roads, girdling trees, and plugging culverts and water control structures. Beaver problems are addressed on a case-by-case basis by Refuge staff.

Plant Species

Table 4 indicates the various ways pest plant species are controlled on the Refuge. Although invasive species, these plants are usually restricted to disturbed sites such as fields, roadsides, and levees.

Archeological and Cultural Resources

Cultural resources management in the U.S. Fish and Wildlife 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 early and timely notification of the RHPO 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. More than 140 sites are known on the Refuge, and the potential for additional sites is high.

Special Management Areas

No management activities occur within the Research Natural Areas, but they are affected by water level manipulations that occur across the Refuge.

Farm Services Administration Conservation Easements

Mingo NWR manages 17 Farm Services Agency (FSA) conservation easements totaling nearly 448 acres within a 48-county region in the southern third of the state (Table 5). All easement properties are inspected, have management plans, and are posted with signs indicating the properties are under conservation easements.

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

Table 5: FSA Conservation Easements Managed by Mingo NWR

Original Landowner	Tract	County	Easement Acres
A. Lenz	BR10c	Barton	42
J. Reaves	BR12c	Barton	50
D. Eaton	BL09c	Butler	14
A. McCombs	BL10c	Butler	17
H. Petty	BL11c	Butler	36
D. Seabaugh	CP10c	Cape Girardeau[1]	16
Probst Hog Farm	CP11c	Cape Girardeau[2]	30
C. Decker	DA11c	Dade	31
D. Eaton	DU10c	Dunklin	35
R. Mattlage	LW10c	Lawrence	4
M. Herman	PR02n	Perry	6
H. Asher	RI10c	Ripley	32
S. Kleffer	SD10c	Stoddard	13
R. Crowell	SD11c	Stoddard	19
S. Lynch	SD12c	Stoddard	29
D. Ast	VE10c	Vernon	66
Goucher		Hickory	25
Total			465

1.These acres are assumed from past reports but could not be verified.
2.These acres are assumed from past reports but could not be verified

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.

Pilot Knob National Wildlife Refuge

Introduction

Pilot Knob National Wildlife Refuge, located on top of Pilot Knob Mountain in Iron County, Missouri, is managed by staff at Mingo NWR (see Figure 9). Acquired by donation from the Pilot Knob Ore Company on July 22, 1987, the 90-acre Refuge contains iron mine shafts dating to the mid-1800s that are critical habitat for the federally-listed endangered Indiana bat. The abandoned shafts, excavated in rhyolite (a light-colored, igneous rock consisting primarily of the mineral silica), are well-ventilated by upper and lower entrances. The mine traps cold air and provides ideal conditions for hibernating bats, which enter the shafts in the fall and exit in the spring. Up to a half of Missouri's known population of Indiana bats is believed to hibernate in the old mine.

The Refuge was created expressly to protect the Indiana bat; there is no other management emphasis. Public use is prohibited at this time.

Special Management Areas

There are no special management areas on the Refuge.

Geographic/Ecosystem Setting

Pilot Knob NWR is located in southeast Missouri in Iron County. It consists of a steep conical hill, ascending more than 560 feet above the Arcadia Valley floor.

Figure 9: Location of Mingo National Wildlife Refuge

U.S. Fish and Wildlife Service Ecosystems

Like Mingo NWR, Pilot Knob NWR is situated near the boundary of the Ozark Plateau Ecosystem and the Lower Mississippi River Ecosystem. See the description of these in Chapter 1 and in Chapter 3 under Mingo NWR, respectively.

Migratory Bird Conservation Initiatives

See the discussion of these initiatives in the discussion of Mingo NWR, "Migratory Bird Conservation Initiatives" on page 21.

Region 3 Fish and Wildlife Resource Conservation Priorities

See the discussion of these priorities under Mingo NWR, "Region 3 Fish and Wildlife Resource Conservation Priorities" on page 23.

Other Recreation and Conservation Lands in the Area

The Fredericktown Ranger District of the 1.5-million-acre Mark Twain National Forest lies approximately 2 miles east of the Refuge.

Socioeconomic Setting

Pilot Knob NWR is located in rural Iron County, Missouri. Iron County lost population between 2000 and 2003, in contrast to the State of Missouri, which grew by about 2 percent; the county is also less racially and ethnically diverse than the state. Its population has a lower average income, and less high school and college education than the state's population as a whole.

When white settlers arrived in what is now Iron County in about 1800, lured mostly by its mining potential, they encountered native Osage Indians as well as displaced eastern tribes, including Delaware, Shawnee, Piankasha, Miami and Peoria (McClure, 2004). Iron County was created in 1857 by a special act of the Missouri Legislature. The St. Louis and Iron Mountain Railroad to Pilot Knob was completed the same year to haul iron ore from the mine there. With the arrival of the railroad, cutting wood and making charcoal for the engines became a big business locally. In the 1860s, Iron County saw its share of Civil War action. Today, Iron County is known for its historical sites like the Civil War-era Fort Davidson and outdoor recreation opportunities in the Mark Twain National Forest and several state parks.

Population and Demographics

The 2003 population estimate for Iron County was 10,306, which was a 3.7 percent decline from the population in 2000 (Census, 2005a). This population decline perpetuated and accelerated a 0.3 percent decline in the county's population from 1990 to 2000. Iron County's rural character is shown by its population density in 2000 of 19 persons per square mile; Missouri's population density was 81 per square mile in the same year. The county's population is less diverse than the state as a whole. Iron County was 97 percent white in 2000, compared with Missouri as a whole which was 85 percent white. In Missouri, 5 percent of the people 5 years and older speak a language other than English at home; in Iron County the corresponding figure is 2 percent. Less than 1 percent of the population was foreign-born.

Employment and Income

Private non-farm employment numbered 2,116 in 2001. Mean travel time to work was slightly higher than the state mean. The unemployment rate of 9-10 percent is almost double the national average of about 5 percent (BLS, 2005). Median household income in 1999 was $26,080, 30 percent lower than the $37,934 median for Missouri as a whole. The 1999 poverty rate of 19 percent for the county was substantially higher than the statewide average of 12 percent, although this higher rate is typical for rural counties.

Education

As with most rural counties, educational attainment in Iron County is lower than the state and nation. In 2000, 65 percent of Iron County residents 25 years old or older had a high school diploma, compared with 81 percent for the state as a whole and 80 percent for the entire United States. With regard to higher education, 8 percent of Iron County residents 25 years old or older had earned a Bachelor's degree or higher, in comparison with 22 percent of state residents 25 years old or older as a whole and 24 percent of all Americans.

Climate

The climate of the Refuge is humid continental with warm summers and cool winters. Mean annual temperature of Iron County is 56 degrees Fahrenheit (F) with a mean January temperature of 32 degrees F and a mean July temperature of 73 degrees F. Mean annual precipitation is 44.3 inches and is rather evenly distributed throughout the year with an average of 3.7 inches per month. Mean length of the growing season in Iron County is 185

days with the average first freeze date occurring October 11 and the average last freeze date occurring April 27.

Geology and Soils

Pilot Knob diverges from the general igneous hills in many aspects. It is cone-shaped and largely separated from the adjoining porphyry hills, connected on the east by a low neck of igneous rock that emerges only about 200 feet above the surrounding Cambrian rocks. It has a basal diameter of three-quarters of a mile and rises about 600 feet above the surrounding valley, attaining an elevation of approximately 1,500 feet above sea level. Buzzard Mountain is located north of Pilot Knob, across a narrow valley. Cedar Hill is located northwest of Pilot Knob, and Shepherd Mountain lies to the southwest. Other mountains can be seen to the east and southeast, all of which are composed of compact, reddish brown porphyry (igneous rock) that does not differ essentially from that constituting the lower portion of Pilot Knob.

The majority of Pilot Knob mountain soils are comprised of Killarney very cobbly silt loam, 14 to 50 percent slopes, and rubbly. This is a well drained soil with a dark grayish brown very cobbly silt loam about 3 inches thick. The subsurface soil is a very brown cobbly silt loam about 4 inches thick. The upper 29 inches of the subsoil is yellowish brown very cobbly silt loam, and very gravelly silty clay loam. The surface runoff is high and erosion is a major hazard. The Killarney soil type covers approximately 50-60 percent of the mountain's base.

The second soil type is Irondale very cobbly silt loam, 15 to 40 percent slopes, and rubbly. Stones and boulders generally cover 15 to 50 percent of the surface. The surface layer is extremely dark grayish brown very cobbly silt loam about 3 inches thick. The subsurface layer is a brown very cobbly silt loam about 5 inches thick. The subsoil is very cobbly silt loam about 32 inches thick. It is yellowish brown in the upper part and reddish brown in the lower part. Rhyolite bedrock is at a depth of about 35 inches. Permeability is moderate, but surface runoff is rapid. The organic content is low, and the surface layer is friable but cannot be easily tilled because it commonly has 50 percent or more rock fragments.

Water and Hydrology

As indicated in a previous section, annual mean precipitation at Pilot Knob NWR is about 44 inches, more or less evenly distributed throughout the year, and falling as rain.

Refuge Resources

Plant Communities

Forests

Upland forest covers the Refuge. Oak-hickory forest types predominate on the cobbly silt loam areas, and are interspersed with shortleaf pine in places. These shallow soils support various forbs and native grasses, such as sumac (*Rhus* spp.), coralberry (*Symphoricarpos orbiculatus*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), and indiangrass (*Sorghastrum nutans*).

Fish and Wildlife Communities

Birds

Appendix C shows the bird species that have been documented at Pilot Knob NWR.

Mammals

See Appendix C for a list of the mammals documented or suspected to occur at Pilot Knob NWR.

Amphibians and Reptiles

See Appendix C for a list of amphibians and reptiles found on the Refuge.

Fish

Due to its location atop a hill or small mountain, there are no water bodies that contain or might contain fish at Pilot Knob NWR.

Invertebrates

At this time, the Refuge does not possess a list of invertebrates whose presence on the Refuge has been documented.

Indiana bat on Pilot Knob NWR. USFWS

Threatened and Endangered Species

The federally-listed endangered Indiana bat hibernates within the abandoned mine shaft located at the peak of Pilot Knob Mountain. There are differing estimates of Pilot Knob NWR's Indiana bat population, but the number is likely within the range of 50,000 to 100,000. The bats generally arrive in September and leave in April. The bat's historic range includes Missouri, and its summer habitat preference is small to medium river and stream corridors with well developed riparian woods, woodlots within 1 to 3 miles of small to medium rivers and streams, and upland forests.

The Indiana bat was added to the federal endangered species list in 1967. Its dwindling population continues to cause concern and support its protection at the Refuge. Its decline has many different contributing factors, including the commercialization of roosting caves, wanton destruction of habitat by vandals, disturbances caused by increased numbers of spelunkers, bat banding programs, use of bats as laboratory experimental animals, and suspected insecticide poisonings (USFWS, no date-d).

The gray bat also hibernates in the mine, and is federally listed as an endangered species. The bat's fall migration begins in early September and is generally completed by early November.

Since its placement on the endangered species list in 1976, the gray bat has become of particular concern. Its population decline is believed to be due primarily to human disturbances. These disturbances include vandalism, excessive pesticide use, overall insect prey decline due to pollution, and cave commercialization. The decline in gray bat populations can also be attributed to natural catastrophes. Collapsing caves and flooding have been known to render many gray bats homeless.

Since 1976, efforts have been made to assist the recovery of these nearly extinct animals. Some of the major recovery goals include:

Preserving critical winter habitat by securing primary caves and mines and restricting entry.
Initiating informational and educational programs.
Monitoring population levels and habitat to include an evaluation of pesticide effects.

Threats to Resources

Invasive Species

There are no invasive species known to occur on Pilot Knob NWR.

Contaminants

Contaminants have not been studied or documented on the Refuge, but may be expected to occur in at least low concentrations, as they do in virtually all locations. Whether or not these concentrations pose a threat to wildlife and listed species at Pilot Knob NWR is yet to be determined.

Administrative Facilities

No administrative facilities are present on the Refuge. The Refuge is managed entirely by staff from Mingo NWR, 75 miles to the southeast.

Archeological and Cultural Values

No archeological investigations have occurred at Pilot Knob NWR. The iron mine probably is not eligible for the National Register of Historic Places. The summit of Pilot Knob encompassed by the Refuge is thought to have historic significance related to a Civil War battle fought nearby.

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.

Visitation

Pilot Knob NWR has never been managed for, nor open to, the public. It has always been managed strictly to protect and enhance Refuge habitat to maintain or increase use by endangered species. Scientific investigations, research, and monitoring are allowed by permit only.

Current Management

Habitat Management

There is no active habitat management program at Pilot Knob NWR.

Fire Management

Fire management at Pilot Knob NWR is guided by a Fire Management Plan (FMP) adopted in 2003 (USFWS, 2003c). The FMP describes the responsibilities of each member of the fire management team, including training, experience, physical fitness requirements, and fire duty assignments.

All wildland fires are suppressed at Pilot Knob and wildland fire use for resource benefit is not be utilized at the present time. Currently prescribed fire is not used either for fuel reduction or habitat management on the Refuge.

Fish and Wildlife Monitoring

Annual bat capture surveys and temperature monitoring in the mine shafts are conducted in conjunction with the Missouri Department of Conservation. Comparison of capture rates helps determine the population trend for Indiana bats.

Visitor Services

The Refuge is not open to the public. No hunting, fishing, wildlife observation or photography take place on Pilot Knob NWR. Refuge staff have recently conducted interpretive hikes as part of the Civil War reenactments at Fort Davidson State Historic Park. In addition, approximately 40 college geology students visit the Refuge annually to study the unique geomorphology. This is done under special use permit and is a Refuge staff member accompanies students.

Non-wildlife dependent recreation is not currently permitted.

Pest Management

No pest management is conducted on the Refuge.

Archeological and Cultural Resources

No management of archeological or cultural resources takes place on the Refuge.

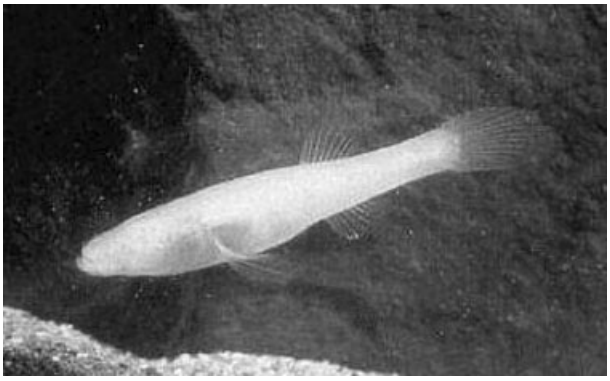
Special Management Areas

The Refuge has no special management areas.

Ozark Cavefish National Wildlife Refuge

Introduction

The 40-acre Ozark Cavefish National Wildlife Refuge, located 20 miles west of Springfield in Lawrence County, Missouri, was acquired in 1991 to protect a federally-listed endangered species, the Ozark cavefish (Figure 10). Turnback Creek Cave Spring is located on this property and is the outlet of an underground stream known to contain a population of the endangered Ozark cavefish. According to the preliminary project proposal approved in 1991, Turnback Creek Cave was one of 21 Ozark cavefish sites in three states identified for potential inclusion in the Refuge, but a detailed plan including all sites was not completed. Land acquisition and planning was limited to the existing parcels. Access to the stream is gained via Turnback Cave, which has openings on adjacent property owned by the Missouri Department of Conservation. There is also a separate 1.3-acre parcel of the Refuge located several miles away along the Hearrell Spring in Neosho, Missouri, that adjoins the Service's Neosho National Fish Hatchery. Ozark cavefish are known to inhabit this site (Figure 11). The Refuge is managed by staff at Mingo NWR in Puxico, Missouri, some 200 miles east of the Refuge.



Ozark cavefish. USFWS

Special Management Areas

Ozark Cavefish NWR does not contain any special management areas.

Geographic/Ecosystem Setting

U.S. Fish and Wildlife Service Ecosystem

Like Mingo NWR, Ozark Cavefish NWR is within the Ozark Plateau Ecosystem. See the description of this ecosystem in Chapter 3 under Mingo NWR.

Migratory Bird Conservation Initiatives

See the discussion of these initiatives under Mingo NWR, "Migratory Bird Conservation Initiatives" on page 21.

Region 3 Fish and Wildlife Resource Conservation Priorities

See the discussion of these priorities under Mingo NWR, "Region 3 Fish and Wildlife Resource Conservation Priorities" on page 23.

Other Recreation and Conservation Lands in the Area

The 208-acre Paris Springs Access managed by the Missouri Department of Conservation adjoins the Refuge to the south.

Socioeconomic Setting

All but 1.3 acres of Ozark Cavefish NWR is located in Lawrence County, Missouri. The county, organized in 1845 out of northern Barry and south-

Figure 10: Turnback Creek Unit, Ozark Cavefish NWR

Figure 11: Hearrel Spring Unit, Ozark Cavefish NWR

ern Dade counties, was named for Captain James Lawrence, a hero of the War of 1812. The first settlers of European descent began arriving in what is now Lawrence County in the early 1830s, about 5 years after the Indian Removal of 1825. These migrants came primarily from Virginia, Kentucky, North and South Carolina and Tennessee. Today the county has 14 townships with Mt. Vernon being the county seat (MOGenWeb, 2004).

Lawrence County is primarily agricultural, its principal products including wheat, hay, oats, barley, corn, apples, peaches, and vegetables. Farmers also raise turkeys and cattle and there is a dairy industry. Manufacturing, primarily dairy and grain products, occurs in the towns of Aurora, Mt. Vernon, Pierce City, and Marionville.

Population and Demographics

The 2003 population estimate for Lawrence County was 36,426, which was a 3.5 percent increase from the population in 2000 (Census, 2005b), nearly double the rate of population growth in Missouri as a whole (1.9 percent from 2000 to 2003). This population growth continued a trend from the 1990s during which the county's population grew by 16.4 percent, in comparison to 9.3 percent for the state. Lawrence County's population density in 2000 was 57 persons per square mile, a little less Missouri's density of 81 per square mile in the same year. The county's population is less diverse than Missouri's. Lawrence County was 96 percent white in 2000, compared with Missouri as a whole which was 85 percent white. Blacks comprised 0.3 percent of the county population versus 11 percent in the entire state. The population of people of Asian descent was 0.2 percent, which compares to 1.1 percent in the entire state. However, both American Indians and Hispanics are represented in greater proportions in the county population than in the state's population. Hispanics compose 3.4 percent of the Lawrence County population compared to 2.1 percent of Missouri's population, while American Indians make up 0.8 percent of the county population compared to 0.4 percent of the state as a whole. Approximately 2 percent of the county population was foreign-born, about the same percentage as the state's foreign-born population (Census, 2005b).

Employment and Income

Private non-farm employment in Lawrence County numbered about 7,000 in 2001. Mean travel time to work was almost identical to the state mean, 23.6 compared to 23.8 minutes. The county unemployment rate of 4-5 percent is very close to the national average (BLS, 2005). Median household income in 1999 was $31,239, 18 percent lower than the $37,934 median income for Missouri as a whole. The 1999 poverty rate of 14 percent for the county was slightly higher than the statewide average of 12 percent, although this higher rate is typical for rural counties (Census, 2005b).

Education

Average educational attainment in Lawrence County is slightly lower than averages for the state and nation. In 2000, 77 percent of county residents 25 years old or older had a high school diploma, compared with 81 percent for the state as a whole and 80 percent for the entire United States. With regard to higher education, 12 percent of Lawrence County residents 25 years old or older had earned a Bachelor's degree or higher, compared to 22 percent of state residents 25 years old or older as a whole and 24 percent of all Americans.

Climate

The climate of Lawrence County is humid continental with warm summers and cool winters. Mean annual temperature of Lawrence County is 55.9 Fahrenheit with a mean January temperature of 32.6 F and a mean July temperature of 77.7 F. Rainfall is fairly heavy with mean annual precipitation of 39.74 inches and is rather evenly distributed throughout the year with an average of 3.3 inches per month. Mean length of the growing season in Lawrence County is 189 days with the average first freeze date occurring October 14 and the average last freeze date occurring April 28.

Geology and Soils

Wilderness cherty silt loam, the primary soil type found on the Refuge, has 2 to 9 percent slopes. It is deep, gently or moderately sloping, and moderately well drained. Some areas have small and large sinkholes. Coarse fragments of chert are on the surface. Generally, the surface layer is dark grayish brown cherty silt loam about 2 inches thick. The subsurface layer is brown cherty silt loam about 8 inches thick. The subsoil above the fragipan is about 11 inches thick, with the upper part being a yellowish brown, friable cherty silt loam, and the lower part a brown, firm cherty silty clay loam. The fragipan is about 35 inches thick. The upper part is pale brown, firm, cherty silt loam, and the lower part is mottled, multicolored, firm very cherty silty clay loam. The subsoil below the fragipan is dark red, very firm cherty clay to a depth of 72 inches. Some areas are stony.

This soil is moderately permeable and surface runoff is medium.

Water and Hydrology

Turnback Cave is developed in Mississippian Burlington-Keokuk Limestone on the west side of Turnback Creek in Lawrence County. It is an extensive cave containing over 3,000 feet of interconnecting passages. The stream passage is a few hundred feet from the main entrance and trends roughly north. Water enters the stream passage at the southern end, and exits the cave through a spring along Turnback Creek to the north. Turnback Creek originates in northwestern Christian County about 12 miles southeast of Turnback Cave.

Refuge Resources

Plant Communities

Wetlands

Terrace Bottoms Community – Terrace or second bottoms are located at the base of lower slopes, flat banks, and watercourse margins. These well-drained and rarely flooded transitional areas support a mixture of upland and flood plain woody species. Major trees are:

Sugar Maple (*Acer saccharum*)
Northern Red Oak (*Quercus rubra*)
Shagbark Hickory (*Carya ouata*), Bitternut Hickory (*Carya cordiformis*)
Sweetgum (*Liquidambar styraciflua*)
American Elm (*Ulmus americana*)
Hackberry (*Celtis occidentalis*)
Box Elder (*Acer negundo*)
Chinkapin Oak (*Q. muehlenbergii*)
Blackgum (*Nyssa sylvatica*)
Black Walnut (*Juglans nigra*)
Butternut (*Juglans cinerea*)
Black Cherry (*Prunus serotina*)
Bur Oak (*Q. macrocarpa*)
Southern Red Oak (*Q. falcata*)

Mixed Soft-Hardwood Levees Community – This community type exists along drainage ditch levees, stream margins, roadside embankments, and other watercourse borders. Tree species include:

Black Willow (*Salix nigra*)
Cottonwood (*Populus deltoides*)
Silver Maple (*Acer saccharinum*)
Sycamore (*Platanus occidentalis*)
River Birch (*Betula nigra*)

Later successional species occurring in this community are similar to the Oak Hardwood Bottoms community.

Forests

Upland Old Fields Community – These areas include scattered woodland clearings, abandoned fields or pastures, and ridge roadsides which are reverting to an oak-hickory forest. Principal trees and shrubs are:

Sassafras (*Sassafras albidum*)
Persimmon (*Diospyros virginiana*)
Honey Locust (*Gleditsia triacanthos*)
Sumac (*Rhus spp.*)
Elm (*Ulmus spp.*)
Black Walnut (*Juglans nigra*), Red Cedar (*Juniperus virginiana*)
Blackberry (*Rubus allegheniensis*)
Dewberry (*Rubus spp.*)
Coralberry (*Symphoricarpos orbiculatus*)
Multiflora Rose (*Rosa spp.*)

Xeric Ridge Crests Community – The driest and most exposed forest community exists on ridge crests, bluff tops, and upper slopes on thin, excessively drained soils. Over-story trees include:

Black Oak (*Quercus velutina*)
Post Oak (*Q. stellata*)
White Oak (*Q. alba*)
Black Hickory (*Carya texana*)
Mockernut Hickory (*C. tomentosa*)
Elm (*Ulmus* spp.) and White Ash (*Fraxinus americana*)

Understory trees and shrubs are:

Serviceberry (*Amelanchier spp.*)
Winged Elm (*Ulmus alata*)
Big Tree Plum (*Prunus mexicana*)
Sparkleberry (*Vaccinium arboreum*)
Hawthorn (*Crataegus spp.*)
Southern Blackhaw (*Viburnum spp.*)
Sumac, Blueberry (*Vaccinium spp.*)
St. Andrew's Cross (*Ascyrum hypericoides*).

Mesic Slopes Community – Great species diversity occurs on the middle to lower slopes because of improved temperature-moisture conditions. Important trees and shrubs include:

Deer fawn along the Auto Tour Route, Mingo NWR.

- White Oak (*Quercus alba*), Mockernut Hickory (*Carya alba*) Shagbark Hickory (*Carya ovata*)
- Chinkapin Oak (*Quercus muehlenbergii*)
- White Ash (*Fraxinus americana*), Sassafras (*Sassafras albidum*), Flowering Dogwood (*Cornus florida*)
- Mulberry (*Morus spp.*)
- Pawpaw (*Asimina triloba*)
- Bladdernut (*Staphylea trifolia*)
- Spicebush (*Lindera spp.*)
- Devil's Walking Stick (*Aralia spinosa*)
- Wild Hydrangea (*Hydrangea arborescens*).

Fish and Wildlife Communities

Birds

The Service has no information on the species of birds that may be present on the Refuge; the Refuge has no bird list. However, a number of avian species nest or migrate through the area and these may be expected to occur at least seasonally on Ozark Cavefish NWR.

Mammals

At this time, the Refuge does not have a mammal list, though a number of species would be expected to occur at Ozark Cavefish NWR.

Amphibians and Reptiles

At this time, the Refuge does not have a list of amphibians and reptiles, though a number of species would be expected to occur at Ozark Cavefish NWR.

Fish

At this time, the Refuge does not have a list documenting which species of fish are present.

Invertebrates

There is not a complete list of invertebrates occurring on the Refuge, but the Bristl Cave crayfish (*Cambarus setosus*), a Missouri state-listed species of conservation concern, is known to occur within Turnback Creek Cave Spring.

Threatened and Endangered Species

Two species that are listed as endangered, threatened, or rare species occur on Ozark Cavefish NWR.

A population of federally-listed threatened Ozark cavefish (*Amblyopsis rosae*) inhabits Turnback Creek Cave Spring within the Ozark Cavefish NWR. The Ozark cavefish was listed as threatened in 1984. A colorless fish about 2 and one-quarter-inches long, its head is flattened, and it has a slightly protruding lower jaw. The fish has no pelvic fin and its dorsal and anal fins are farther back than on most fish. The Ozark cavefish has only rudimentary or vestigal eyes and no optic nerve. However, it is well-adapted to dark environment of caves through well-developed sensory papillae. The reproductive rate of Ozark cavefish is comparatively low (USFWS, 1992).

The Ozark cavefish lives its entire life in cave streams, underground waters, and springs. It uses sense organs located on the sides of its head, body, and tail to find food. Its range is restricted to caves in Missouri, Arkansas, and Oklahoma; as of 1992, 15 caves had verified populations. Ozark cavefish rely heavily on microscopic organisms like plankton as a food source, but also feed on small crustaceans, salamander larvae, and bat guano.

Factors that have led to the decline of the Ozark cavefish include habitat destruction, collecting of specimens, and disturbance by spelunkers (cavers). In terms of its recovery, protection of caves containing cavefish is the most important task. This includes monitoring the quality of water flowing into these caves, and erecting fences or gates that limit access by humans but that do not interfere with bat populations. In many caves, the principal source of energy for the organisms on which cavefish feed is bat guano. Therefore, Ozark cavefish survival depends on the survival of bats.

The federally-listed endangered gray bat utilizes Turnback Cave in the summer for reproductive and

Food aplenty on Rockhouse Marsh, Mingo NWR.

rearing purposes. As mentioned above, guano produced by the bats provides an important food source for Ozark cavefish.

Threats to Resources

Invasive Species

No invasive species are known to occur on Ozark Cavefish NWR.

Contaminants

The situation with regard to contaminants on the Refuge is unknown.

Administrative Facilities

No administrative facilities are present on the Refuge. The Refuge is managed entirely by staff from Mingo NWR 200 miles to the east.

Archeological and Cultural Values

No archeological investigations have occurred at Ozark Cavefish NWR, and no cultural resources have been identified on the Refuge.

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.

Visitation

The Refuge is not open to the public, and no visitor services are provided.

Current Management

Ozark Cavefish NWR is not managed for, nor is open to the public. It is managed strictly to protect and enhance Refuge habitat to maintain or increase use by endangered species, in particular the fish for which it is named – the Ozark cavefish, and the Federally endangered gray bat, on whose guano the cavefish depends in part. Scientific investigations, research, and monitoring are allowed by permit only.

Specific objectives include, but are not limited to:

Ensure protection of the federally-listed endangered gray bat maternity colony inhabiting the cave and utilizing the Refuge.
Ensure protection of the federally-listed endangered Ozark cavefish population inhabiting the cave stream.
Protect the uncommon bristle cave crayfish population inhabiting the cave stream.
Prohibit recreational visitation to the site.
Prevent potentially adverse impacts on the site and its ecosystem from surface management practices.

Habitat Management

There is no active habitat management program at Ozark Cavefish NWR at the present time.

Fire Management

Fire management at Ozark Cavefish NWR is guided by a Fire Management Plan (FMP) adopted in 2003 (USFWS, 2003c). The FMP describes the responsibilities of each member of the fire management team, including training, experience, physical fitness requirements, and fire duty assignments.

All wildland fires are suppressed at Ozark Cavefish and wildland fire use for resource benefit is not be utilized at the present time. Currently prescribed fire is not used either for fuel reduction or habitat management on the Refuge.

Fish and Wildlife Monitoring

Other than observation and monitoring of the rare, threatened and endangered species that exist on the Refuge, no additional fish and wildlife monitoring takes place.

Visitor Services

The Refuge is not open to the public, and no visitor services are provided. Priority public uses including hunting, fishing, wildlife observation and photography, and environmental education and interpretation are not allowed. Non-wildlife dependent recreation is not permitted at present.

There is an underwater camera installed at Hearell Springs. Visitors to the Neosho National Fish Hatchery have an opportunity to view a video image of this elusive species. Approximately 40,000 to 45,000 people visit the hatchery annually.

Pest Management

No pest management is conducted on the Refuge.

Archeological and Cultural Resources

No management of archeological or cultural resources takes place on the Refuge.

Special Management Areas

The Refuge has no special management areas.

Chapter 4: Future Management Direction

Goals, Objectives and Strategies

The Environmental Assessment in Appendix A describes and analyzes a series of management alternatives: four for Mingo NWR, two for Pilot Knob NWR, and two for Ozark Cavefish NWR. The Service identifies one preferred alternative for each refuge. These preferred alternatives are described in the following chapter as the proposed future management direction that would guide activities on the three refuges for the next 15 years. In some cases the proposed future management direction describes initial steps of a long term vision that may take 100 years or more to achieve.

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 six goals for Mingo NWR and two each for Pilot Knob NWR and Ozark Cavefish NWR. Goals are followed by objectives, specific statements that describe management intent. Objectives provide detail and are supported by rationale statements that describe background, history, assumptions, and technical details to help understand how the objective was formulated. Finally, beneath each objective are lists of strategies—specific actions, tools, and techniques required to fulfill the objective.

Bullfrog on Mingo NWR. USFWS

Mingo National Wildlife Refuge Goals, Objectives and Strategies

Goal 1: Habitat

The Refuge will actively conserve a mosaic of upland and wetland habitats, including designated wilderness, through appropriate management strategies that preserve, protect, and enhance the vitality and health of the natural environment.

Objective 1.1: Ditch System

Over the next 15 years, maintain the rate and volume of water movement at or above 2005 levels within a portion of Ditch 10 and all of Ditches 1, 2, 3, 5, 6, and 11, totaling approximately 34 miles, by ensuring that at least 75 percent of the depth along these stretches is free of sediment and the length is free of obstructions that impede water flow. Maintain rate and volume of water movement at or above 2005 levels within the remaining ditches based on measurements of water flow, sedimentation rates, and duration of flooding..

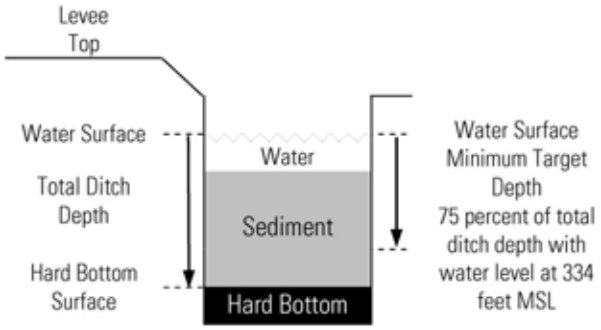
Supporting Rationale

Actions to improve water transport throughout the ditch network reduce flood duration and improve bottomland forest dynamics, helping meet the Refuge purpose of providing habitat for migratory birds. Floodwaters that once flowed across the entire Mingo basin are now channeled by ditches totaling more than 50 miles. Land use changes within much of the watershed that increased sedimentation rates prevent restoration of sprawling flow across the Mingo basin. The ditch network traps the increased amount of sediment that would choke existing habitats if carried by slower sprawling flow. Dikes and water control structures placed along the ditch system that assisted water management also reduced water velocity increasing the rate of sedimentation. A 1995 survey showed 5-7 feet of sediment accumulation throughout most of the ditch network. This diminished the ditch network's ability to transport and hold water causing prolonged flooding that adversely affected the bottomland forest as well as fish populations. Total ditch depth varies across the Refuge and is measured vertically from the water surface to the surface of harder underlying soils when the water level is at 334 feet MSL. See Figure 12.

Strategies:

1. Use an excavator to remove sediment from the ditches and pile it along adjacent banks.
2. Seek funding and full-time (1.0 FTE) heavy equipment operator to accelerate the rate of sediment removal.
3. Within 3 years of CCP approval, develop an MOU between Mingo NWR and Duck Creek Wildlife Management Area to manage water jointly, both for public use and habitat management.
4. Maintain thorough records of when each reach of each ditch was cleaned out. Monitor depths and widths of ditches over time to assess rate of future sedimentation and develop a timetable for systematic ditch maintenance.
5. Continually investigate possible ways of speeding up ditch cleaning or making it more efficient.
6. Repair, replace and upgrade water control structures (converting to bottom draw) as needed, including Ditch 2 pump.

Figure 12: Ditch Structure



7. Consider hiring a professional hydrologist and conducting an elevation survey to guide improvements to the drainage network.
8. Maintain levees after silt removal to provide maintenance access.
9. Plant cover crops on levees for wildlife use.
10. Place water control structure along Ditch 10.
11. Maintain spring drainage so that system is flushed from bottom of water column.

Objective 1.2: Forest

Over the long-term (100-200 years), on 15,547 acres of the Refuge, achieve a mosaic of bottomland hardwood stands of different age and structural classes distributed across a narrow elevation gradient ranging from 335.5-339.5 feet MSL with lower elevations dominated by bald cypress and water tupelo, mid elevations dominated by overcup oak and red maple, and upper elevations dominated by red oak species and willow oak. Within 15 years, ensure that approximately 20 percent (with a long-term target of 40 percent) of stands presently dominated by overcup oak, red maple and their associates are converting to red oak species, willow oak and their associates based on regeneration surveys.

Supporting Rationale

Land use practices and modifications to the hydrology of the Mingo basin over the past 120 years impeded drainage, causing seasonal flooding to persist for longer than had occurred historically (Heitmeyer et al. 1989). The prolonged flooding helped shift composition of bottomland hardwood forests towards species with greater

water tolerances, and largely eliminated regeneration resulting in single-aged mature stands. Changes to the drainage system now allow for water management that more closely resembles those earlier conditions and the restoration of species associated with those conditions. This objective represents the Refuge's intent to more actively manage bottomland forest habitat to benefit forest-dependent wildlife, especially certain species of migratory waterfowl, neotropical migratory birds and mammals (like swamp rabbit). The 15,547-acre objective represents an increase of 547 acres over existing acreage; the additional amount comes from conversion of 225 acres of open marsh and 322 acres of other open habitats.

Strategies for Green Tree Reservoirs (Pools 5, 7, and 8 totaling about 3,040 acres)

1. Continue to flood three Green Tree Reservoirs (Pools 5, 7, and 8), totaling 3,040 acres, for no more than 130 consecutive days between November and March. Drain water prior to growing season to encourage regeneration and avoid killing trees. Under dry conditions may hold water in Green Tree Reservoirs into spring.

Strategies for Bottomland Hardwoods (includes Green Tree Reservoirs)

2. Conduct forest surveys or inventories every 5 years to monitor changes in health, composition, and structure of lowland and upland forests.
3. Develop and implement 5-year forest management plan.
4. Manage timber to promote regeneration of willow oak, pin oak, and red oak.
5. As indicated, conduct forest management activities such as thinning dense stands or midstory and selective harvest on a small scale to allow for habitat diversity and opening of canopy to stimulate plant growth, regeneration and recruitment on forest floor.
6. Provide vernal pools where feasible.
7. Allow water levels to fluctuate between mid-December to April. Have areas flooded no more than 130 consecutive days between November and March.
8. Conduct a study to learn more about the hydrology and geomorphology of the Refuge.

Objective 1.3: Open Marsh

Over the next 15 years, maintain approximately 3,075 acres of open marsh habitat within Rockhouse Marsh (900 acres) and Monopoly Marsh (2,175 acres) comprised of a mixture of submergent vegetation such as coontail (*Ceratophyllum demersum*) and American pondweed (*Potamogeton nodosus*), floating vegetation such as water lily (*Nymphaea odorata*) and watershield (*Brasenia schreberi*), and emergent vegetation such as narrowleaf cattail (*Typha angustifolia*) and lizard's tail (*Saururus cernuus*), and convert approximately 225 acres of Monopoly Marsh from open marsh habitat to wet forest dominated by bald cypress and water tupelo.

Supporting Rationale

Monopoly and Rockhouse marshes encompass 3,300 acres of Refuge lands. These open marshes provide vital nesting, resting, and feeding habitat to a wide variety of waterfowl, shorebirds, and wading birds. Wood ducks utilize the marshes of Mingo throughout the year as they provide the proper habitat requirements for all life stages of this species and ducklings from over a 10 mile radius migrate to Monopoly every year. The marshes receive a combined total of over nine million waterfowl use days annually. Many other species of birds, reptiles, amphibians, fish, and mammals utilize the marshes on a regular basis.

Strategies:

1. Draw down Monopoly Marsh once every 2-3 years, temporarily shrinking the flooded area to 30 acres.
2. Draw down Monopoly Marsh incrementally over 10 years to progressively expose edge habitats allowing for eventual conversion of about 225 acres to bald cypress and water tupelo.
3. Accelerate removal of willow and promote fluctuating water levels via enhanced water level control capability.
4. Restore ingress/egress fish (and other aquatic species) passages to both marshes and assess and enhance fish passage as necessary during draw downs.
5. Consider that Monopoly Marsh is located within the Wilderness Area and manage accordingly, i.e. through use of minimal tools.
6. Drawdown Rockhouse Marsh to 334 feet MSL by May 15 every other year, and remove

woody vegetation (willow) during drawdown. Reflood the marsh beginning on October 1.

7. Conduct vegetation surveys every 5 years to gauge success of reforestation along perimeter of Monopoly Marsh.
8. Conduct vegetation surveys every 2 years to monitor expansion of emergent vegetation in the basin including cut grass.

Objective 1.4: Open Water (excluding ditches)

Over the next 15 years, maintain the amount of open water at or above 2005 levels (9.2 miles of streams and 200 acres of other open water) within Red Mill Pond, May Pond, Fox Pond, Stanley Creek, Mingo River, Lick Creek, and Cow Creek, and decrease the amount of open water in Gum Stump. Within 5 years increase the amount of open water by about 20 acres within the Binford Unit and increase the amount of structure within Fox Pond.

Supporting Rationale

Water not only drives the ecology of Mingo NWR, but is a valuable habitat type in its own right for innumerable invertebrates and all five orders of vertebrates, including many species of birds, mammals, amphibians, reptiles, and fish. Mingo's watershed is comprised of approximately 90 square miles which includes nearly 60 square miles outside of the Refuge boundary. The refuge is within the lower portion of the St. Francis River basin and acts as a storage reservoir or detention basin during periods of flooding. Most of the open water on the refuge exists due to impoundment by water control structures and/or levees and recharge is dependent upon runoff and direct precipitation. Water levels of Stanley Creek, the Mingo River, Red Mill Pond, and Gum Stump are managed in accordance with the Annual Water Management Plan.

Strategies

1. Continue to manage ponds, pools, and impoundments using the appropriate tools such as periodic drawdowns, vegetation removal, and levee and structure maintenance.
2. Ensure appropriate consultation and cooperation between fishery biologists and engineers in construction of open water on Binford Unit and in the rehabilitation of Hartz Pond.
3. Use tree drops in some ponds to create habitat structure and fish cover.
4. By 2010, construct about 20 acres of open water at Binford Unit to provide additional fishing opportunities.
5. By 2010, rehabilitate Hartz Pond for fishing opportunities.

Objective 1.5: Moist Soil Units

Over the next 15 years, manage Moist Soil Units 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.) with an annual seed/rhizome/tuber production of at least 1,000 lbs/acre above ground and 600 lbs/acre below ground based on grid sampling as defined by Laubhan and Fredrickson (1992).

Supporting Rationale

Moist soil management is a widespread practice for producing a diverse mixture of native herbaceous plant foods and invertebrates that has its origins at Mingo NWR (Fredrickson and Taylor 1982). It partially mimics seasonal flooding that has long occurred in the lowlands of the Mingo basin, but moist soil units – areas impounded by levees, dikes, and structures that permit precise control of water levels – allow managers to consistently produce conditions favorable to growth of native plants. Seeds produced by these plants provide balanced nutrition for migrating waterfowl, and also provide food and habitat for other migratory birds and wildlife. The diverse mixture

Mingo National Wildlife Refuge

of native plants also creates conditions that produce abundant invertebrates, a high protein wildlife food source.

Strategies:

1. Disturb (through mowing, disking, fire, etc…) an average of one-third of Moist Soil Unit acreage annually to set back succession.
2. Moist soil units will be maintained in early successional native plant communities for the production of annual seed crops.
3. Flood Moist Soil Units in stages beginning in October or November, initially flooding one-third and progressively flooding more of each unit as waterfowl deplete the food supply until units are entirely inundated.
4. Maintain MSUs dry throughout the growing season to produce food for migratory birds.
5. Maintain pumps, dikes and water control structures in good working order.
6. Maintain units to demonstrate comparison practices for educational purposes.
7. Replace water control structures and slope sides of borrow pits, thereby increasing opportunities for wildlife observation and environmental education and research.
8. Develop waterfowl public educational seminars and tours course conducted by Leigh Fredrickson and Mickey Heitmeyer.
9. Develop MOU with MDC on management of Moist Soil Unit 11 (Luken Farm).
10. Explore land exchange with MDC for Luken Farm property.
11. Provide additional fall-flooded, shallow-water habitat for shorebirds when feasible.
12. Maintain stable water levels at 1 to 6 inches across 80 to 90 acres of moist soil units from March through July 31 and encourage a mosaic of moist soil plants such as softstem bulrush (*Schoenoplectus tabernaemontani*), giant cutgrass (*Zizaniopsis miliacea*), prairie cordgrass (*Spartina pectinata*) and cattail (*Typus* spp.) to provide medium height cover (2-6 feet) interspersed with small areas of mud flats and shallow depressions as nesting habitat for King Rails.
13. With the exception of those acres managed for Black Rail and King Rail, begin draining moist soil units in March to expose mudflats by April to benefit migrating shorebirds which can feed on invertebrates.
14. Maintain stable water levels of 1 inch or less across 10 to 20 acres of moist soil units from April through August 15, and encourage a vegetative monotype of *Eleocharis* spp. (spikerushes), sedges, or other wetland/wet prairie grasses that provide dense low cover (2 feet or less) interspersed with small areas of mudflats and shallow depressions to provide nesting habitat for Black Rails.
15. Annually disturb the 10 to 20 acres of moist soil managed for Black Rails to remove unwanted vegetation while maintaining level ground capable of providing stable water levels of 1 inch or less.
16. Begin draining in March to expose mud flats by April to benefit migrating shorebirds that feed on the invertebrates.

Objective 1.6: Grassy Openings, Cropland, and Food Plots

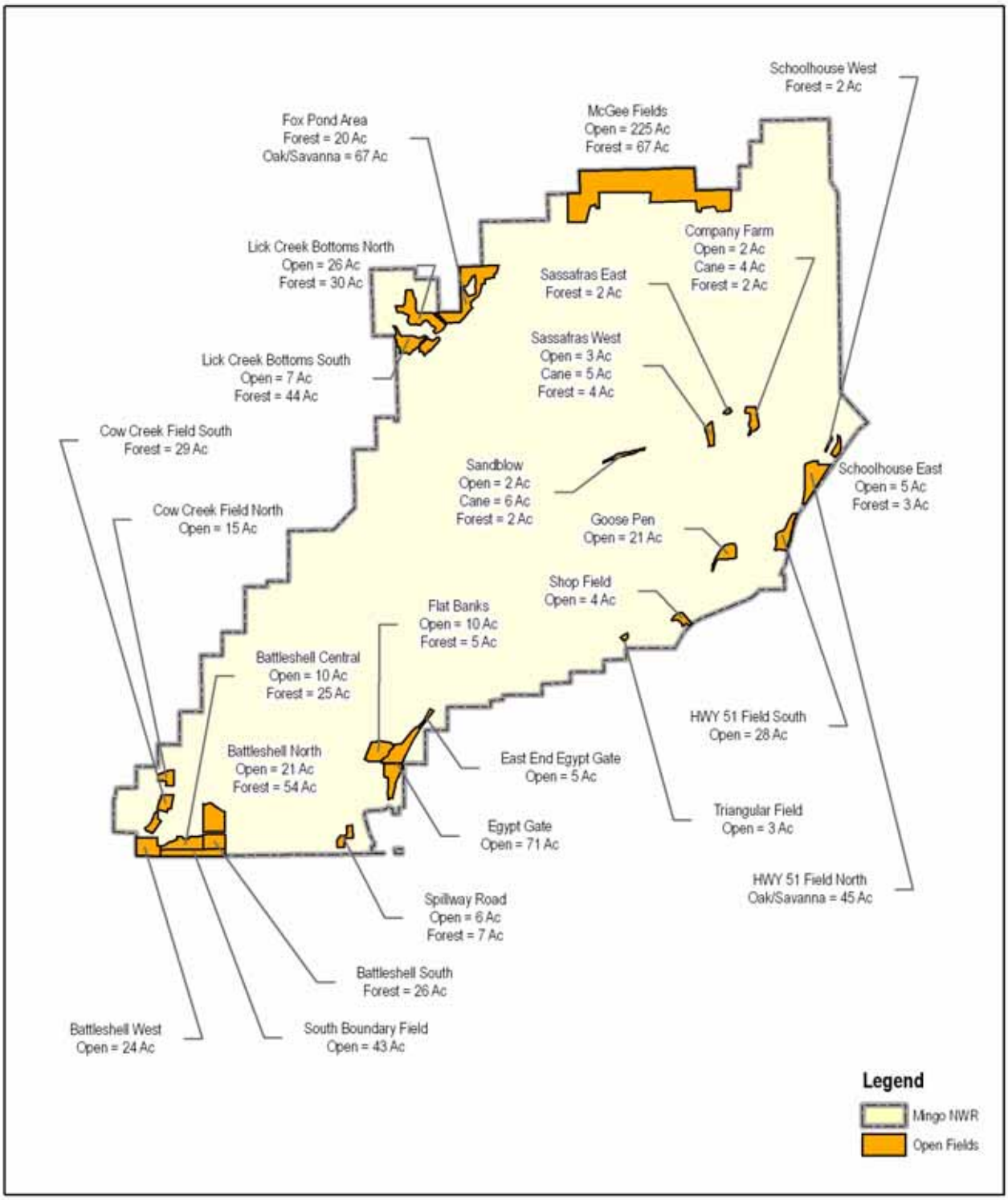
Maintain 205 acres of grassy openings, 253 acres of cropland, and 73 acres of food plots. Convert the remaining 449 acres to cane (15 acres), oak savanna (112 acres), and young bottomland forest (322 acres), early successional habitats that would benefit species such as quail, turkey, doves, and swamp rabbits (see Figure 13 and Table 6). Within 15 years, develop a soft edge – a vegetative gradient from open to forested habitats – along the perimeters of these areas, and replace fescue with native vegetation.

Supporting Rationale

Grassy openings, cropland, and food plots located mostly around the perimeter of the Refuge partially simulate lost native habitat. The Refuge is situated at the interface of the Ozark Highlands and Crowley's Ridge, encompassing portions of each along with the bottomlands between. Temporary and permanent forest openings are part of the historic vegetative condition of the Refuge.

Fire, wind, and other disturbance agents likely kept about 3-5 percent (450-750 acres at Mingo NWR) of bottomland forests in temporary openings (Heitmeyer et al, 2005; Hartshorne, 1980; Heitmeyer et al, 1989; King and Antrobus, 2001). Caused by death or wind throw of one or more trees, such open habitats normally are quickly colonized by herbaceous plants, shrubs, and tree seedlings. These temporary openings provide diversity within the otherwise forested matrix, and are important habitat for wildlife such as swamp rabbits and Swainson's warblers. At Mingo NWR, years of prolonged annual floods caused by poor drainage impeded col-

Figure 13: Locations and Future Cover Type Allocations of Grassy Openings, Cropland and Food Plots, Mingo NWR[1]



1. In some locations, future cover types may vary based on site potential and restoration costs.

Table 6: Current and Future Condition of Mingo NWR Openings

	Current Condition		Future Condition	
Name	**Habitat Type**	**Acres**	**Habitat Type**	**Acres**
Schoolhouse East	Food Plot	8	Shrub/Forest	3
			Food Plots	5
Schoolhouse West	Food Plot	2	Shrub/Forest	2
Company Farm	Food Plot	8	Shrub/Forest (early succession)	2
			Cane Restoration	4
			Food Plot	2
Sassafras-East	Food Plot	2	Shrub/Forest	2
Sassafras-West	Food Plot	12	Shrub/Forest (early succession)	4
			Cane Restoration	5
			Food Plot	3
Sandblow	Food Plot	10	Short grass prairie with forbs	2
			Cane Restoration	6
			Shrub/Forest (early succession)	2
Lick Creek Bottoms North	Fallow Field and Cropland	56	Shrub/Forest (early succession) with scoured wetlands	30
			Old Field with scoured wetlands	18
			Food Plot	8
Goose Pen	Food Plot	21	Food Plot	21
Triangular Field	Food Plot	3	Food Plot	3
East end Egypt Gate	Food Plot	5	Food Plot	5
Flat Banks			Shrub/Forest	5
	Food Plot	15	Food Plot	10
Spillway Road	Fallow Field	4	North End Shrub/Forest	7
	Food Plot	9	South End Food Plot	6
Battleshell North	Fallow Field	75	Shrub/Forest	34
			Shrub/Forest (early succession with scoured wetlands)	20
			Grassy Opening	21
McGee Fields	Cropland	292	Cropland	225
			Shrub/Forest	67
Fox Pond area	Fallow Field	87	Shrub/Forest	20
			Grassy opening with scattered trees	67
Lick Creek Bottoms South	Fallow Field	51	Sedge meadow	7
			Shrub/ Forest	44
Cow Creek Field North	Fallow Field	15	Sedge meadow	15
Cow Creek Field South	Fallow Field	29	Shrub/Forest	29

Table 6: Current and Future Condition of Mingo NWR Openings

	Current Condition		Future Condition	
Name	**Habitat Type**	**Acres**	**Habitat Type**	**Acres**
Battleshell Central	Cropland	35	Food Plot	10
			Shrub/Forest	25
Egypt Gate	Fallow Field	71	Convert higher elevations to mixed grass prairie	41
			Lower elevations to be maintained as grassy openings	30
Hwy. 51 Field South	Cropland	28	Cropland (1/2 idle in alternating years)	28
Hwy. 51 Field North	Fallow Field	45	Oak savanna with scoured wetlands)	45
Shop Field	Fallow field	4	Grassy Opening	4
Battleshell South	Fallow Field	26	Scrub/Forest	26
South Boundary Field	Fallow Field	43	Grassy opening	43
Battleshell West	Fallow Field	24	Grassy opening	24

onization of these openings by plants and young trees, eliminating much of this habitat. Food plots and cropland largely around the perimeter of the Refuge provide partial replacement of this lost habitat as well as wildlife viewing opportunities for visitors. Over the life of the plan (15 years), the need to maintain these permanent openings is expected to diminish as improvements to the ditch system (Objective 1.1) and changes in forest management (Objective 1.2) restore bottomland forest dynamics.

Grassy openings are part of the historic vegetative condition within the portions of the Refuge that grade into the bluffs of the Ozark Highlands on the west and Crowley's Ridge on the east (Dr. Leigh Fredrickson and Dr. Mickey Heitmeyer, personal communication). Invasive species such as fescue quickly colonize these areas crowding out native species. Periodic farming is one low cost method used to disturb these sites and temporarily diminish the amount of invasive plant cover. On these sites, totaling about 205 acres, farming typically occurs for 1-2 years followed by a 2-3 year fallow period during which native species dominate.

Strategies:

1. Maintain cooperative agreements, which require cooperating farmers to leave 33 percent of the corn, milo, or 100 percent of winter wheat or clover for wintering waterfowl and resident species.
2. Mow fields as often as necessary to set back encroaching woody growth.
3. Provide food sources in upland openings for wildlife use during inclement weather.
4. Utilize mowing/haying to create and maintain forage.
5. Mow or plant food plots to provide for expanded opportunities for wildlife observation by public.
6. Seek partnerships to enhance funding and staffing resources to replace cooperative farming program to maintain open areas and provide early successional edge habitat.
7. Plant mast trees to speed succession of open areas.

Objective 1.7: Invasive/Exotic/Nuisance Plants

Annually work to maintain exotic or invasive vegetation on the Refuge at or below levels to be determined within 2 years of plan approval (of present concern are Johnson grass, *Sericea lespedeza*, bull thistle, reed canary grass, autumn olive, and multiflora rose).

Supporting Rationale

Exotic or non-native plants are those that have been deliberately or inadvertently transported and transplanted by humans outside their native range, often found on another continent. Certain exotic plants become "invasive" if they survive and begin to spread on their own, in the absence of the population controls (e.g. diseases, parasites, environmental constraints, organisms that fed on them) that held their propagation in check

in their native ranges. Invasive exotics are troublesome because they displace native vegetation on which native animal species have come to depend over many millennia of adaptation and coevolution. Refuge staff attempts to slow the spread of these invasive plants by a variety of mechanical and chemical means. Success will be determined based on factors which include reduction in spreading, shrinkage of infestation, complete eradication, and/or stabilization of infestation depending on the individual species, its negative impacts, and the feasibility of control.

Strategies:

1. Actively communicate with other state and federal resources agencies, as well as non-governmental organizations, to stay abreast of emerging exotic threats, as well as management strategies and techniques.
2. Coordinate control strategies with Regional Office and other state and federal agencies.
3. Maintain good records of control efforts and results.
4. Complete a comprehensive inventory to assess invasive plant infestations.
5. Use mechanical, chemical, and biological controls to slow the spread of invasive plant species.

Goal 2: Wildlife

The Refuge will provide for a diversity of migratory birds and native fish and wildlife associated with healthy Refuge habitats and contributing to the mission of the National Wildlife Refuge System.

Objective 2.1: Migratory Bird Monitoring

Within 3 years of plan approval, implement a monitoring program to establish abundance, population trends, and habitat associations of selected migratory bird species or groups of species (e.g. waterfowl, migrating land birds, shorebirds, marsh birds).

Supporting Rationale:

Mingo NWR was established under the Migratory Bird Treaty Act, so that its very purpose is to conserve habitat for and populations of migratory birds, including waterfowl, shorebirds, and neotropical birds. Forty-four species of waterfowl have been documented on the Refuge at one season or another. Most of these birds are migrants, either passing through Mingo NWR on journeys north and south in the spring and fall, or wintering on the Refuge. Four species of waterfowl are known to breed at the Refuge: Canada Goose, Wood Duck, Pied-billed Grebe and Hooded Merganser. In addition, the Green-winged Teal, Mallard, Northern Pintail, Northern Shoveler, Gadwall, American Widgeon, and Ring-necked Duck are listed as common or abundant at Mingo NWR during at least one season.

About 20 species of shorebirds use the Refuge at least one season of the year; of these, seven species – including the Killdeer, Lesser Yellowlegs, Spotted Sandpiper, Solitary Sandpiper, Pectoral Sandpiper, Common Snipe and American Woodcock – are listed as common at least one season of the year. The last two species (Common Snipe and American Woodcock) tend to be found in moist or swampy wooded areas while the others favor the shorelines of shallow, open marshes.

Mingo NWR also sports a number of species of passerines (perching birds) and songbirds – notably the warblers, but also tanagers, thrushes, and others – that are neotropical migrants, breeding in the summer in North America and wintering in Central America, the Caribbean, and South America. Most of these neotropical migrants depend on wooded habitats. Some of the neotropical migrants breed at Mingo NWR but many others pass through the Refuge in the spring and fall.

Strategies:

1. Conduct waterfowl surveys, Bald Eagle surveys, Christmas Bird Counts, and breeding bird surveys.
2. Conduct shorebird surveys using the International Shorebird Survey Protocol to track occurrence, relative abundance, and response to management regimes.
3. Develop an Inventory and Monitoring step-down management plan based on direction contained in part 701 FW 2 of the Fish and Wildlife Service Manual.
4. Partner with conservation and private organizations to assist with monitoring, inventory, and educational efforts.
5. Conduct pre- and post-bird monitoring in conjunction with habitat management efforts including conversions and restoration/regeneration efforts.

Objective 2.2: Fish/Aquatic Species

Over the next 15 years, create or maintain diverse, self-sustaining fisheries in Refuge ponds,

streams, and ditches; and within 4 years begin reintroduction of extirpated, native species (of present interest is alligator gar) to help restore aquatic ecosystems to historic conditions.

Supporting Rationale

The Refuge has a rich historic diversity and abundance of swamp-dependent fisheries species. Previous Refuge surveys identified over 38 species, including alligator gar. A 2005 survey identified an additional nine species bringing the Refuge total to 46 fish species, many of which are limited to swamp habitat. Since the loss of nearly 2.5 million acres of bottomland swamp habitat in the Bootheel, many swamp dependent species have been restricted to isolated areas. On the Refuge, many species are described as locally abundant, but are rare State-wide. This would include such species as bantam sunfish, banded pygmy sunfish, flier, swamp darter, cypress darter, dollar sunfish, slough darter, and brown bullhead. Changes in the Lake Wappapello Corps of Engineers Project discharge rates and the construction of the Spillway Water Control Structure several feet above the bottom of the ditch have prevented fish movement and natural restocking of the impounded system of the Refuge. In addition, several of the interior water control structures on the Refuge serve as fish barriers preventing natural migration. These conditions compounded with an acceleration of the accumulation of sediment in the ditch system since the early 1980s caused shifts in abundance and diversity of fish species. Water clarity and dissolved oxygen levels decreased along with populations of most popular sport fish. Although surveys are lacking, it is likely diminished water quality also caused declines in numbers of freshwater mussels. Ditch restoration efforts, beginning in 1999, have already shown improvements in abundance and diversity of fish species. The diverse habitats on the Refuge such as clear creeks, ponds, springs and small streams, temporary forest and meadow flooding, marshes, and ditches offer a mixture of habitats that help maintain a diverse aquatic system.

Strategies:

1. In cooperation with MDC, conduct annual population censuses of sport fishery using electro-shocking or other techniques.
2. Working with MDC, stock catfish and other native game fish in ditches and ponds as needed.
3. By 2009, reintroduce alligator gar to provide added sport fishing opportunities and to restore a critical component of the aquatic ecosystem.
4. By 2008, conduct a comprehensive aquatic resources survey in cooperation with MDC.
5. Improve fisheries resources at Fox Pond by creating a balanced and self-sustaining fishery.
6. Continue removal of barriers and modify existing water control structures to enhance fish passage.
7. Use tree drops in ditches at appropriate locations to create habitat structure and fish cover.
8. Work with COE to periodically modify water discharge rates from Wappapello Lake to enhance opportunities for fish passage at the Refuge spillway.
9. By 2015, restore and enhance mussel populations by allowing for reintroduction of host fish, through the modification of the spillway structure.

Objective 2.3: Reptiles and Amphibians

Within 3 years of plan approval, implement a monitoring program to establish abundance, population trends, and habitat associations of selected reptile and amphibian species.

Supporting Rationale

Due to its diversity of habitats and the ample supply of water, amphibians and reptiles abound at Mingo NWR. More than 65 species have been documented, including frogs, toads, salamanders, lizards, turtles, and snakes. Among the snakes are the venomous cottonmouth (all three subspecies), southern copperhead, and timber rattlesnake. Many of these species hibernate along the bluff on the perimeter of the Refuge. Several species of reptiles and amphibians that occur on Mingo are endangered or threatened either federally or at the state level including the alligator snapping turtle and the three-toed amphiuma. Amphibians are especially sensitive to changes in their environment and their populations are declining worldwide (Houlahan et al. 2000) (Wake 1991) (Blaustein 1994). Monitoring the health of reptile and amphibian populations at Mingo NWR may help detect other environmental problems. Baseline data on reptiles and amphibians that occur on Mingo NWR are outdated and some is unreliable.

Mingo Wilderness Area. USFWS

Strategies:

1. Monitor reptile and amphibian migration mortality due to vehicular use along Auto Tour Route and modify the opening and closure of the route to minimize mortality.
2. With partners, conduct research on mortality, mercury levels, and habitat use and availability.
3. Provide or enhance vernal pool habitat.
4. Conduct pre- and post-monitoring in conjunction with habitat management efforts including conversions and restoration/regeneration efforts.
5. Partner with conservation and private organizations to assist with monitoring inventory and educational efforts.

Objective 2.4: Invasive/Exotic/Nuisance Animal

Annually work to maintain levels of exotic or invasive animals on the Refuge at or below levels to be determined within 2 years of plan approval (of present concern are nutria, beaver, and feral hogs).

Supporting Rationale

Beaver are native to the Refuge, but can cause problems by undermining roads, girdling trees, and plugging culverts and water control structures, which causes extensive flooding. The Refuge previously enlisted trappers to help control beaver numbers, but due to the successful expansion of river otter, a desirable species, trapping was discontinued to avoid accidental take. Refuge Staff currently dispose of nuisance beaver in problem areas as needed. Successful control of this species will be based on the reduction of the observation of beaver dams, reduction of flooding of sensitive habitats not intended to be flooded, reduction of complaints from adjacent landowners of beaver caused flooding, and decrease in the occurrence of road, levee, and water control structure damage from burrowing and dam and den construction.

The nutria is a large, dark-furred, semi-aquatic rodent native to southern South America and introduced into North America as early as 1899. It was first discovered on the Refuge in 2000. The nutria's relentless burrowing weakens dikes, levees, and other earthen structures. Nutria also feed on native vegetation and can cause damage when they occur in high numbers. Refuge Staff dispose of nutria whenever they are found. Presently, nutria do not occur in high numbers on the Refuge. Successful control of this species will be based upon the reduction of the observation of damage to wetland habitats from foraging of the rodent and decrease in the occurrence of road and levee damage from burrowing.

Feral hogs or swine have emerged as a serious problem on many national wildlife refuges in recent years. They both harm habitat and displace native wildlife. Feral swine are elusive and widely scattered in Missouri; moreover, they use heavy cover and are difficult to find (MDC, 2004b). Thus, hunting specifically for wild hogs is usually unproductive, but they can be hunted incidentally when hunting other animals. Because they cause damage to streams, undergrowth and wildlife, the Missouri Conservation Department as well as the Service, hope to enlist the public in helping to control or eradicate them. In some places, trapping hogs by luring them with bait into pens and then disposing of them has proven successful in reducing hog populations. Successful control of this species will be measured on number of incidental sightings and signs including tracks, routing areas, and wallows.

Strategies:

1. Control nutria and feral hogs on the Refuge.
2. Promote incidental hunting of hogs if the population expands.
3. Monitor beaver populations and control nuisance beaver.
4. Document habitat impacts and infrastructure damage caused by beavers, nutria, and feral hogs.

5. In cooperation with MDC and neighbors, consider the use of trapping to reduce feral hog numbers.

Objective 2.5: White-tailed Deer

Upon plan approval, manage the deer herd to sustain a healthy population ranging from 800-1,200 deer at a density considered optimal in this portion of Missouri (24-35 per square mile).

Supporting Rationale

The white-tailed deer is the only large native mammal that occurs at Mingo NWR. It is a species popular for both hunting and viewing, bringing in an estimated 21,000 visits in 2004. Deer management on Mingo is based on a large data set that spans over 15 years. Spotlight surveys, deer track surveys, deer exclosures, and harvest data are utilized and interpreted to determine population sizes and make management recommendations. Emigration and immigration can greatly alter population size and density and can be extremely variable from year to year. Food availability, mainly mast production, is largely responsible for these variations in deer demographics. Damage to surrounding landowners can occur during years of poor mast production if the population rises above the target level. Overpopulation of deer can lead to the damage of seedlings, especially oaks, which can impede regeneration success in the bottomland hardwood areas of the Refuge. Overgrazing can lead and contribute to changes in species composition which in turn can result in negative effects on other plant and animal species (Rooney and Waller 2002). A firm understanding of population size and strong management decisions based on annual survey information prevents these negative effects, while sustaining a viable population to satisfy the needs of the public.

Strategies:

1. Monitor the size and population density of the deer herd through surveys conducted in December and January and conduct presence/absence survey following closure of bow season.
2. Monitor Refuge exclosures for signs of habitat damage that would indicate that carrying capacity has been surpassed.
3. Evaluate the health of individual animals and herds using standard techniques.

Goal 3: Visitor Services

Provide a variety of wildlife-dependent recreational and educational opportunities to allow the public to enjoy the resources of the Refuge and support the National Wildlife Refuge System. (Figure 14)

Objective 3.1: Hunting

Within 4 years of plan approval, provide opportunities for approximately 4,200 hunting visits per year while maintaining sustainable resources and providing participants with minimal conflicts with other user groups.

Supporting Rationale

As one of the six priority recreational uses identified in the *National Wildlife Refuge System Improvement Act of 1997*, hunting provides traditional recreational activities on the Refuge and in the local area with no definable adverse impacts to the biological integrity or habitat sustainability of the Refuge resources.

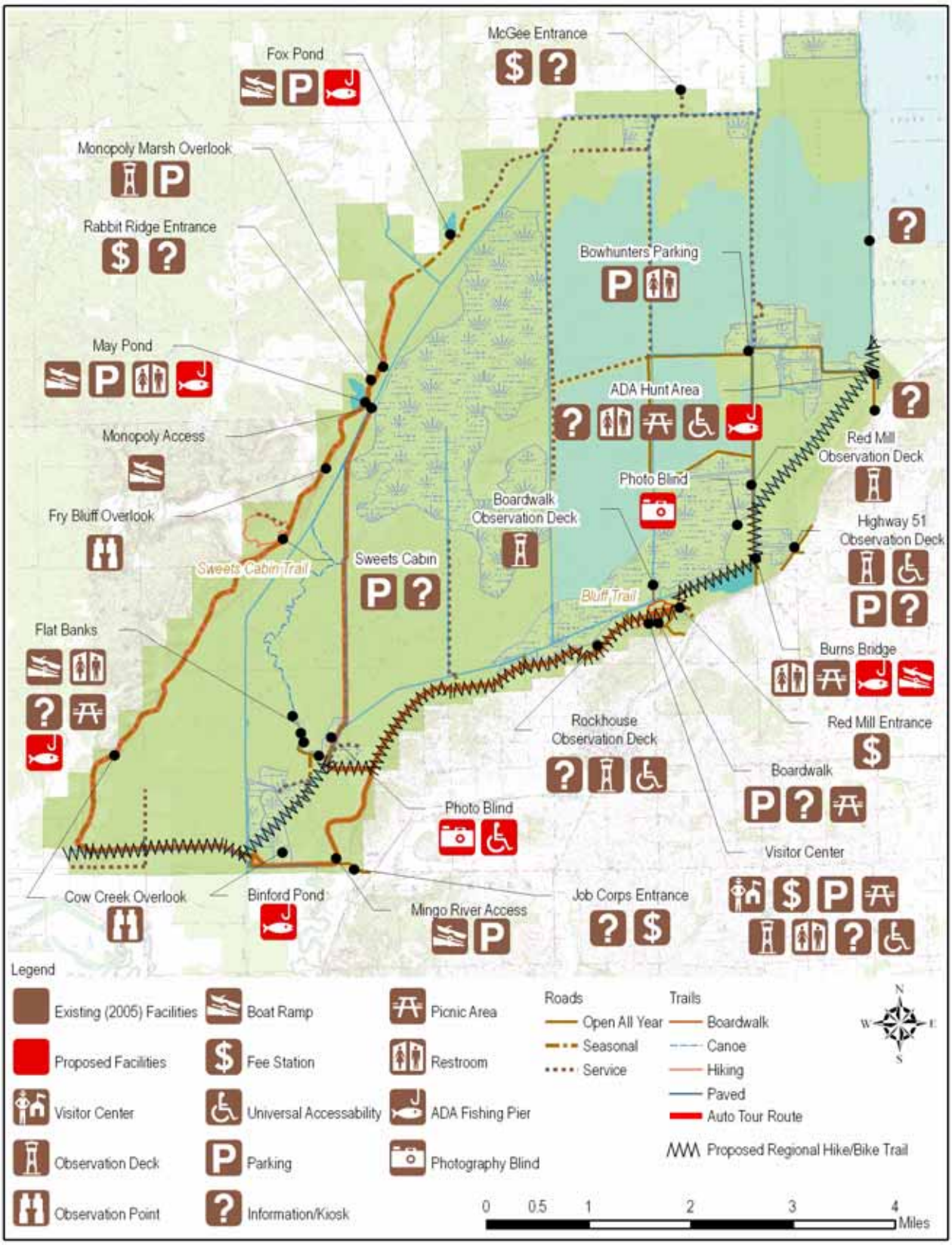
The Refuge has a designated hunting area which consists of 8,960 acres and an additional 6,891 acres during the Managed Deer Hunt, a muzzleloader hunt. The diversity of hunting opportunities include archery deer and turkey hunting, spring firearm turkey hunting, and squirrel hunting. Waterfowl hunting is permitted in Pool 8, a 1,191- acre green tree reservoir. The unit is managed through a cooperative agreement with the MDC as a wade-in hunting area. In 2004, hunting accounted for 3,760 hunting visits with annual increases and decreases in visits based on local conditions.

Refuge management strategies reduce visitor conflicts and provide for a variety of uses through the use of personal contacts and designated hunting and fishing pamphlets and general recreational activities pamphlets. In addition, recreational uses are designated in specific areas, during specific times of the year, and specific durations.

Hunting activities are managed with kiosk information centers and require hunters to sign-in and sign-out and the record the number of hours hunted and any animals harvested. Biologists conduct pre and post hunting season deer surveys to assess the effects of hunting on the population and determine if the Refuge is meeting herd size goal of 800-1,200 deer.

All recreational activities are secondary to the primary purpose in which the Refuge was estab-

Figure 14: Future Facilities, Mingo NWR



lished, and must be compatible. Uses identified in the Refuge Improvement Act (hunting, fishing, wildlife observation and photography, interpretation, and environmental education) receive special recognition by the Service and are accommodated when compatible with the original purpose of the Refuge as a resting and wintering area for migratory waterfowl and other migratory birds.

Strategies:

1. Manage hunts to minimize conflicts with other uses and resources.
2. Maintain good communication with hunters and other user groups so as to minimize conflicts and any friction between different users.
3. Host participants of Missouri Department of Conservation's Spring Turkey Women's Outdoor Skills Event within the public hunting area.
4. Offer educationally based fall youth firearms deer hunt within the public hunting area.
5. Offer Refuge hosted hunter education courses.
6. Offer access to Ditch 3 area by opening Sand Blow Ridge Road year-round except when it is flooded.
7. Request assistance from MDC for muzzleloader hunt.
8. Participate in State waterfowl drawing held at Duck Creek that includes Pool 8.
9. Offer waterfowl hunting on Pool 8 as follows: when the water level reaches a suitable elevation. Provide a maximum of 40 individuals through a daily drawing.

Objective 3.2: Fishing

Within 4 years of plan approval, offer opportunities for 4,500 fishing visits per year while maintaining sustainable resources and providing participants with minimal conflicts with other user groups.

Supporting Rationale

As one of the six priority recreational uses identified in the *National Wildlife Refuge System Improvement Act of 1997*, fishing provides traditional recreational activities on the Refuge and in the local area with no definable adverse impacts to the biological integrity or habitat sustainability of the Refuge resources.

Fisherman on May Pond. USFWS

In 2004, fishing accounted for 2,324 recreational visits to the Refuge. The number of anglers is based on extrapolations from the readings of traffic counters strategically placed at popular destinations. The counters are read at least two times monthly and figures are reported in a public use data base by month. Most anglers visiting the Refuge are families including women, children, and the elderly out for a day-long visit which usually includes picnicking. Approximately 10 percent of the Refuge anglers access the Refuge by boat or canoe in areas restricting motors. Popular destinations include; Stanley Creek, May and Fox Ponds, Flat Banks, Red Mill Pond, the downstream end of water control structures, and Ditch 11 and other ditches.

In the ditches, improvements in fish species composition and abundance, since ditch cleaning efforts were begun in 1999, are evident. The species most commonly caught are crappie, bass, bluegill, bowfin, and catfish. Periodic assessments of fisheries resources will be utilized to monitor species, relative abundance, and location.

Refuge management strategies reduce visitor conflicts and provide for a variety of uses through the use of personal contacts and designated hunting and fishing pamphlets and general recreational activities pamphlets. In addition, recreational uses are designated in specific areas, during specific times of the year, and specific durations.

All recreational activities are secondary to the primary purpose in which the Refuge was established, and must be compatible. Uses identified in the Refuge Improvement Act (hunting, fishing,

wildlife observation and photography, interpretation, and environmental education) receive special recognition by the Service and are accommodated when compatible with the original purpose of the Refuge as a resting and wintering area for migratory waterfowl and other migratory birds.

Strategies:

1. Offer fishing from March 1 to September 15 in the area north of Ditch 11 between and including Ditch 2 and Ditch 6.
2. Offer fishing year-round on Ditch 1, Ditch 2, Ditch 11, Mingo River, Stanley Creek, May Pond, Fox Pond, and Red Mill Pond.
3. Offer fishing from March 1 to September 15 on Ditches 3, 4, 5, Monopoly Marsh, Rockhouse Marsh, and Gum Stump.
4. By 2010 construct a recreational fishing pond in the Binford Unit that would include disabled access and be available for special events.
5. Add universally accessible fishing piers at Flat Banks Entrance Area, Burris Bridge, Ditch 1, May Pond, Fox Pond.
6. Add mowed bank fishing access along ditches, Flat Banks, and Pierman Lane when possible.
7. Offer fishing year-round at the Ditch 5 and Ditch 11 water control structures.
8. Eliminate bow fishing and gigging on the Refuge.
9. Provide boat access to Monopoly Marsh, as feasible, under varying water levels.

Objective 3.3: Wildlife Observation and Photography

Within 5 years of plan approval, provide a range of wildlife observation and photography opportunities for 75,000 visits per year that allow for viewing a variety of wildlife species and habitats with minimal conflicts with other user groups.

Supporting Rationale

Wildlife observation and photography are both priority public-use activities, which are listed in the *NWRS Improvement Act of 1997*. In 2004, wildlife observation and photography accounted for 71,491 visits. The number of wildlife observer and photographer visits is based on extrapolations from the readings of traffic counters strategically placed at popular viewing and photography destinations. The counters are read at least two times monthly and figures are reported in a public use data base by month.

Facilities that support these activities include the Visitor Center and associated interpretive displays, the Auto Tour Route, eight overlooks and observation platforms, informational kiosks, and five trails, including a five-mile canoe trail and the Boardwalk Nature Trail. The canoe trail offers a wilderness experience of solitude on the Mingo River and opportunities to view and photograph wildlife in a primitive setting.

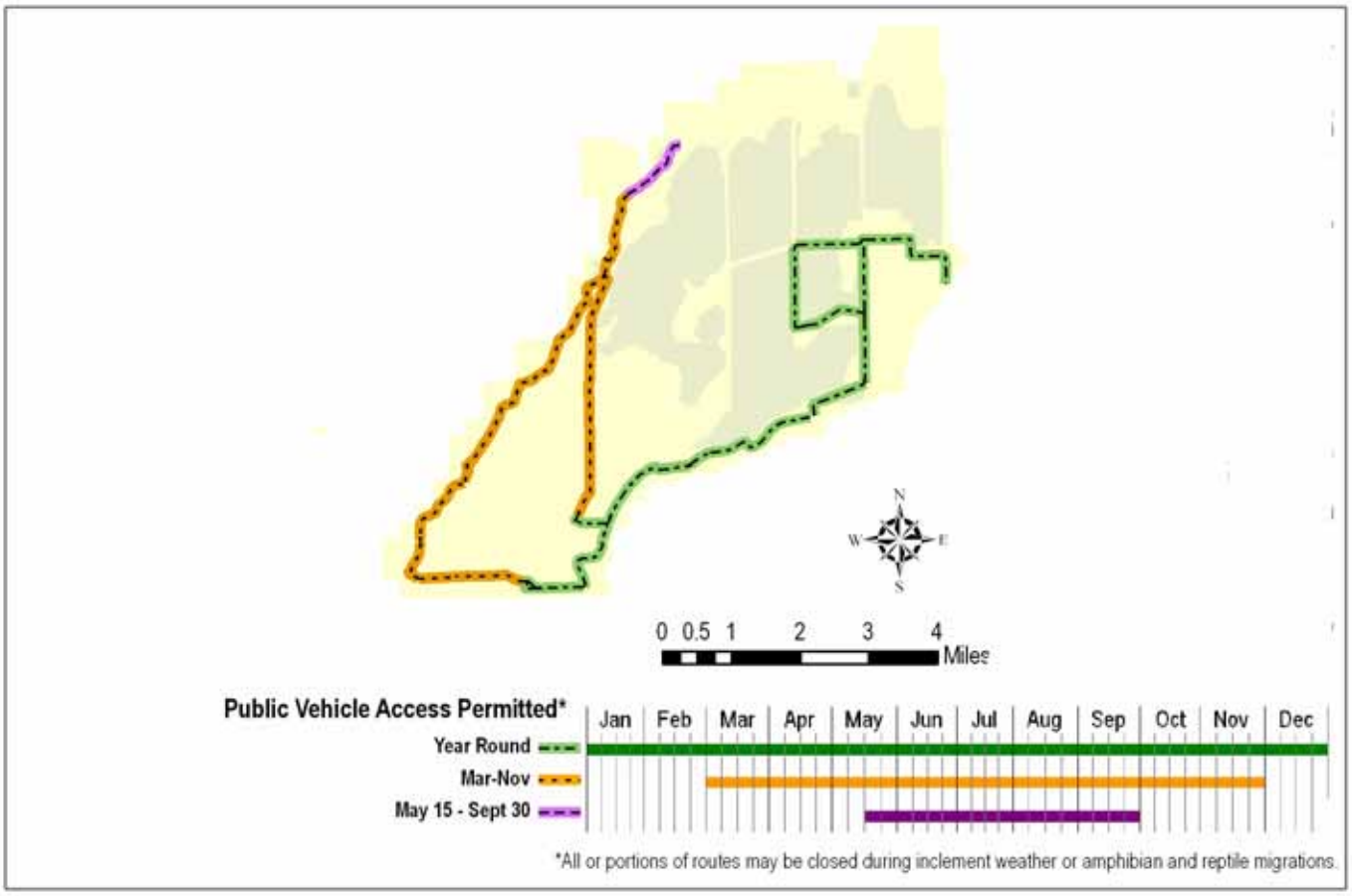
Refuge management strategies reduce visitor conflicts and provide for a variety of uses through the use of personal contacts, designated hunting and fishing pamphlets and general recreational activities pamphlets. In addition, recreational uses are designated in specific areas, during specific times of the year, and specific durations and group size is limited as needed.

All recreational activities are secondary to the primary purpose in which the Refuge was established, and must be compatible. Uses identified in the Refuge Improvement Act (hunting, fishing, wildlife observation and photography, interpretation, and environmental education) receive special recognition by the Service and are accommodated when compatible with the original purpose of the Refuge as a resting and wintering area for migratory waterfowl and other migratory birds.

Strategies:

1. Along 13 miles of the Auto Tour Route, offer seasonal vehicle access from March 1 through November 30 except for closure during State firearm deer season and as needed during reptile and amphibian migrations. (Figure 15)
2. Offer year round vehicle access along 6 miles of the Auto Tour Route, and the entire 5-mile length of Red Mill Drive.
3. Offer year round vehicle access along the entire 3-mile length of Sand Blow Ridge Road.
4. Offer seasonal vehicle access from May 15 through September 30 on the 1 mile road segment between Monopoly Overlook and Fox Pond.
5. Open Auto Tour Route for selected events during winter months (December 1 to end of February).

Figure 15: Public Vehicle Access Permitted, Mingo NWR



6. Offer a number of observation sites and structures that include universally accessible sites.
7. Open Monopoly Marsh to public use from March 1 to September 15.
8. Install Web Cam for remote viewing of Refuge.
9. Provide a photo blind/observation site. Potential sites include Red Mill Pond or near Rockhouse Cypress Marsh Overlook.
10. Maintain or improve opportunities for viewing wildlife at overlooks and at selected open fields and farm units.
11. Maintain existing and provide additional foot bridges to improve access to the Refuge.
12. Provide wildlife observation and photography opportunities west of Ditch 6 year round.
13. Provide wildlife observation and photography opportunities east of Ditch 6 to the eastern Refuge boundary from March 1 to September 15.
14. From September 15 to March 1, close to all public use the area between Ditch 4 and Ditch 5 south of Monopoly Marsh and north of Ditch 11 to provide an area for wildlife that is free of disturbance.
15. Designate Red Mill Drive as a second auto tour route with interpretive information.

Objective 3.4: Environmental Education

Within 4 years of plan approval, establish an environmental education program that provides a diverse balance of educational topics to over 2,000 students annually.

Supporting Rationale

Environmental education, is one of the six priority public-use activities listed in the *NWRS*

Refuge staff conducting environmental education on Mingo NWR. USFWS

Improvement Act of 1997, and generates continued support from area schools and youth conservation groups. The program is 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 focus on Refuge-specific issues including wildlife, history, archaeology, culture, and habitats. Weekly visits by area schools, home school groups, scouts, etc are common with other special programs occurring both on and off the Refuge. In recent years, the Refuge has averaged about 1,800 students for environmental education programs annually. Individual attendees are counted and submitted in the public use database each month.

Programming will be monitored to ensure a variety of programming topics are being presented. When mission is in all programming and four different educational topics are available annually, the environmental education programs will be considered diverse and balanced.

Strategies:

1. Offer environmental education programs for youth groups, schools, and general public with a reptile and amphibian focus at times of the year when they are most likely to be seen.
2. Offer teacher workshops for environmental education.
3. Develop programs specific to Mingo NWR (e.g. ditch system, snakes, waterfowl).
4. Work with scouting groups on merit badge projects.
5. Renovate Hartz Pond and trail for environmental education.
6. Add a full-time (1.0 FTE) Park Ranger to assist with weekend visitor center operations, programming, special events, and maintenance of visitor facilities.
7. Insert more information on reptiles and amphibians in environmental education materials.
8. Continue to maintain existing environmental education facilities and materials.

Objective 3.5: Interpretation

Within 4 years of plan approval, incorporate the agency mission and the purposes of the Refuge into all direct contacts and 75 percent of self-guided interpretive programs.

Supporting Rationale

Interpretation is one of the six priority public-use activities listed in the *NWRS Improvement Act of 1997*. Interpretation on the Refuge focuses primarily on self-guided exhibits, interpretive panels, and brochures. Many facilities are utilized to support this popular use such as the Refuge Visitor Center exhibits, the Boardwalk Nature Trail, the Auto Tour Route, kiosks, and overlooks. In 2004, over 16,000 visits occurred to the Boardwalk Nature Trail, over 8,000 individuals visited the Visitor Center exhibits, over 6,000 visits occurred to the interpretive Auto Tour Route, and over 21,000 individuals visited Refuge interpretive panels and kiosks. The Refuge hosts special events focusing on environmental topics and Refuge specific activities. On-site special events include: Bald Eagle Days, Kid's Free Fishing Day, Migratory Bird Day, National Public Lands Day, and National Wildlife Refuge Week. Every other year, the Refuge and MO DOC host Eagle Days. Bald Eagle Days attracts over 800 individuals annually. Every special event focuses on a Refuge specific interpretive message. Off-site special events conducted by staff include staffed exhibit at the Southeast Missouri District Fair in cooperation with the Missouri Department of Conservation (MO DOC). This event contacts over 25,000 individuals each year. In 2004, over 9,000 individuals were contacted by Refuge staff off-site. Interpretative programming and special events helps foster an appreciation, support, and understanding of the Refuge specific topics and the National Wildlife Refuge System as a whole.

Strategies:

1. Partner with other agencies for special events.
2. Continue to operate Visitor Center with exhibits during week days year-round and extend operations to include weekends from March 1 to November 30.
3. Develop interpretive panels at Monopoly Overlook.
4. Complete renovation of the Boardwalk Nature Trail.
5. Complete observation platform and interpretive panels along Highway 51.
6. Partner with Friends and others to provide guided wildlife interpretive tours.
7. Develop an annual wildlife festival.
8. Provide historic "living history" programming such as timber harvest with mules.
9. Provide additional interpretive programming along the Auto Tour Route.
10. Develop one or more exhibits on reptiles and amphibians for the Visitor Center.
11. Continue to maintain existing interpretive facilities and materials including the Visitor Center, exhibits, brochures, waysides, etc…
12. Increase off-site outreach efforts to attract long distance visitors.
13. Insert more information on reptiles and amphibians in interpretive materials.

Objective 3.6: Other Compatible Recreational and Consumptive Uses

Throughout the life of the plan, provide compatible opportunities for horseback riding, canoeing, biking, hiking, jogging, and gathering of wild edible plants for a total of 2,300 visits per year.

Supporting Rationale

The *NWRS Improvement Act of 1997* identifies six priority public uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation that 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.

Mingo NWR supports various forms of nature-based outdoor recreation that, while not exactly wildlife-dependent, may well be compatible with the purposes of the Refuge and contributes to public appreciation and enjoyment of it. These include equestrian use, canoeing, bicycling, hiking, jogging, and gathering of wild edibles. In 2004, a total of 2,385 visits for these activities occurred. The number of visits is based on extrapolations from the readings of traffic counters strategically placed at popular destinations, and individual sightings of individuals engaged in these activities. The counters are read at least two times monthly and figures are reported in a public use data base by month.

Berry, mushroom, pokeweed, and nut gathering are non-wildlife dependent activities that occur near the Rockhouse Overlook and along Bluff Drive. These activities are permitted outside the Wilderness Area as long as the ground is not disturbed.

Horseback riding on the Refuge has local support from area riding clubs, who continue to use the Refuge on an annual basis for single rider and group rides along portions of the Auto Tour Route. Impacts to biological resources, such as the introduction of invasive species and disturbance to wildlife during periods of migration, are a continuing concern.

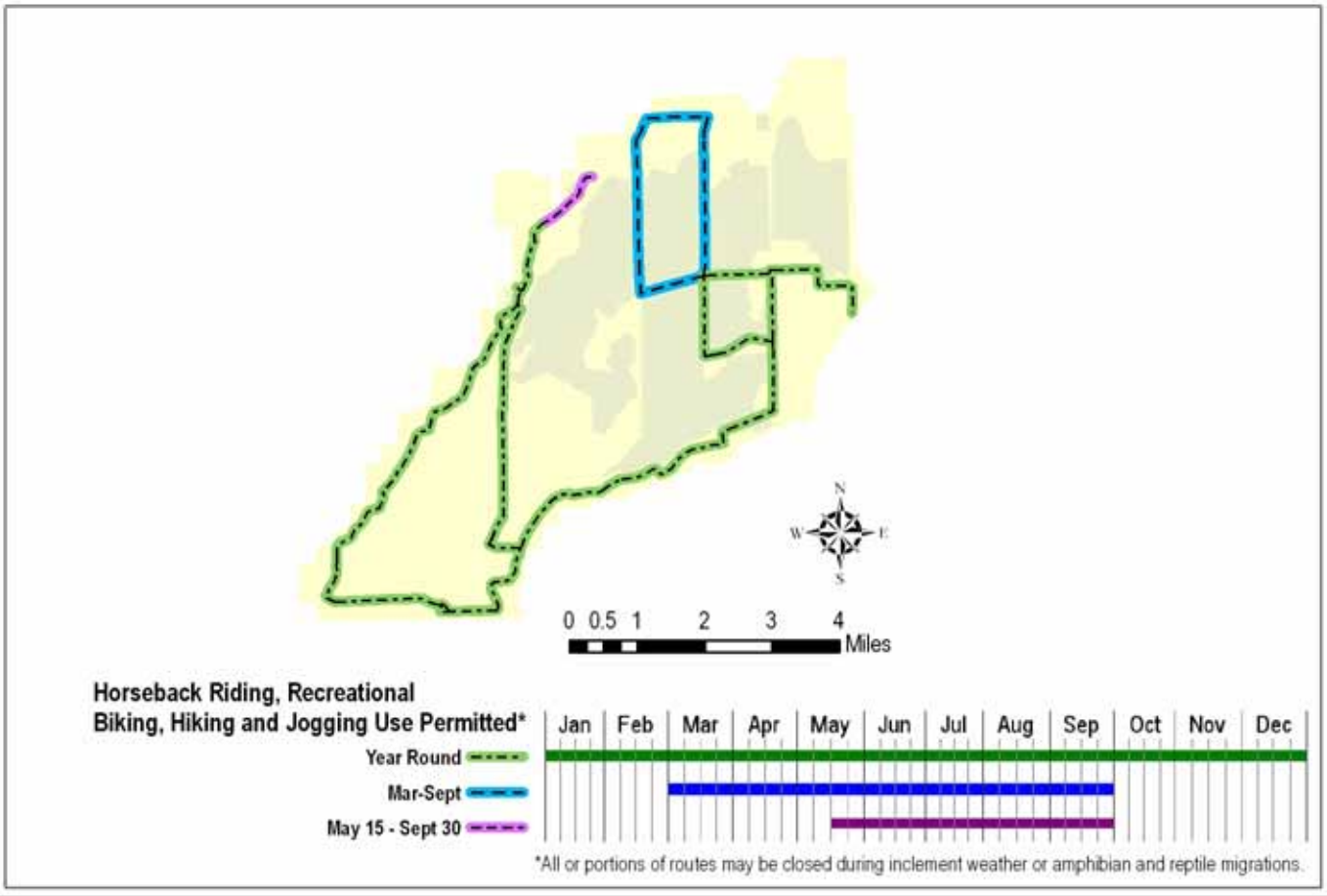
Hiking continues to occur on Refuge trails while bicycling has become increasingly popular in recent years along the established roadways. Likewise, canoeing has become more and more poplar with small groups and wilderness enthusiasts seeking solitude. Refuge management guidelines, legal mandates, and policies, such as the Wilderness Act of 1964, require compatibility and form a standard to help minimize conflicts among user groups while protecting resources and wildlife habitat.

Refuge management strategies reduce visitor conflicts and provide for a variety of uses through the use of personal contacts, designated hunting and fishing pamphlets and general recreational activities pamphlets. In addition, recreational uses are designated in specific areas, during specific times of the year, and specific durations and group size is limited as needed.

Strategies:

1. Offer year round access for horseback riding, recreational biking, hiking, and jogging along

Figure 16: Horseback Riding, Recreational Biking, Hiking, and Jogging Use Permitted, Mingo NWR



the entire 19-mile length of the Auto Tour Route and along the entire 5-mile length of Red Mill Drive. (Figure 16)

2. Offer year round access for horseback riding, recreational biking, hiking, and jogging along the entire 3-mile length of Sand Blow Ridge Road.
3. Offer seasonal access from March 1 through September 15 for horseback riding, recreational biking, hiking, and jogging along a 6-mile loop between Ditch 3 and Ditch 4.
4. Offer seasonal access from May 15 through September 30 for horseback riding, recreational biking, hiking, and jogging on the 1 mile road segment between Monopoly Overlook and Fox Pond.
5. Offer year round access for horseback riding, recreational biking, hiking, and jogging along a 6-mile length of Bluff Road.
6. Evaluate and authorize equestrian use, recreational biking, canoeing, and jogging involving group events through a permitting process.
7. Provide for the regional bike route to pass through the Refuge along existing roads and (improved) levee tops.
8. Maintain existing hiking trails and canoe trails.
9. Offer boating, canoeing, and kayaking from March 1 to September 15 in the area north of Ditch 11 between and including Ditch 2 and Ditch 6.

10. Offer boating, canoeing, and kayaking year-round on Ditch 1, Ditch 2, Ditch 11, Mingo River, Stanley Creek, May Pond, Fox Pond, and Red Mill Pond.
11. Offer boating, canoeing, and kayaking from March 1 to September 15 on Ditch 3, Ditch 4, Ditch 5, Monopoly Marsh, Rockhouse Marsh, and Gum Stump.
12. Offer gathering of one gallon per day of mushrooms and berries and five gallons per day of pokeweed for personal use and without ground disturbance in the areas south of Ditch 11 and east of Ditch 6 from March 1 to September 15. Possession or harvest outside this area is prohibited.
13. Provide year-round boating access to Ditch 11 at Burris Bridge, and Flat Banks.
14. Phase out all grills and concentrate picnic tables near areas of high public use.

Goal 4: Resource, Facility, and Visitor Safety and Protection

Protect natural, cultural, and man-made resources and provide for the safety of staff, volunteers, and visitors to the extent feasible.

Objective 4.1: Archeological, Cultural, and Historic Protection

Over the life of the plan, avoid and protect against disturbance all known cultural, historic, or archeological sites (presently more than 140 sites).

Supporting Rationale

Cultural resources are an important facet of the country's heritage and Mingo NWR, like all national wildlife refuges, remains committed to preserving archeological and historic sites against degradation, looting, and other adverse impacts. The guiding principle for management occurs in the *National Historic Preservation Act of 1966 as amended, 16 U.S.C. 470 et seq.* and the *Archeological Resources Protection Act of 1979 as amended, 16 U.S.C. 47011-mm* which establish legal mandates and protection against identifying sites for the public, etc. Archeological surveys of the Refuge, including the Mingo Job Corps campus, have now been completed on almost 7,200 acres of the Refuge.

More than 140 cultural resources sites have been identified to date on the Refuge. These sites represent all Midwest United States cultural periods from the earliest Paleo-Indian through 20th century Western, a period of about 12,000 years. One standing structure on the Refuge, the Sweet's (or Patrol) Cabin, a Depression-Era structure from the early 20th century, is considered eligible for the National Register of Historic Places. The importance of the cultural resources on the Refuge is evident with the Mingo NWR Archeology District having status on the National Register Places.

Management of the rich cultural resources on the Refuge must include awareness of maintaining architectural integrity of historic structures, avoidance of ground disturbance practices and public activities, such as the picking up of arrowheads from plowed fields, and a continuing vigilance to safeguard these regional and national treasures. It is also essential that the Refuge document new site discoveries. It is also important for Refuge management to maintain an open dialogue with the Regional Historic Preservation Officer (RHPO) and to provide the RHPO with information about new archeological site discoveries.

Strategies

1. Conduct site-specific surveys prior to ground disturbing projects and protect known archeological, cultural and historic sites.
2. Within 10 years of CCP approval, complete a Cultural Resources Management Plan (CRMP) and start to implement recommendations and procedures over the remaining life of the CCP.
3. Determine National Register eligibility of known sites.
4. Inform the Regional Historic Preservation Officer early in project planning to ensure compliance with Section 106 of National Historic Preservation Act.
5. Contract with cultural resources firms specializing in Missouri to conduct Phase I surveys prior to undertakings that could adversely affect historic resources.
6. In the event of inadvertent discoveries of ancient human remains, follow instructions and procedures indicated by the RHPO.
7. Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings.
8. Complete Phase I archeological surveys of the non-flooded areas of the Refuge, by qualified personnel when the RHPO determines surveys are necessary.

9. Identify, inventory, preserve, and protect early settler grave sites on the Refuge.

Objective 4.2: Wilderness Area Management and Protection including Research Natural Areas

Protect and maintain the wilderness and biological character of the 7,730-acre, Class I Mingo Wilderness Area.

Supporting Rationale

In 1964, Congress passed the Wilderness Act, which established the National Wilderness Preservation System. The legislation set aside certain federal lands as wilderness areas. The act says that such lands are areas "…where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." In 1976, Congress designated 7,730 acres of swamp, riparian areas, and Ozark Plateau uplands as the Mingo Wilderness Area. This is an area with numerous tributaries forming a storage watershed in the Monopoly Marsh and Mingo River basin. A series of ditches and levees adjacent to the Wilderness Area help approximate hydrologic conditions that once occurred naturally.

A large diversity of flora and fauna exists within this system which is home to indigenous species, such as river otter, bowfin, hairy-lip fern, and nesting Bald Eagles. The Wilderness Area also serves as an important wintering area for migratory waterfowl and critical habitat for swamp rabbits, Wood Ducks, migrating monarch butterflies, and other species. As the largest remaining tract of bottomland hardwood forest in Missouri, the Mingo Wilderness depends on the safeguards of the Wilderness Act of 1964, the Clean Air Act Amendments of 1990, Public Law 94-557, and the Draft Wilderness Stewardship Policy of 2001. These laws are important to protect against a loss of wilderness character leading to a loss of biological integrity and degradation of air and water quality, as well as adverse impacts of invasive species such as feral hogs, nutria, Sericia, etc. Other potential negative impacts also occur from the increase in human-use demands on the resources. Minimum tool analysis and other management guidelines help address potential human impacts and their effects and further safeguard against encroachments such as "temporary roads, motor vehicles, motorized equipment, motorboats, mechanical transport, landing of aircraft, structures, and installations." While motorized recreational activities are prohibited inside the Mingo Wilderness Area, motorized traffic does occur along non-wilderness corridor roads alongside a network of waterways. Hiking, backpacking, fishing, wildlife observation, environmental education and interpretation are allowed, as well as biological research as approved through Refuge Management.

There are seven research natural areas on the Refuge, six of which are located within the Mingo Wilderness Area. Each research natural area is part of a national network of reserved areas under various ownerships 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 predominate without human intervention.

Strategies:

1. Preserve and protect wilderness values within the area through proper signage, keeping out unauthorized entry, etc.
2. Inspect the perimeter of the Wilderness Area at least once every 3 years to replace signs that have fallen, disappeared, been damaged or vandalized.
3. Inspect interior of Wilderness Area at least once every 3 years to monitor for habitat changes, succession and any signs of unauthorized human disturbance.
4. Install Webcam at a location that shows daily and seasonal habitat changes and recreational activities.
5. Install photo monitoring sites that encompass the Monopoly Basin to help monitor air quality.
6. Implement the "Leave No Trace" program to teach the public about minimizing impacts to Wilderness Area.
7. Ensure that one or more of the Refuge staff have received Service training in wilderness management, including Minimum Tool Analysis.
8. Conduct air and water quality monitoring within the Wilderness Area (e.g. mercury contamination).
9. Mimic natural hydrology within Wilderness Area.

Objective 4.3: Contaminants

Over the life of the plan, maintain water and airborne contaminants at levels that meet or exceed Missouri Department of Natural Resources and Environmental Protection Agency standards.

Supporting Rationale

Mercury has been detected on the Refuge, but has not been measured in a consistent manner, so exact levels and the degree of present risk to wildlife and humans are not known. One study (Mercury Levels in Water and Fish Tissue Samples from Mingo Swamp National Wildlife Refuge, G. Bruland, 1995) offered preliminary results indicating mercury levels in fish tissue ranging from 0.9 to 2.5 ppm.. These are concentrations which indicate that there is a problem with mercury contamination of the fish in the system.

Air quality monitoring for nitrates and sulfates of the Mingo Wilderness Area indicate that Mingo's Class I Area is one of the more polluted areas of the 23 sites the Service manages (U.S. Fish and Wildlife Service Region 3 Air Quality Briefing, January 23, 2004). The 2001 Total Annual Light Extinction Rates indicate that Mingo has almost four times higher than the natural visibility conditions according to the U.S. Environmental Protection Agency "Draft Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Program". The Refuge works cooperatively with the Air Quality Branch of the Service in Denver, Colorado on evaluating requested air permits from various manufacturing companies. Goals of the air quality program, based on the Clean Air Act and Wilderness Act, are to assess potential hazards and protect the Mingo Class I Wilderness Area from air pollutants causing visibility concerns.

Strategies

1. Within 5 years of CCP approval, expand the program to include monitoring on a regular basis of fish, reptiles and amphibians, sediments, and water quality for contamination by a variety of toxins. Also, conduct monthly drinking water tests to comply with State regulations, and periodically conduct more detailed tests of other contaminants like nitrates, leads, other heavy metals, etc.
2. Ensure that employees collecting different kinds of environmental quality and contaminant samples are adequately trained in standard procedures for sampling.

Doe on Mingo NWR. USFWS

3. Establish sites for repeated sampling to build a baseline of comparable data, and obtain information from other locations to expand breadth of data and reduce risk that localized problems are not being overlooked.
4. Conduct cooperative research on mercury and other contaminants.

Objective 4.4: Visitor and Employee Safety

Over the life of the plan, limit reported incidents to no more than 20 per 100,000 visits per year.

Supporting Rationale

Over the last 5 years, the Refuge has received at least 100,000 visitors annually participating in all six priority Refuge recreation activities demanding the need for safety precautions. Numerous hazards exist on the Refuge including poisonous snakes, falling trees, road hazards, becoming lost while hunting/hiking, rock cliffs, and poisonous plants. The Refuge contains a variety of natural and cultural resources that in addition to facilities, infrastructure, and equipment require protection both from human neglect and malfeasance as well as from natural disasters and time. A safety inspection of all facilities and grounds

occurs annually with corrective measures taken on hazardous findings to provide a safe environment for both visitors and staff. Two dual-function Refuge Officers spend a minimum of 25 percent of their duty hours conducting regular patrols of all grounds to ensure public safety. Refuge Officers and several Refuge personnel are trained in CPR and First Aid. A Mingo Search and Rescue Team composed of volunteers and staff exists to assist with lost hunters and hikers.

In recent years, the Refuge has received approximately 24 reported incidents per 100,000 visits per year. Reported incidents include: safety concerns with equipment, facilities, and infrastructure utilized by staff and volunteers and reports of safety concerns by visitors, researchers, and other authorized users of the Refuge's infrastructure and facilities supporting recreation, administration, and/or biology.

Strategies

1. Provide regular law enforcement patrol, respond to search and rescue cases, and maintain facilities and infrastructure in compliance with OSHA and other regulations, educate public on environmental hazards.
2. Continue close cooperation with MDC agents, Stoddard County and Wayne County deputies, and the State Patrol.
3. Continue the Refuge-sponsored Search and Rescue Team with a designated Refuge Coordinator.
4. Expand law enforcement patrol.
5. Maintain all facilities and infrastructure in compliance with OSHA and other regulations.
6. Install electric gates at entrances.

Hermit Thrush. USFWS

7. Add signage and information in the brochure about dangerous wildlife and other Refuge hazards.
8. Expand Visitor Center hours to include weekends from March 1 through November 30.
9. Improve directional signing along Refuge roads and waterways.
10. Increase staffing by two 0.8 FTEs for roadside mowing and facility/road maintenance to provide safe environment for visitors and employees.

Objective 4.5: Resource Protection

Over the life of the plan, limit the amount of documented incidents of illegal activities to no more than 1 incident per 60 hours of law enforcement effort.

Supporting Rationale

Two Refuge staff members have law enforcement authority and work closely with Missouri Department of Conservation agents and Stoddard County deputies. The number of public contacts far exceeds the citations and warnings issued during a year. Past violations have included trespass, poaching, illegal possession of a firearm in an area closed to weapons, artifact collection, hunting in closed areas, and not paying entrance fees. Problems of stray hunting dogs, vandalism, and litter exist, but violators are not often caught. Dual-function Refuge Officers spend a minimum of 25 percent of their duty hours conducting regular patrols and investigations to ensure resource protection.

Although wildfires on the Refuge have been relatively rare, the potential exists for resource damage by fire under extremely dry conditions. Two Refuge staff members currently are qualified as wildfire firefighters and cooperative agreements are in place with four Rural Fire Districts surrounding the Refuge.

The present level of documented incidents of illegal activities is one incident per 60 hours of law enforcement effort.

It is expected that as law enforcement effort increases, the amount of documented incidents should increase, because as an officer spends more time and effort in the field, he/she becomes more aware of incidents and issues more notices of violations and warnings. These efforts, along with preventative law enforcement efforts such as distribution of literature that highlights areas

often overlooked by Refuge visitors and explains Refuge specific requirements, will result in a reduction of documented incidents. In time, the initial increase in the number of documented incidents will level off and show an appreciative decline as the local community and visiting public become more aware and compliant regarding Refuge regulations.

Strategies:

1. Continue close cooperation with MDC agents, Stoddard County and Wayne County deputies, and the State Patrol.
2. Enhance the relationship with U.S. District Attorney's Office.
3. Increase boundary and interpretive signage and distribution of Refuge-specific regulatory information.
4. Conduct electronic surveillance.
5. Develop additional cooperative law enforcement efforts with local, state, and federal law enforcement organizations.
6. Obtain a full-time (1.0 FTE) law enforcement officer.
7. Increase law enforcement efforts to prevent poaching of Refuge resources.
8. Revamp Refuge regulations and general activities pamphlets to improve clarity and understanding of Refuge-specific regulations.
9. Annually inspect areas where most wild edibles gathering has occurred to check for any habitat damage, erosion, litter, etc.
10. Conduct periodic inspections of sites known to be popular with gatherers and incidental inspections of visitors in those areas carrying bags, baskets or other containers that might be carrying wild edibles.

Goal 5: Off Refuge Conservation

Preserve, protect, and enhance Refuge Integrity and encourage conservation beyond Refuge boundaries.

Objective 5.1: Reducing Sedimentation from Off-Refuge Sources

Over the life of the plan, decrease the amount of sediment entering the Refuge to levels to be determined within 7 years of plan approval.

Supporting Rationale

For decades, Mingo Swamp has been a sediment trap for sediments transported and deposited from the watershed upstream. Rainfall on sloping sites that have been recently cleared, logged, grazed or cultivated is prone to cause erosion and runoff, which in turn generate sediments. These sediments are then deposited in the Mingo NWR drainage ditch system, where the water current loses velocity and no longer has the energy to carry its sediment load. The accumulation of sediment in the ditches has reduced not only the water-holding and transporting capacity of the ditches themselves, but has damaged habitats by substantially reducing the ability to drain water, and provide deep water habitat for aquatic resources.

Strategies:

1. Over the life of the plan carry out strategic wetland restoration along the watershed of Duck Creek Bottoms.
2. Over life of the plan, expand private landowner duck-hunting and wildlife observation opportunities from wetland restoration along the watershed of Duck Creek Bottoms.
3. Partner with MDC, Little River Drainage District and private landowners to reduce sediment entering the Refuge by implementing projects upstream on watersheds entering the Refuge.
4. Approach landowners individually or in a meeting arranged by the Refuge to consider cooperative efforts to carry out wetland restoration.
5. Explore the possibility of using the Wetland Reserve Program or Conservation Reserve Programs to help fund wetland restoration on private lands.
6. Try to enlist the support of local, regional, and national waterfowl hunting organizations like Ducks Unlimited.
7. Concentrate conservation efforts along Stanley Creek, Kawker Creek, Brush Creek, McGee Creek, Slage Creek, Cane Creek, Dry Creek, Malone Creek, Glassed Creek, and Lick Creek.
8. Add 0.5 FTE Biotech to conduct inspections and assist in Wetland Reserve Program and wetland restoration.
9. Identify lands near the Refuge, totaling 10 percent or less of existing Refuge acreage (approximately 2,100 acres), for possible acquisition.
10. Work with the Natural Resources Conservation Service, Farm Services Agency, and Mis-

souri Department of Conservation to establish conservation easements with land owners in the Stanley Creek watershed.

11. Use a variety of methods to seed, plant, level or otherwise cover exposed banks and slopes to reduce erosion and sedimentation.
12. Work with the EPA and others to asses the sedimentation rate and establish acceptable thresholds.

Objective 5.2: Rural Economic Development and Easements

Over the life of the plan, ensure compliance of conservation easements and restore and enhance wildlife habitat on 17 sites totaling 448 acres.

Supporting Rationale

The Farm Services Administration (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 then the agency will hold and eventually dispose of the land. The Service participates in the inventory of properties that contain or support significant fish and wildlife resources or have current, former or degraded wetlands that can be restored, or other unique habitats that merit protection.

Mingo NWR manages 17 FSA conservation easements comprising approximately 448 acres within a 48 county region in the southern third of Missouri. All easement properties are to be inspected, have management plans, and be posted with signs indicating the properties are under conservation easements. Conservation Easements are considered to be units of the National Wildlife Refuge System and are required to comply with all regulations governing Chapter 50 of the Code of Federal Regulations.

Strategies:

1. Enhance efforts for compliance reviews and restoration opportunities by conducting annual site inspections and reviews on at least nine sites.
2. Maintain an archive of records, files and photographs for each property to monitor progress towards habitat enhancement.
3. Cooperate closely with the FSA.
4. Increase cooperation with the FSA in visiting new sites with potential wildlife or habitat value.
5. Add 0.5 FTE Biotech to assist with inspections and restoration work on easements.
6. Use 15 percent of full-time law enforcement officer for compliance inspections.

Goal 6: Human Resources and Facilities

Seek opportunities to obtain sufficient human resources and facilities through partner and agency funding mechanisms to achieve the goals and objectives of the CCP.

Objective 6.1: Refuge

Throughout the life of the plan, establish the Refuge as a sound investment that adds value through natural resource management.

Supporting Rationale

The implementation of CCP strategies requires a commitment from many organizational levels. Refuge projects are successfully funded when forethought and linkage to mission, goals, and objectives can be demonstrated. When grass-root support of the Refuge exists, Congressional interest and involvement occurs, and interagency partnerships are created, many projects become actualized and the Refuge develops credibility. Creative work force planning, partnerships, and utilizing supplemental funding opportunities are routes to successfully implement CCP recommendations.

Strategies:

1. Cultivate good relations with local neighbors, officials, and the media.
2. Document funding needs precisely through memos and reports.
3. Conduct site visits for USFWS and other federal officials (e.g. Congressional offices) to showcase the Refuge's achievements and needs; select a location and time of year that will best highlight these needs and accomplishments.
4. Demonstrate precisely what would be gained for the Refuge and the local community if sufficient support were to be received.
5. Utilize the local media to promote Refuge habitat improvements, outreach activities, and other accomplishments.
6. Coordinate with Friends and other users groups (e.g. Wild Turkey Federation, Ducks Unlimited, Audubon, Wilderness Society etc.) to actively explore opportunities to promote compatible wildlife-dependent recreation on the Refuge.

7. Cooperate with organizations like The Nature Conservancy and Mingo Job Corps on habitat improvement projects.
8. Implement a year-round fee system to assist with public use administration and infrastructure improvements.
9. Promote volunteer opportunities that help facilitate wildlife-dependent recreation, habitat management, or other Refuge objectives.

Pilot Knob National Wildlife Refuge Goals, Objectives and Strategies

Goal 1: Endangered Species

Contribute to the recovery of federally-listed species and the conservation of their subterranean habitat on the Refuge.

Objective 1.1: Law Enforcement

Throughout the life of the plan, limit the amount of documented incidents of illegal activity to no more than 1 incident per 60 hours of law enforcement effort.

Supporting Rationale

Complications to the management of Pilot Knob NWR include a lack of local Refuge personnel to randomly patrol the area and not possessing an uncontested easement to the Refuge boundary. During public scoping for Pilot Knob NWR, some people suggested that the Service enter into a cooperative agreement with the Missouri Department of Conservation or some other local agency to assist with management or law enforcement on the Refuge. The staffing of the adjoining state park has a more historical focus than biological with their primary interest being the preservation of the Civil War Era battlefield; however, a Conservation Officer does reside locally.

The present (2005) level of documented incidents of illegal activity is 7.5 incidents per 60 hours of law enforcement effort. Past documented incidents of illegal activities include vandalism, wildlife disturbance while bats were hibernating, litter, and trespass.

Strategies:

1. Define and upgrade existing access or acquire a new access to the Refuge.
2. Repair fencing and maintain boundary signs to help reduce illegal access.
3. Track law enforcement reports to detect trends in illegal activity at the Refuge.

Wildlife observation is a priority public use on national wildlife refuges. USFWS

4. Issue and monitor special use permits.
5. Develop a cooperative agreement with Missouri Department of Conservation to share law enforcement on the Refuge.
6. Initiate a Friends group or similar body to act as a "neighborhood watch" to assist in monitoring activity on the Refuge.

Objective 1.2: Bat Recovery

Over the next 15 years, contribute to the stabilization or increase of Indiana bat and gray bat numbers by protecting the hibernaculum found on the Refuge.

Supporting Rationale

Indiana bat and gray bat are federally endangered species. The Refuge is listed as critical habitat for the Indiana bat and is one of nine Priority One hibernacula identified in the Indiana Bat Recovery Plan. Historically, the hibernaculum provides annual winter habitat for at least 30,000 Indiana bats.

Strategies

1. Work with MDC, MDNR, and other partners to implement State and Federal recovery plans for the Indiana bat and gray bat.
2. Place barriers to restrict access to chasm leading to abandoned mine entrance.
3. Develop a survey protocol approved by the Indiana Bat Recovery Team for monitoring wintering bats within inaccessible hibernacula.
4. Investigate stabilizing the mine entrance to prevent its collapse.

5. Work with MDC, MDNR, and other partners to investigate summer roosting habits of Indiana bats within and surrounding the Refuge.

Goal 2: Refuge Visibility

Local residents and visitors are aware of the Refuge and its purpose.

Objective 2.1: Public Access and Visitor Services

Within 5 years of plan approval, allow up to 100 visitors per year guided access to the Refuge.

Supporting Rationale

During public scoping held at the outset of the CCP process, it became evident that local residents support allowing public use of the Refuge. The summit of Pilot Knob is unique geologically and offers a panoramic view of the surrounding area, including a Civil War battlefield, Fort Davidson. Supporters believe access can be provided while protecting both bats and public safety. It has been suggested that public access and visitor services could use guided tours during times when little disturbance to the Indiana and gray bats might occur. This will further educate the local public about the importance of the bat species to people and local business and provide a biological balance, as to the need to protect the species.

All recreational activities are secondary to the primary purpose in which the Refuge was established, and must be compatible. Uses identified in the Refuge Improvement Act (hunting, fishing, wildlife observation and photography, interpretation, and environmental education) receive special recognition by the Service and are accommodated when compatible with the original purpose of the Refuge to conserve fish or wildlife which are listed as endangered or threatened species.

Strategies:

1. Place barriers to restrict access to the chasm leading to the abandoned mine entrance.
2. Establish a minimally developed administrative/maintenance access road passable by a four-wheel drive vehicle for implementing public use activities.
3. Accurately locate and map (using GPS and GIS technology) mine entrances and other potential hazards.
4. Develop a Refuge brochure.
5. Add 0.5 FTE Refuge Operations Specialist (5/7/9) to oversee biological monitoring, maintenance, cooperative agreements, interpretive programming, and outreach.
6. Explore a partnership with Fort Davidson State Historic Site to assist with guided tours and law enforcement.
7. Explore seasonal closure of the Refuge to avoid disturbing hibernating bats.
8. Use appropriate methods to avoid hazards and provide for visitor safety.
9. Work with local residents to form a Friends group or some similar body to communicate information and support the Refuge.
10. Evaluate the feasibility and compatibility of an observation platform on the summit of Pilot Knob.
11. Explore partnership opportunities with Fort Davidson Historic Site Friends Group.

Ozark Cavefish National Wildlife Refuge Goals, Objectives and Strategies

Goal 1: Endangered Species

Contribute to the recovery of federally listed species and the conservation of other subterranean species and their habitats within the Springfield Plateau.

Objective 1.1: Habitat Management

Within 10 years of plan approval, document historic conditions, collect current data on vegetation composition consistent with standards of the National Vegetation Classification System, and identify opportunities for habitat restoration.

Supporting Rationale

The Refuge consists of 40 acres along Turnback Creek in Lawrence County and a 1-acre tract located at Hearrell Springs near the Neosho National Fish Hatchery. Habitats present on Ozark Cavefish NWR include the terrace bottoms community (well-drained and rarely flooded transitional areas that support a mixture of upland and floodplain woody species); the mixed hardwood-softwood levees community along drainage ditch levees, stream margins, roadside embankments, and other watercourse borders; the upland old fields community, including scattered woodland clearings, abandoned fields or pastures, and ridge roadsides reverting to oak-hickory forest; and the xeric ridge crests community, the driest and most exposed forest community, which occurs on ridge crests, bluff tops, and

upper slopes on thin, excessively drained soils. To date, the Service has conducted no habitat management at Ozark Cavefish NWR.

Strategies

1. Develop a cooperative agreement with Missouri Department of Conservation to share management activities of the Refuge.
2. Develop and begin implementation of a Habitat Management Plan.
3. Add 0.5 FTE Refuge Operations Specialist (5/7/9) to oversee Refuge management including habitat management, implementing recovery plans, building and maintaining partnerships, and managing visitor services.

Objective 1.2: Visitor Services and Public Awareness

Within 10 years of plan approval, 33 percent of a randomly selected sample of residents within the Turnback Creek and Hearrell Spring recharge areas will recognize the purpose of the Refuge.

Supporting Rationale

Presently there is no active promotion of the Refuge other than a brochure and website. During public scoping for the CCP, the Missouri Department of Conservation suggested opening the Refuge to public use, which would contribute greatly to public awareness of it and necessitate at least minimal visitor services and facilities. Permitting limited public use would make it consistent with access to the Paris Springs, an adjoining State-owned property that contains the entrance to Turnback Cave. A greater awareness of water quality issues may result in land use improvements in the watersheds of the Ozark Cavefish and in turn contribute to the recovery of the species.

Strategies:

1. Maintain web cam at Hearrell Spring and provide interpretation.
2. Develop a cooperative agreement with Missouri Department of Conservation to share public use management of the Refuge.
3. Allow only scientific, educational, and interpretive uses at Hearrell Spring portion of Refuge.
4. Install educational/interpretive kiosks at Hearrell Spring and Turnback Creek portions of Refuge.
5. Offer compatible wildlife dependent recreation at the Turnback Creek portion of the Refuge.
6. Develop a cooperative agreement with Neosho National Fish Hatchery to share management and oversight of the Hearrell Spring portion of the Refuge located in Neosho, Missouri near the hatchery.

Objective 1.3: Law Enforcement

Throughout the life of the plan, limit the amount of documented incidents of illegal activity to no more than 1 incident per 60 hours of law enforcement effort.

Supporting Rationale

Presently, there are infrequent law enforcement inspections of the Refuge. With no local personnel, its closure to the public is difficult to enforce. Fencing and signage likely reduces the number of trespass violations, but seasonal patrols during hunting seasons and other peak usage periods are needed to monitor compliance levels. Threats associated with fire or destruction of habitat are not presently monitored on a regular basis.

The present (2005) level of documented incidents of illegal activity is 22.5 incidents per 60 hours of law enforcement effort. Past documented incidents of illegal activities include trespass and poaching.

Strategies

1. Develop a cooperative agreement with the Missouri Department of Conservation to share law enforcement oversight of the Refuge.
2. Post and maintain Refuge boundaries.

Goal 2: Water Quality

Landowners in the recharge areas of the Refuge apply best management practices to maintain water quality.

Objective 2.1: Recharge Area Conservation

At least 75 percent of landowners in the Turnback Creek recharge area will be presented with information regarding the relationship between best management practices and water quality and encouraged to apply the practices.

Supporting Rationale

Currently there is no active program to improve water quality within the recharge areas for Turnback Creek or Hearrell Springs. During public scoping for the CCP, several commenters

observed that protecting and conserving recharge areas for streams known to contain Ozark cavefish would provide the greatest protection for the species. Hazardous material spills along Highway 44 within the recharge area for Turnback Creek pose a potential risk to the Ozark cavefish on the Refuge: spill could not only contaminate surface water, but also have adverse effects on the Ozark cavefish and other subterranean species.

Strategies

1. Coordinate with the Missouri Department of Conservation on Turnback Cave recharge area mapping.
2. Explore the need for mapping the recharge area of Hearrell Spring portion of Refuge.
3. Work with the Service's Partners for Wildlife program and the Missouri Department of Conservation's private lands programs to develop a landowner education program, and to assist in the restoration of habitats that would contribute to the conservation of the recharge area.
4. Work with Missouri Department of Conservation, Missouri Department of Natural Resources, Missouri Department of Transportation, landowners, and others to develop mitigation measures for hazardous materials spills.
5. Monitor water quality at various locations in the recharge area and communicate trends to landowners.

Chapter 5: Plan Implementation

New and Existing Projects

This CCP outlines an ambitious course of action for the future management of Mingo, Pilot Knob, and Ozark Cavefish national wildlife refuges. 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 Refuges 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 F on page 261. In the appendix, the highest priority Refuge projects are described briefly.

Table 7: Additional Staffing Required to Fully Implement the CCP by 2022, Mingo NWR

Position	Full-time Equivalents (FTEs)
Refuge Operations Specialist	1
Biological Technician	1
Law Enforcement Officer	1
Park Ranger	1
Two Tractor Operators	1.6
Heavy Equipment Operator	1

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. Figure 17 describes current staffing and organization at Mingo NWR and Figure 18 describes the staff and organization needed to fully implement this CCP by fiscal year 2022. Table 7 describes proposed full-time equivalents (FTEs) increases for the Mingo NWR staff.

Snow day on Mingo NWR. USFWS

Partnership Opportunities

Partnerships have become an essential element for the successful accomplishment of goals, objectives, and strategies at Mingo NWR, Pilot Knob NWR and Ozark Cavefish NWR. The objectives

Figure 17: Current Staffing, Mingo NWR

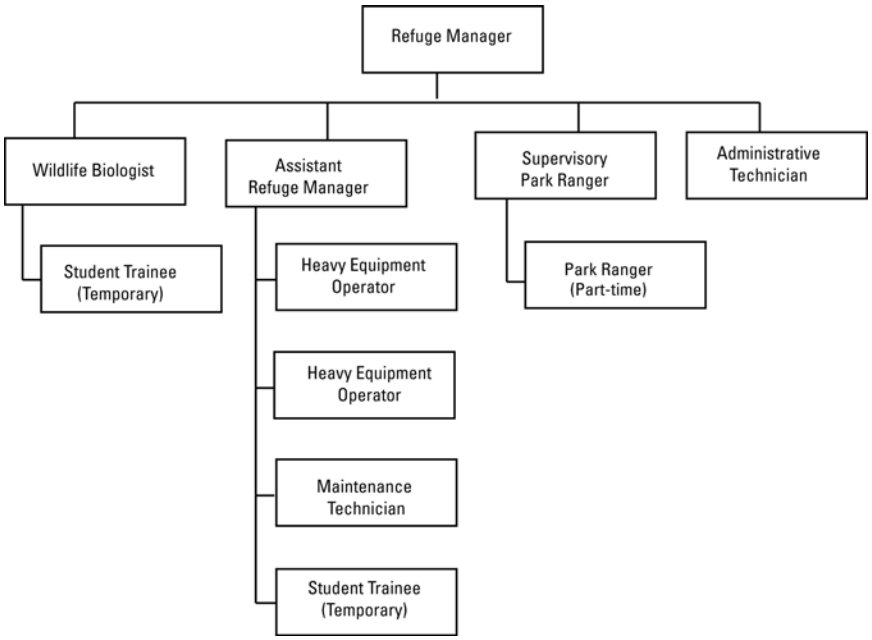
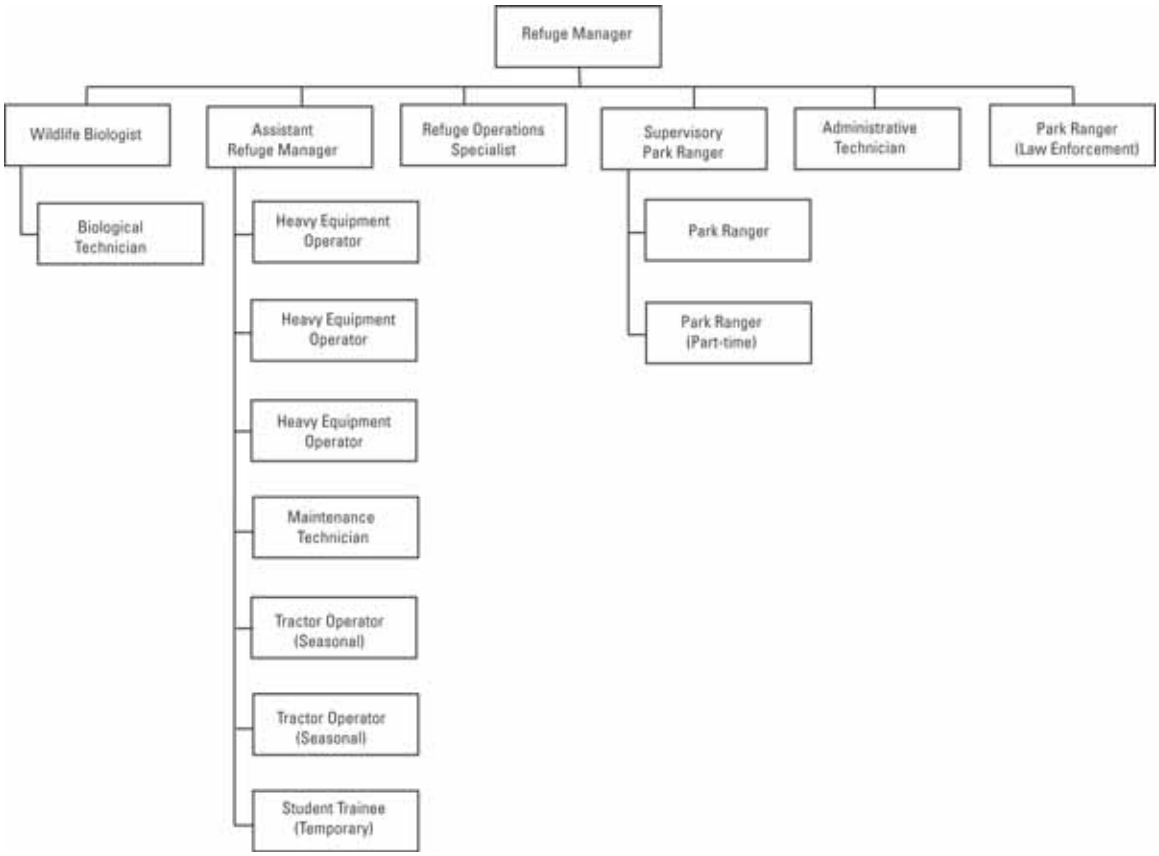


Figure 18: Staffing Needed to Fully Implement the CCP, Mingo NWR



outlined in this CCP need the support and the partnerships of federal, state and local agencies, non-governmental organizations and individual citizens. This broad-based approach to managing fish and wildlife resources extends beyond social and political boundaries and requires a foundation of support from many. Refuge staff will continue to seek creative partnership opportunities to achieve the visions of the three Refuges.

Other notable partners include:

Mingo Swamp Friends, Inc.
Ducks Unlimited
East Ozarks Audubon Society
University of Missouri's Gaylord Memorial Laboratory
U.S. Naval Construction Force
Natural Resources Conservation Service (NRCS)
Missouri Department of Conservation (MDC)
U.S. Army Corps of Engineers (USACE)
U.S. Geological Survey (USGS)
Missouri Department of Transportation (MODOT)
Ozark Border Electric Company
Girl Scouts of America Cotton Boll Area Council, Inc.
Wal Mart
Rocky Top Gun Shop
Dennis Outdoors
Crappie Company
Mingo Job Corps Center

Step-down Management Plans

Step-down management plans describe the specific strategies and implementation schedules for meeting general goals and objectives identified in the CCP. The following list shows the step-down management plans we intend to prepare. We completed a fire management plan that is referenced in the CCP.

The Fire Management Plan, approved in 2004, provides direction and establishes procedures to guide various wildland fire program activities. The Fire Management Plan covers the historical and ecological role of fire, fire management objectives, preparedness, suppression, fire management actions and responses, fire impacts, use of prescribed fire, and fire management restrictions.

Mingo NWR

Law Enforcement
Visitor Services
Wilderness Management
Habitat Management
Fire Management
Inventory and Monitoring

Pilot Knob NWR

Law Enforcement
Visitor Services
Habitat Management
Fire Management
Inventory and Monitoring

Ozark Cavefish NWR

Law Enforcement
Visitor Services
Habitat Management

Monitoring and Evaluation

The direction set forth in this CCP and specifically identified strategies and projects will be monitored throughout the life of this plan. On a periodic basis, the Regional Office will assemble a station review team whose purpose will be to visit Mingo, Pilot Knob and Ozark Cavefish national wildlife refuges 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 from which this field station will be evaluated.

Plan Review and Revision

The CCP for the three refuges is meant to provide guidance to refuge managers 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 natural uncontrollable events such as windstorms and floods. 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.

Archeological and Cultural Values

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

Archeological investigations and collecting are performed only in the public interest by qualified archeologists working under an Archaeological Resources Protection Act 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 FWS cultural resources contracts as well: the contract is the equivalent of a permit.) Too, the Refuge Manager issues a special use permit. 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.

The Refuge Manager will, with the assistance of the RHPO, develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.

The Refuge Manager should have and implement a plan for inspecting the condition of known cultural resources on the Refuge and report to the RHPO changes in the conditions.

The Refuge Manager will initiate budget requests for the following activities as needed for Section 106 compliance:

1. Inventory, evaluate, and protect all significant cultural resources located on lands controlled by the FWS, including historic properties of religious and cultural significance to Indian tribes.
2. Identify and nominate to the National Register of Historic Places all historic properties including those of religious and cultural significance to Indian tribes.
3. Cooperate with Federal, state, and local agencies, Native American tribes, and the public in managing cultural resources on the Refuge.
4. Integrate historic preservation with planning and management of other resources and activities. Historic buildings are rehabilitated and adapted to reuse when feasible.
5. Recognize the rights of Native American to have access to certain religious sites and objects on Refuge lands within the limitations of the FWS mission.

Appendix A: Finding of No Significant Impact

Finding of No Significant Impact

Environmental Assessment and Comprehensive Conservation Plan for Mingo, Pilot Knob, and Ozark Cavefish National Wildlife Refuges, Missouri

An Environmental Assessment (EA) has been prepared to identify management strategies to meet the conservation goals of Mingo, Pilot Knob, and Ozark Cavefish National Wildlife Refuges. The EA examined the environmental consequences that each management alternative could have on the quality of the physical, biological, and human environment, as required by the National Environmental Policy Act of 1969 (NEPA). The EA presented and evaluated four alternatives for Mingo National Wildlife Refuge (NWR) and two alternatives each for Pilot Knob NWR and Ozark Cavefish NWR for managing fish, wildlife, and plant habitats, as well as visitor services, on the Refuges over the next 15 years.

Mingo NWR

Alternative 1: Current Management Direction (No Action)
Current management is focused on improving drainage within the Refuge by removing sediment from a portion of the ditch network. Wetlands are actively managed to benefit migratory birds, especially waterfowl. Grassy openings, cropland, and food plots are concentrated around the perimeter of the Refuge. There are opportunities for hunting, fishing, wildlife observation, wildlife photography, environmental interpretation, environmental education, horseback riding, canoeing, and several other activities.

Alternative 2: Expanded Public Use
This alternative would augment visitor services and expand public use facilities and opportunities on the Refuge above current levels. In pursuing the habitat goal, Alternative 2, like the No Action Alternative (1), would generally manage habitats as they are managed at present, except in cases where changes in habitat management are directly related to proposed changes in public use. One example is that efforts to improve drainage within the Refuge would be expanded to include more of the ditch network.

Alternative 3: Expanded Habitat Management and Reduced Visitor Conflicts
This alternative would emphasize expanding habitat management and reducing visitor conflicts on the Refuge generally by curtailing the amount and extent of public use below present levels. The bottomland forest would be actively managed and would slightly increase because of the conversion of some open marsh and all grassy openings, cropland, and food plots. Efforts to improve drainage within the Refuge would be expanded above present levels to include more of the ditch network. Management of some units would be altered to attract nesting marsh birds.

Alternative 4: Balanced Expanded Public Use and Habitat Management *(Preferred Alternative)*
Alternative 4 would pursue both expanded public use and habitat management in a balanced approach that would seek to increase the benefits of the Refuge in all respects. Under Alternative 4, Mingo NWR would increase opportunities for a number of recreational activities particularly hunting, fishing, wildlife observation, and horseback riding. The bottomland forest would be

actively managed and would slightly increase because of the conversion of some open marsh, grassy openings, cropland, and food plots. Efforts to improve drainage within the Refuge would be expanded above present levels to include more of the ditch network. Management of some units would be altered to attract nesting marsh birds.

Pilot Knob NWR

Alternative 1: Current Management Direction (No Action)
Under current management direction, law enforcement activities at Pilot Knob NWR would remain infrequent. Public access would be limited to specific authorized visits associated with research, education, or historic interpretation. Repair and maintenance of fencing and boundary signs would continue.

Alternative 2: Expanded Species Protection and Opportunities for the Public *(Preferred Alternative)*
The preferred alternative for Pilot Knob includes increased community outreach to improve communication with local residents, seasonal guided public access to the summit of Pilot Knob, and developing a formal agreement with the Missouri Department of Conservation to share law enforcement duties.

Ozark Cavefish NWR

Alternative 1: Current Management Direction (No Action)
Under current management direction, the Refuge would continue to provide protection to the surface outlet of Turnback Creek and Hearrell Springs. There would be no active habitat management on the Refuge, and it would continue to be closed to the public. Boundaries would be posted and maintained, but law enforcement inspections would be infrequent.

Alternative 2: Expanded Species Protection and Opportunities for the Public *(Preferred Alternative)*
The preferred alternative for Ozark Cavefish includes opening the Refuge to compatible wildlife dependent recreation, working with surrounding land owners to improve water quality, assessing and managing habitat, and developing a formal agreement with the Missouri Department of Conservation to share management activities at this remote site.

The alternative selected for implementation is Alternative 4 for Mingo NWR, Alternative 2 for Pilot Knob NWR, and Alternative 2 for Ozark Cavefish NWR. The strategies presented in the Comprehensive Conservation Plan (CCP) were developed as a direct result of the selection of these alternatives. Managing and expanding bottomland hardwood forest will benefit a variety of wildlife species identified as Resource Conservation Priority species by the Service. Habitats will be managed for nesting and migrating water and land birds. Visitors to the Refuges also will benefit from expanded recreational opportunities, especially fishing, hunting, and wildlife observation.

For reasons presented above and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative 4 for Mingo NWR, Alternative 2 for Pilot Knob NWR, and Alternative 2 for Ozark Cavefish NWR as

the management alternatives is not a major federal action which would significantly affect the quality of the human environment, within the meaning of Section 102 (2)(c) of the National Environmental Policy Act of 1969.

Additional Reasons:

1. Future management actions will have a neutral or positive impact on the local economy.
2. A cultural resource inventory completed prior to this CCP included recommendations for the protection of cultural, archaeological and historical resources.
3. This action will not have an adverse impact on threatened or endangered species.

Supporting References:

Environmental Assessment
Comprehensive Conservation Plan

Robyn Thorson APR 17 2007

Regional Director Date

Appendix B: Glossary

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 nonmaterial 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 significant 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 plan 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 Lists

Appendix C: Species Lists

Mammal Species List, Mingo NWR

Opossum	*Didelphis virginiana*
Golden Mouse	*Ochrotomys nuttalli*
Shorttail Shrew	*Blarina brevicauda*
Hispid Cotton Rat	*Sigmodon hispidus*
Least Shrew	*Cryptotis parva*
Eastern Woodrat	*Neotoma floridana*
Eastern Mole	*Scalopus aquaticus*
Southern Bog Lemming	*Synaptomys cooperi*
Little Brown Bat	*Myotis lucifugus*
Prairie Vole	*Microtus ochrogaster*
Eastern Red Bat	*Lasiurus borealis*
Pine Vole	*Microtus pinetorum*
Eastern Cottontail	*Sylvilagus floridanus*
Muskrat	*Ondatra zibethicus*
Swamp Rabbit	*Sylvilagus aquaticus*
Norway Rat	*Rattus norvegicus*
Woodchuck	*Marmota monax*
House Mouse	*Mus musculus*
Eastern Chipmunk	*Tamias striatus*
Coyote	*Canis latrans*
Eastern Gray Squirrel	*Sciurus carolinensis*
Red Fox	*Vulpes vulpes*
Eastern Fox Squirrel	*Sciurus niger*
Gray Fox	*Urocyon cinereoargenteus*
Southern Flying Squirrel	*Glaucomys volans*
Raccoon	*Procyon lotor*
Beaver	*Castar canadensis*
Longtail Weasel	*Mustela frenata*
Nutria	*Myocastar coypus*
Mink	*Mustela vison*
Rice Rat	*Mys palustris*

Mammal Species List, Mingo NWR (Continued)

Striped Skunk	*Mephitis mephitis*
Western Harvest Mouse	*Reithrodontomys megalotis*
River Otter	*Lontra canadensis*
Deer Mouse	*Peromyscus maniculatus*
Bobcat	*Lynx rufus*
White-footed Mouse	*Peromyscus leucopus*
White-tailed Deer	*Odocoileus virginianus*
Cotton Mouse	*Peromyscus gossypinus*

Amphibian Species List, Mingo NWR

Smallmouth Salamander	*Ambystoma texanum*
Mole Salamander	*Ambystoma talpoideum*
Marbled Salamander	*Ambystoma opacum*
Spotted Salamander	*Ambystoma maculatum*
Tiger Salamander	*Ambystoma tigrinum*
Red-backed Salamander	*Plethodon serratus*
Slimy Salamander	*Plethodon albagula*
Central Newt	*Notophthalmus viridescens louisianensis*
Lesser Siren	*Siren intermedia*
Amphiuma	*Amphiuma tridactylum*
Blanchard's Cricket Frog	*Acris crepitans blanchardi*
Northern Spring Peeper	*Pseudacris crucifer crucifer*
Green Treefrog	*Hyla cinerea*
Western Chorus Frog	*Pseudacris triseriata*
Illinois Chorus Frog	*Pseudacris streckeri illinoensis*
Gray Treefrog	*Hyla chrysoscelis/versicolor*
Bullfrog	*Rana catesbeiana*
Southern Leopard Frog	*Rana sphenocephala*
Pickerel Frog	*Rana palustris*
Bronze Frog	*Rana clamitans clamitans*
Green Frog	*Rana clamitans*
American Toad	*Bufo americanus*
Fowler's Toad	*Bufo fowleri*
Eastern Spadefoot	*Scaphiopus holbrookii*
Eastern Narrow-mouthed Toad	*Gastrophryne carolinensis*

Reptile Species List, Mingo NWR

Common Snapping Turtle	*Chelydra serpentina*
Alligator Snapping Turtle	*Macroclemys temminckii*
Mississippi Mud Turtle	*Kinosternon subrubrum hippocrepis*
Three-toed Box Turtle	*Terrapene carolina triunguis*
Southern Painted Turtle	*Chrysemys picta belli*
Red-eared Slider	*Trachemys scripta*
Cooter	*Pseudemys concinna/Chrysemys floridana complex*
Western Chicken Turtle	*Deirochelys reticularia miaria*
Spiney Softshell	*Apalone spiniferus spiniferus*
Midland Smooth Softshell	*Apalone muticus muticus*
Map Turtle	*Graptemys geographica*
Mississippi Map Turtle	*Graptemys pseudogeographica kohnii*
Fence Lizard	*Sceloporus undulatus hyacinthinus*
Five-lined Skink	*Eumeces fasciatus*
Ouachita Map Turtle	*Graptemys ouachitensis ouachitensis*
Stinkpot	*Sternotherus odoratus*
Green Water Snake	*Nerodia cyclopion*
Diamondback Water Snake	*Nerodia rhombifer*
Yellow-bellied Water Snake	*Nerodia erythrogaster flavigaster*
Broad-banded Water Snake	*Nerodia fasciata confluens*
Graham's Water Snake	*Regina grahamii*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Western Ribbon Snake	*Thamnophis proximus proximus*
Eastern Hognose Snake	*Heterodon platirhinos*
Mississippi Ringneck Snake	*Diadophis punctatus stictogenys*
Western Worm Snake	*Carphophis vermis*
Race Runner	*Cnemidophorus sexlineatus*
Ground Skink	*Scincella lateralis*
Western Mud Snake	*Farancia abacura reinwardtii*
Southern Black Racer	*Coluber constrictor priapus*
Black Rat Snake	*Elaphe obsoleta*
Speckled King Snake	*Lampropeltis getula holbrooki*
Red Milk Snake	*Lampropeltis triangulum syspila*

Reptile Species List, Mingo NWR (Continued)

Prairie King Snake	*Lampropeltis calligaster calligaster*
Midland Brown Snake	*Storeria dekayi wrightorum*
Northern Red-belly Snake	*Storeria occipitomaculata occipitomaculata*
Rough Green Snake	*Opheodrys aestivus aestivus*
Southern Copperhead	*Agkistrodon contortrix contortrix*
Western Cottonmouth	*Agkistrodon piscivorus leucostoma*
Timber Rattlesnake	*Crotalus horridus*
Broad-headed skink	*Eumeces laticeps*

Fish Species List, Mingo NWR

Flier Sunfish	*Centrarchus macropterus*
Banded Pygmy Sunfish	*Elassoma zonatum*
Green Sunfish	*Lepomis cyanellus*
Warmouth Sunfish	*Lepomis gulosus*
Orange-spotted Sunfish	*Lepomis humilis*
Bluegill	*Lepomis macropterus*
Dollar Sunfish	*Lepomis marginatus*
Longear Sunfish	*Lepomis megalotis*
Redear Sunfish	*Lepomis microlophus*
Red-spotted Sunfish	*Lepomis miniatus*
Bantam Sunfish	*Lepomis symmatricus*
Spotted Bass	*Micropterus punctulatus*
Largemouth Bass	*Micropterus salmoides*
White Crappie	*Pomoxis annularis*
Black Crappie	*Pomoxis nigromaculatus*
Bluntnose Darter	*Etheostoma chlorosomum*
Slough Darter	*Etheostoma gracile*
Johnny Darter	*Etheostoma nigrum*
Cypress Darter	*Etheostoma proeliare*
Speckled Darter	*Etheostoma stigmaeum*
Blackside Darter	*Percina maculata*
Swamp Darter	*Etheostoma fusiforme*
Pirate Perch	*Aphredoderus sayanus*

Fish Species List, Mingo NWR (Continued)

Black Bullhead	*Ictalurus melas*
Yellow Bullhead	*Ictalurus natalis*
Brown Bullhead	*Ameiurus nebulosus*
Channel Catfish	*Ictalurus punctuatus*
Tadpole Madtom	*Noturus gyrinus*
Lake Chubsucker	*Erimyzon sucetta*
Smallmouth Buffalo	*Ictiobus bubalus*
Bigmouth Buffalo	*Ictiobus cyrinellus*
Black Buffalo	*Ictiobus niger*
Spotted Sucker	*Minytrema melanops*
Black Redhorse	*Moxostoma duquesnei*
Golden Redhorse	*Moxostoma erythrurm*
Largescale Stoneroller	*Campostoma oligolepis*
Cental Stoneroller	*Campostoma pullum*
Blacktail Shiner	*Cyprinella venusta*
Carp	*Cyprinus carpio*
Ozark Minnow	*Notropis nubilus*
Striped Shiner	*Luxilus chrysocephalus*
Redfin Shiner	*Lythrurus umbratilis*
Golden Shiner	*Notemigonus crysoleucas*
Taillight Shiner	*Notropis maculatus*
Weed Shiner	*Notropis texanus*
Mimic Shiner	*Notropis volucellus*
Pallid Shiner	*Notropis amnis*
Pugnose Minnow	*Opsopoedus emilae*
Bluntnose Minnow	*Pimephales notatus*
Bullhead Minnow	*Pimephales vigilax*
Creek Chub	*Semotilus atromaculatus*
Bowfin	*Amia calva*
Spotted Gar	*Lepisosteus oculatus*
Longnose Gar	*Lepisosteus osseus*
Shortnose Gar	*Lepisosteus platostomus*
Alligator Gar	*Lepisosteus spatula*
Freshwater Drum	*Aplodinotus grunniens*
Gizzard Shad	*Dorosoma cepedianum*

Fish Species List, Mingo NWR (Continued)

Grass Pickerel	*Esox americanus vermiculatus*
Chain Pickerel	*Esox niger*
Northern Studfish	*Fundulus catenatus*
Black-stripe Topminnow	*Fundulus notatus*
Starhead Topminnow	*Fundulus dispar*
Black-spotted Topminnow	*Fundulus olivaceus*
Western Mosquitofish	*Gambusia affinis*
Brook Silverside	*Labidesthes sicculus*

Bird Species List, Mingo NWR

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Pied-billed Grebe *Podilymbus podiceps*	Documented Breeder	common	rare	common	common	
Horned Grebe *Podiceps auritus*		rare	-	rare	-	
Eared Grebe *Podiceps nigricollis*		rare	-	rare	-	
American White Pelican *Pelecanus erythrorhynchos*		rare	-	uncommon	-	
Double-crested Cormorant *Phalacrocorax auritus*		rare	-	rare	-	Resource Conservation Priority
American Bittern *Botaurus lentiginosus*		common	rare	rare	-	Resource Conservation Priority
Least Bittern *Ixobrychus exilis*		rare	rare	rare	-	Resource Conservation Priority
Great Blue Heron *Ardea herodias*	Documented Breeder	common	common	common	uncommon	
Great Egret *Ardea alba*		uncommon	uncommon	uncommon	-	
Snowy Egret *Egretta thula*		rare	rare	-	-	
Little Blue Heron *Egretta caerulea*	Documented Breeder	common	common	common	-	
Cattle Egret *Bubulcus ibis*	Documented Breeder	common	uncommon	common	-	
Green Heron *Butorides virescens*	Documented Breeder	common	abundant	common	rare	
Black-crowned Night-Heron *Nycticorax nycticorax*	Documented Breeder	rare	rare	uncommon	-	Resource Conservation Priority

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Yellow-crowned Night-Heron *Nyctanassa violacea*	Documented Breeder	common	common	uncommon	-	
White Ibis *Eudocimus albus*		uncommon	rare	uncommon	-	
Tundra Swan *Cygnus columbianus*		-	-	-	rare	
Trumpeter Swan *Cygnus buccinator*		-	-	-	rare	Resource Conservation Priority
Greater White-fronted Goose *Anser albifrons*		rare	-	uncommon	rare	
Snow Goose *Anser caerulescens*		uncommon	-	uncommon	uncommon	Resource Conservation Priority
Canada Goose *Branta canadensis*	Documented Breeder	abundant	uncommon	abundant	abundant	Resource Conservation Priority
Wood Duck *Aix sponsa*	Documented Breeder	common	common	abundant	common	Resource Conservation Priority
Green-winged Teal *Anas crecca*		common	-	common	uncommon	
American Black Duck *Anas rubripes*		uncommon	-	uncommon	uncommon	Resource Conservation Priority
Mallard *Anas platyrhynchos*		abundant	rare	abundant	abundant	Resource Conservation Priority
Northern Pintail *Anas acuta*		common	-	common	common	Resource Conservation Priority
Blue-winged Teal *Anas discors*		abundant	-	common	uncommon	Resource Conservation Priority
Northern Shoveler *Anas clypeata*		common	-	common	uncommon	
Gadwall *Anas strepera*		common	-	abundant	uncommon	
American Wigeon *Anas americana*		common	-	common	uncommon	
Canvasback *Aythya valisineria*		rare	-	rare	rare	Resource Conservation Priority
Redhead *Aythya americana*		rare	-	rare	rare	
Ring-necked Duck *Aythya collaris*		common	-	common	common	
Lesser Scaup *Aythya affinis*		uncommon	-	uncommon	uncommon	Resource Conservation Priority
Common Goldeneye *Bucephala clangula*		rare	-	rare	rare	
Bufflehead *Bucephala albeola*		rare	-	rare	rare	
Hooded Merganser *Lophodytes cucullatus*	Documented Breeder	uncommon	uncommon	uncommon	common	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Common Merganser *Mergus merganser*		rare	-	rare	rare	
Red-breasted Merganser *Mergus serrator*		rare	-	rare	-	
Ruddy Duck *Oxyura jamaicensis*		-	-	rare	rare	
Black Vulture *Coragyps atratus*	Documented Breeder	uncommon	uncommon	uncommon	rare	
Turkey Vulture* *Cathartes aura*	Documented Breeder	common	common	common	uncommon	
Osprey *Pandion haliaetus*		rare	-	rare	-	
Mississippi Kite *Ictinia mississippiensis*	Documented Breeder	rare	uncommon	-	-	
Bald Eagle *Haliaeetus leucocephalus*	Documented Breeder	uncommon	rare	common	common	Threatened; Resource Conservation Priority
Northern Harrier *Circus cyaneus*		uncommon	-	common	common	Resource Conservation Priority
Sharp-shinned Hawk *Accipiter striatus*	Documented Breeder	rare	rare	rare	rare	
Cooper's Hawk *Accipiter cooperii*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	
Northern Goshawk *Accipiter gentilis*		-	-	rare	rare	Resource Conservation Priority
Red-shouldered Hawk *Buteo lineatus*	Documented Breeder	common	common	common	common	Resource Conservation Priority
Broad-winged Hawk *Buteo platypterus*		rare	rare	rare	rare	
Red-tailed Hawk *Buteo jamaicensis*	Documented Breeder	common	common	common	common	
Rough-legged Hawk *Buteo lagopus*		rare	-	rare	uncommon	
Golden Eagle *Aquila chrysaetos*		rare	-	rare	rare	
American Kestrel *Falco sparverius*	Documented Breeder	uncommon	uncommon	uncommon	common	
Merlin *Falco columbarius*		rare		rare	rare	
Peregrine Falcon *Falco peregrinus*		rare	-	rare	rare	Resource Conservation Priority
Ring-necked Pheasant *Phasianus colchicus*		rare	rare	rare	rare	
Wild Turkey *Meleagris gallopavo*	Documented Breeder	common	common	common	common	
Northern Bobwhite *Colinus virginianus*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Yellow Rail *Coturnicops noveboracensis*		rare	rare	-	-	Resource Conservation Priority
King Rail *Rallus elegans*		rare	rare	-	-	Resource Conservation Priority
Virginia Rail *Rallus limicola*		uncommon	-	uncommon	-	
Sora *Porzana carolina*		common	-	common	-	
Purple Gallinule *Porphyrio martinicus*		-	rare	-	-	
Common Moorhen *Gallinula chloropus*		rare	rare	-	-	Resource Conservation Priority
American Coot *Fulica americana*		common	rare	abundant	common	
Sandhill Crane *Grus canadensis*		rare		rare		
American Golden-Plover *Pluvialis dominica*		rare	-	-	-	
Semipalmated Plover *Charadrius semipalmatus*		rare	rare	rare	-	
Killdeer *Charadrius vociferus*	Documented Breeder	common	common	common	uncommon	
American Avocet *Recurvirostra americana*		rare	rare	rare		
Greater Yellowlegs *Tringa melanoleuca*	Does not breed	uncommon	uncommon	uncommon	-	Resource Conservation Priority
Lesser Yellowlegs *Tringa flavipes*	Does not breed	common	common	common	-	
Solitary Sandpiper *Tringa solitaria*	Does not breed	common	common	rare	-	
Willet *Catoptrophorus semipalmatus*		rare	rare	rare		
Spotted Sandpiper *Tringa macularia*	Documented Breeder	uncommon	common	rare	-	
Upland Sandpiper *Bartramia longicauda*	Does not breed	rare	-	rare	-	Resource Conservation Priority
Sanderling *Calidris alba*	Does not breed	rare	-	rare	-	
Semipalmated Sandpiper *Calidris pusilla*	Does not breed	uncommon	uncommon	rare	-	
Least Sandpiper *Calidris minutilla*	Does not breed	uncommon	uncommon	uncommon	-	
White-rumped Sandpiper *Calidris fuscicollis*	Does not breed	rare	-	-	-	
Western Sandpiper *Calidris mauri*	Does not breed	rare	-	rare	-	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Baird's Sandpiper *Calidris bairdii*		-	-	rare	-	
Pectoral Sandpiper *Calidris melanotos*	Does not breed	common	common	common	-	
Dunlin *Calidris alpina*	Does not breed	uncommon	-	uncommon	-	
Stilt Sandpiper *Micropalama himantopus*	Does not breed	uncommon	rare	uncommon	-	Resource Conservation Priority
Dowitcher Spp.		uncommon	rare	uncommon	-	
Common Snipe *Gallinago gallinago*	Does not breed	common	rare	common	rare	
American Woodcock *Scolopax minor*		common	rare	common	rare	Resource Conservation Priority
Wilson's Phalarope *Steganopus tricolor*		uncommon	-	uncommon	-	Resource Conservation Priority
Franklin's Gull *Larus pipixcan*				rare		
Ring-billed Gull *Larus delawarensis*		uncommon	-	uncommon	uncommon	
Herring Gull *Larus argentatus*		uncommon	-	uncommon	uncommon	
Caspian Tern *Sterna caspia*		rare		rare		
Common Tern *Sterna hirundo*		uncommon	-	-	-	Resource Conservation Priority
Forster's Tern *Sterna forsteri*		uncommon	-	-	-	Resource Conservation Priority
Least Tern *Sterna antillarum*		rare	rare			Endangered; Resource Conservation Priority
Black Tern *Chlidonias niger*		uncommon	rare	rare	-	Resource Conservation Priority
Rock Dove *Columba livia*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	
Mourning Dove *Zenaida macroura*	Documented Breeder	abundant	abundant	abundant	common	
Black-billed Cuckoo *Coccyzus erythropthalmus*	Documented Breeder	uncommon	uncommon	-	-	Resource Conservation Priority
Yellow-billed Cuckoo *Coccyzus americanus*	Documented Breeder	abundant	abundant	uncommon	-	
Barn Owl *Tyto alba*	Documented Breeder	rare	rare	rare	rare	Resource Conservation Priority
Eastern Screech-Owl *Otus asio*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Great Horned Owl *Bubo virginianus*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	
Barred Owl *Strix varia*	Documented Breeder	common	common	common	common	
Short-eared Owl *Asio flammeus*		rare	-	rare	rare	Resource Conservation Priority
Long-eared Owl *Asio otus*		rare	-	-	rare	Resource Conservation Priority
Northern Saw-whet Owl *Aegolius acadicus*		-	-	-	rare	
Common Nighthawk *Chordeiles minor*	Documented Breeder	uncommon	uncommon	-	-	
Chuck-will's-widow *Caprimulgus carolinensis*	Documented Breeder	common	common	-	-	Resource Conservation Priority
Whip-poor-will *Caprimulgus vociferus*	Documented Breeder	common	common	-	-	Resource Conservation Priority
Chimney Swift *Chaetura pelagica*	Documented Breeder	common	common	uncommon	-	
Ruby-throated Hummingbird *Archilochus colubris*	Documented Breeder	common	common	uncommon	-	
Belted Kingfisher *Ceryle alcyon*	Documented Breeder	common	common	uncommon	uncommon	
Red-headed Woodpecker *Melanerpes erythrocephalus*	Documented Breeder	common	common	abundant	abundant	Resource Conservation Priority
Red-bellied Woodpecker *Melanerpes carolinus*	Documented Breeder	common	common	common	common	
Yellow-bellied Sapsucker *Sphyrapicus varius*		uncommon	-	uncommon	uncommon	
Downy Woodpecker *Picoides pubescens*	Documented Breeder	common	common	common	common	
Hairy Woodpecker *Picoides villosus*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	
Pileated Woodpecker *Dryocopus pileatus*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	
Northern Flicker *Colaptes auratus*	Documented Breeder	common	common	common	abundant	Resource Conservation Priority
Olive-sided Flycatcher *Contopus cooperi*		uncommon	uncommon	-	-	Resource Conservation Priority
Eastern Wood-Pewee *Contopus virens*	Documented Breeder	common	common	-	-	
Yellow-bellied Flycatcher *Empidonax flaviventris*		rare	rare		-	
Acadian Flycatcher *Empidonax virescens*	Documented Breeder	common	common	-	-	Resource Conservation Priority
Alder Flycatcher *Empidonax alnorum*	Does not breed	uncommon	uncommon	-	-	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Willow Flycatcher *Empidonax traillii*	Does not breed	uncommon	uncommon	-	-	
Least Flycatcher *Empidonax minimus*	Does not breed	uncommon	uncommon	-	-	
Eastern Phoebe *Sayornis phoebe*	Documented Breeder	common	common	rare	rare	
Great Crested Flycatcher *Myiarchus crinitus*	Documented Breeder	common	common	-	-	
Eastern Kingbird *Tyrannus tyrannus*	Documented Breeder	common	common	-	-	
Scissor-tailed Flycatcher *Tyrannus forficatus*		rare	rare	rare		
Horned Lark *Eremophila alpestris*	Documented Breeder	common	uncommon	uncommon	common	
Purple Martin *Progne subis*	Documented Breeder	uncommon	uncommon	-	-	
Tree Swallow *Tachycineta bicolor*	Documented Breeder	abundant	abundant	uncommon	-	
Northern Rough-winged Swallow *Stelgidopteryx serripennis*	Documented Breeder	uncommon	uncommon	-	-	
Bank Swallow *Riparia riparia*	Documented Breeder	uncommon	uncommon	-	-	
Cliff Swallow *Petrochelidon pyrrhonota*	Documented Breeder	rare	rare	-	-	
Barn Swallow *Hirundo rustica*	Documented Breeder	common	common	-	-	
Blue Jay *Cyanocitta cristata*	Documented Breeder	common	common	common	common	
American Crow *Corvus brachyrhynchos*	Documented Breeder	common	common	common	abundant	
Fish Crow *Corvus ossifragus*	Documented Breeder	uncommon	uncommon	uncommon	rare	
Black-capped Chickadee *Poecile atricapillus*		-	-	-	uncommon	
Carolina Chickadee *Poecile carolinensis*	Documented Breeder	common	common	common	common	
Tufted Titmouse *Baeolophus bicolor*	Documented Breeder	common	common	common	common	
Red-breasted Nuthatch *Sitta canadensis*		-	-	-	rare	
White-breasted Nuthatch *Sitta carolinensis*	Documented Breeder	uncommon	uncommon	common	common	
Brown Creeper *Certhia americana*		uncommon	-	uncommon	uncommon	
Carolina Wren *Thryothorus ludovicianus*	Documented Breeder	common	common	common	common	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Bewick's Wren *Thryomanes bewickii*	Documented Breeder	rare	rare	rare	rare	Resource Conservation Priority
House Wren *Troglodytes aedon*	Documented Breeder	common	common	common	-	
Winter Wren *Troglodytes troglodytes*		common	-	common	common	
Sedge Wren *Cistothorus platensis*	Documented Breeder	rare	rare	rare	rare	Resource Conservation Priority
Marsh Wren *Cistothorus palustris*		uncommon	-	rare	rare	
Golden-crowned Kinglet *Regulus satrapa*		uncommon	-	common	common	
Ruby-crowned Kinglet *Regulus calendula*		uncommon	-	uncommon	rare	
Blue-gray Gnatcatcher *Polioptila caerulea*	Documented Breeder	abundant	abundant	uncommon	-	
Eastern Bluebird *Sialia sialis*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	
Veery *Catharus fuscescens*		rare	-	rare	-	
Gray-cheeked Thrush *Catharus minimus*		uncommon	-	uncommon	-	
Swainson's Thrush *Catharus ustulatus*		uncommon	-	uncommon	-	
Hermit Thrush *Catharus guttatus*		common	-	common	uncommon	
Wood Thrush *Catharus mustelinus*	Documented Breeder	common	common	common	-	Resource Conservation Priority
American Robin *Turdus migratorius*	Documented Breeder	common	common	common	common	
Gray Catbird *Dumetella carolinensis*	Documented Breeder	common	common	common	rare	
Northern Mockingbird *Mimus polyglottos*	Documented Breeder	common	common	common	common	
Brown Thrasher *Toxostoma rufum*	Documented Breeder	common	common	common	uncommon	
Cedar Waxwing *Bombycilla cedrorum*		uncommon	-	uncommon	uncommon	
Loggerhead Shrike *Lanius ludovicianus*	Documented Breeder	uncommon	uncommon	uncommon	uncommon	Resource Conservation Priority
European Starling *Sturnus vulgaris*	Documented Breeder	abundant	common	abundant	abundant	
White-eyed Vireo *Vireo griseus*	Documented Breeder	common	common	-	-	
Bell's Vireo *Vireo bellii*	Documented Breeder	uncommon	uncommon	-	-	Resource Conservation Priority

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Blue-headed Vireo *Vireo solitarius*		uncommon	-	uncommon	rare	
Yellow-throated Vireo *Vireo flavifrons*	Documented Breeder	common	common	uncommon	-	
Warbling Vireo *Vireo gilvus*	Documented Breeder	common	common	uncommon	-	
Philadelphia Vireo *Vireo philadelphicus*		rare	-	rare	-	
Red-eyed Vireo *Vireo olivaceus*	Documented Breeder	common	common	uncommon	-	
Blue-winged Warbler *Vermivora pinus*		uncommon	-	rare	-	Resource Conservation Priority
Golden-winged Warbler *Vermivora chrysoptera*		rare	-	rare	-	Resource Conservation Priority
Tennessee Warbler *Vermivora peregrina*		uncommon	-	uncommon	-	
Orange-crowned Warbler *Vermivora celata*		uncommon	-	uncommon	rare	
Nashville Warbler *Vermivora ruficapilla*		common	-	uncommon	-	
Northern Parula *Parula americana*	Documented Breeder	common	common	uncommon	-	
Yellow Warbler *Dendroica petechia*	Documented Breeder	uncommon	uncommon	uncommon	-	
Chestnut-sided Warbler *Dendroica pensylvanica*		uncommon	-	uncommon	-	
Magnolia Warbler *Dendroica magnolia*		uncommon	-	uncommon	-	
Cape May Warbler *Dendroica tigrina*		rare	-	-	-	Resource Conservation Priority
Black-throated Blue Warbler *Dendroica caerulescens*		uncommon	-	uncommon	-	Resource Conservation Priority
Yellow-rumped Warbler *Dendroica coronata*		common	-	common	uncommon	
Black-throated Green Warbler *Dendroica virens*		common	-	uncommon	-	
Blackburnian Warbler *Dendroica fusca*	Does not breed	uncommon	rare	uncommon	-	
Yellow-throated Warbler *Dendroica dominica*		common	uncommon	-	-	
Pine Warbler *Dendroica pinus*		uncommon	rare	rare	-	
Prairie Warbler *Dendroica discolor*		uncommon	uncommon	-	-	Resource Conservation Priority
Palm Warbler *Dendroica palmarum*		uncommon	-	uncommon	-	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Bay-breasted Warbler *Dendroica castanea*		uncommon	-	-	-	
Blackpoll Warbler *Dendroica striata*		uncommon	-	uncommon	-	
Cerulean Warbler *Dendroica cerulea*		uncommon	uncommon	-	-	Resource Conservation Priority
Black-and-white Warbler *Mniotilta varia*	Documented Breeder	uncommon	uncommon	uncommon	-	
American Redstart *Setophaga ruticilla*	Documented Breeder	uncommon	uncommon	uncommon	-	
Prothonotary Warbler *Protonotaria citrea*	Documented Breeder	common	common	uncommon	-	Resource Conservation Priority
Worm-eating Warbler *Helmitheros vermivorus*		uncommon	uncommon	-	-	Resource Conservation Priority
Swainson's Warbler *Limnothlypis swainsonii*		rare	rare	-	-	Resource Conservation Priority
Ovenbird *Seiurus aurocapillus*		common	uncommon	uncommon	-	
Northern Waterthrush *Seiurus noveboracensis*	Does not breed	common	uncommon	-	-	
Louisiana Waterthrush *Seiurus motacilla*	Documented Breeder	common	uncommon	uncommon	-	Resource Conservation Priority
Kentucky Warbler *Oporornis formosus*	Documented Breeder	common	common	uncommon	-	Resource Conservation Priority
Mourning Warbler *Oporornis philadelphia*		uncommon	-	uncommon	-	
Common Yellowthroat *Geothlypis trichas*	Documented Breeder	common	common	common	rare	
Hooded Warbler *Wilsonia citrina*	Documented Breeder	uncommon	uncommon	-	-	
Wilson's Warbler *Wilsonia pusilla*		uncommon	-	uncommon	-	
Canada Warbler *Wilsonia canadensis*		uncommon	-	uncommon	-	Resource Conservation Priority
Yellow-breasted Chat *Icteria virens*	Documented Breeder	common	common	uncommon	-	
Summer Tanager *Piranga rubra*	Documented Breeder	common	common	uncommon	-	
Scarlet Tanager *Piranga olivacea*	Documented Breeder	uncommon	uncommon	uncommon	-	
Northern Cardinal *Cardinalis cardinalis*	Documented Breeder	abundant	abundant	abundant	abundant	
Rose-breasted Grosbeak *Pheucticus ludovicianus*	Documented Breeder	common	rare	uncommon	-	
Blue Grosbeak *Guiraca caerulea*		uncommon	rare	-	-	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Indigo Bunting *Passerina cyanea*	Documented Breeder	abundant	abundant	common	-	
Dickcissel *Spiza americana*	Documented Breeder	common	common	-	-	Resource Conservation Priority
Eastern Towhee *Pipilo erythrophthalmus*	Documented Breeder	common	common	common	uncommon	
American Tree Sparrow *Spizella arborea*		rare	-	rare	common	
Chipping Sparrow *Spizella passerina*	Documented Breeder	common	common	uncommon	rare	
Field Sparrow *Spizella pusilla*	Documented Breeder	common	common	uncommon	uncommon	Resource Conservation Priority
Vesper Sparrow *Pooecetes gramineus*		uncommon	-	uncommon	rare	
Lark Sparrow *Chondestes grammacus*		uncommon	rare	rare	-	
Savannah Sparrow *Passerculus sandwichensis*		common	-	common	rare	
Grasshopper Sparrow *Ammodramus savannarum*		uncommon	uncommon	uncommon	-	Resource Conservation Priority
Henslow's Sparrow *Ammodramus henslowii*		rare	rare			Resource Conservation Priority
Le Conte's Sparrow *Ammodramus leconteii*		rare	-	-	rare	Resource Conservation Priority
Fox Sparrow *Passerella iliaca*		uncommon	-	uncommon	uncommon	
Song Sparrow *Melospiza melodia*	Documented Breeder	common	common	common	common	
Lincoln's Sparrow *Melospiza lincolnii*		rare	-	rare	rare	
Swamp Sparrow *Melospiza georgiana*		common	-	common	common	
White-throated Sparrow *Zonotrichia albicollis*		common	-	common	abundant	
White-crowned Sparrow *Zonotrichia leucophrys*		common	-	common	common	
Harris's Sparrow *Zonotrichia querula*		-	-	-	rare	
Dark-eyed Junco *Junco hyemalis*		uncommon	-	uncommon	abundant	
Lapland Longspur *Calcarius lapponicus*		-	-	-	rare	
Bobolink *Dolichonyx oryzivorus*		rare	-	rare	-	Resource Conservation Priority
Red-winged Blackbird *Agelaius phoeniceus*	Documented Breeder	abundant	abundant	abundant	abundant	

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Eastern Meadowlark *Sturnella magna*	Documented Breeder	common	common	common	common	Resource Conservation Priority
Western Meadowlark *Sturnella neglecta*		rare		rare	rare	Resource Conservation Priority
Yellow-headed Blackbird *Xanthocephalus xanthocephalus*				rare	rare	
Rusty Blackbird *Euphagus carolinus*		uncommon	-	uncommon	common	Resource Conservation Priority
Brewer's Blackbird *Euphagus cyanocephalus*		rare	-	rare	uncommon	
Common Grackle *Quiscalus quiscula*	Documented Breeder	common	common	common	abundant	
Brown-headed Cowbird *Molothrus ater*	Documented Breeder	common	common	common	uncommon	
Orchard Oriole *Icterus spurius*	Documented Breeder	common	common	-	-	Resource Conservation Priority
Baltimore Oriole *Icterus galbula*	Documented Breeder	uncommon	uncommon	-	-	
Purple Finch *Carpodacus purpureus*		uncommon	-	uncommon	uncommon	
Red Crossbill *Loxia curvirostra*		rare		rare	rare	
Pine Siskin *Carduelis pinus*		rare	-	rare	rare	
American Goldfinch *Carduelis tristis*	Documented Breeder	common	common	common	common	
Evening Grosbeak *Coccothraustes vespertinus*		-	-	-	rare	
House Sparrow *Passer domesticus*	Documented Breeder	common	common	common	common	
Western Grebe *Aechmophorus occidentalis*	Casual					
Anhinga *Anhinga anhinga*	Casual					
Tricolored Heron *Egretta tricolor*	Casual					
Glossy Ibis *Plegadis falcinellus*	Casual					
Roseate Spoonbill *Ajaia ajaja*	Casual					
Wood Stork *Mycteria americana*	Casual					
Fulvous Whistling-Duck *Dendrocygna bicolor*	Casual					
Mute Swan *Cygnus olor*	Casual					

Bird Species List, Mingo NWR (Continued)

Name	Breeding Status	Seasonal Abundance				Special Designation(s)
		Spring	Summer	Fall	Winter	
Ross's Goose *Chen rossii*	Casual					
Brant *Branta bernicla*	Casual					
Cinnamon Teal *Anas cyanoptera*	Casual					
Greater Scaup *Aythya marila*	Casual					
Long-tailed Duck *Clangula hyemalis*	Casual					
White-winged Scoter *Melanitta fusca*	Casual					
Black Scoter *Melanitta nigra*	Casual					
Swainson's Hawk *Buteo swainsoni*	Casual					Resource Conservation Priority
Prairie Falcon *Falco mexicanus*	Casual					
Gyrfalcon *Falco rusticolus*	Casual					
Whooping Crane *Grus americana*	Casual					Resource Conservation Priority
Snowy Owl *Nyctea scandiaca*	Casual					
Nelson's Sharp-tailed Sparrow *Ammodramus nelsoni*	Casual					
White-winged Crossbill *Loxia leucoptera*	Casual					

Tree and Shrub Species List, Mingo NWR

White Pine	*Pinus strobes*
Shortleaf Pine	*Pinus echinata*
Bald Cypress	*Taxodium distichum*
Eastern Redcedar	*Juniperus virginiana*
Black Willow	*Salix nigra*
Ward's Willow	*Salix caroliniana*
Swamp Cottonwood	*Populus heterophylla*
Eastern Cottonwood	*Populus deltoides*
Black Walnut	*Juglans nigra*
Butternut	*Juglans cinerea*
Water Hickory	*Carya aquatica*
Bitter-nut Hickory	*Carya cordiformis*
Shagbark Hickory	*Carya ovata*
Big Shellbark Hickory	*Carya laciniosa*
Pignut Hickory	*Carya glabra var. glabra*
American Hazelnut	*Corylus americana*
American Hop-Hornbeam	*Ostrya virginiana*
American Hornbeam	*Carpinus caroliniana*
River Birch	*Betula nigra*
Chinese Chestnut	*Castanea mollissima*
White Oak	*Quercus alba*
Post Oak	*Quercus stellata*
Overcup Oak	*Quercus lyrata*
Bur Oak	*Quercus macrocarpa*
Swamp White Oak	*Quercus bicolor*
Swamp Chestnut Oak	*Quercus michauxii*
Shingle Oak	*Quercus imbricaria*
Willow Oak	*Quercus phellos*
Water Oak	*Quercus nigra*
Blackjack Oak	*Quercus marilandica*
Cherry-bark Oak	*Quercus pagoda*

Tree and Shrub Species List, Mingo NWR (Continued)

Black Oak	*Quercus velutina*
Scarlet Oak	*Quercus coccinea*
Shumard Oak	*Quercus shumardii*
Pin Oak	*Quercus palustris*
Northern Red Oak	*Quercus rubra*
American Elm	*Ulmus americana*
Winged Elm	*Ulmus alata*
Slippery Elm	*Ulmus rubra*
Planer Tree	*Planera aquatica*
Common Hackberry	*Celtis occidentalis*
Sugarberry	*Celtis laevigata*
Red Mulberry	*Morus rubra*
Osage Orange	*Maclura pomifera*
Yellow Poplar	*Liriodendron tulipifera*
Pawpaw	*Asimina triloba*
Sassafras	*Sassafras albidum*
Spicebush	*Lindera benzoin*
Kentucky Coffee Tree	*Gymnocladus dioicus*
Honey-Locust	*Gleditsia triacanthos*
Water-Locust	*Gleditsia aquatica*
Eastern Redbud	*Cercis canadensis*
False Indigo	*Amorpha fruticosa*
Black Locust	*Robinia pseudoacacia*
Sweet gum	*Liquidambar styraciflua*
Sycamore	*Platanus occidentalis*
Green Hawthorn	*Crataegus viridis*
Wild Plum	*Prunus americana*
Wild Black Cherry	*Prunus serotina*
Common Hoptree	*Ptelea trifoliata*
Smooth Sumac	*Rhus glabra*
Winged Sumac	*Rhus copallinum*

Tree and Shrub Species List, Mingo NWR (Continued)

Deciduous Holly	*Ilex decidua*
Wahoo	*Euonymus atropurpureus*
American Bladdernut	*Staphylea trifolia*
Sugar Maple	*Acer saccharum*
Swamp Red Maple (Drummond)	*Acer rubrum var. drummondii*
Silver Maple	*Acer saccharinum*
Box elder	*Acer negundo*
Ohio Buckeye	*Aesculus glabra*
Red Buckeye	*Aesculus pavia*
Carolina Buckthorn	*Frangula caroliniana*
American Basswood	*Tilia americana*
Devil's Walkingstick	*Aralia spinosa*
Flowering Dogwood	*Cornus florida*
Stiff Dogwood	*Cornus foemina*
Water-Tupelo	*Nyssa aquatica*
Swamp Black Gum	*Nyssa sylvatica var. biflora*
Persimmon	*Diospyros virginiana*
White Ash	*Fraxinus americana*
Pumpkin Ash	*Fraxinus profunda*
Green Ash	*Fraxinus pennsylvanica*
Swamp Privet	*Forestiera acuminata*
Buttonbush	*Conhalanthus occidentalis*
American Elder	*Sambucus canadensis*
Southern Red Oak	*Quercus falcata*

Pilot Knob NWR Species List

Birds Documented at Pilot Knob NWR

Common Name	Scientific Name
American Crow	*Corvus brachyrhynchos*
Northern Parula	*Parula americana*
American Redstart	*Setophaga ruticilla*
Pileated Woodpecker	*Dryocopus pileatus*
Barred Owl	*Strix varia*
Red-bellied Woodpecker	*Centurus carolinus*
Blue Jay	*Cyanocitta cristata*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Brown Creeper	*Certhia americana*
Red-tailed Hawk	*Buteo jamaicensis*
Carolina Chickadee	*Parus carolinensis*
American Robin	*Turdus migratorius*
Carolina Wren	*Thryothorus ludovicianus*
Scarlet Tanager	*Piranga olivacea*
Summer Tanager	*Piranga rubra*
Cedar Waxwing	*Bombycilla cedrorum*
Tufted Titmouse	*Parus bicolor*
Dark-eyed Junco	*Junco hyemalis*
Turkey Vulture	*Cathartes aura*
Eastern Bluebird	*Sialia sialis*
Whip-Poor-Will	*Caprimulgus vociferous*
Eastern Wood-pewee	*Contopus virens*
White-breasted Nuthatch	*Sitta carolinensis*
European Starling	*Sturnus vulgaris*
White-throated Sparrow	*Zonotrichia albicollis*
Great-crested Flycatcher	*Myiarchus crinitus*
Wild Turkey	*Meleagris gallopavo*
Great Horned Owl	*Bubo virginianus*

Birds Documented at Pilot Knob NWR

Wood Thrush	*Hylocichla mustelina*
Mourning Dove	*Zenaida macroura*
Wood-warblers	*Various Species*
Northern Cardinal	*Cardinalis cardinalis*
Yellow-breasted Chat	*Icteria virens*

Mammals Documented or Suspected to Occur at Pilot Knob NWR

Common Name	Scientific Name
13 Lined Ground Squirrel	*Spermophilus tridecemlineatus*
Eastern Mole	*Scalopus aquaticus*
Eastern Wood Rat	*Neotoma floridana*
Opossum	*Didelphis marsupialis*
Bobcat	*Lynx rufus*
Raccoon	*Procyon lotor*
Eastern Chipmunk	*Tamias striatus*
Striped Skunk	*Mephitis mephitis*
Coyote	*Canis latrans*
Gray Squirrel	*Sciurus carolinensis*
Deer Mouse	*Peromyscus maniculatus*
Whitetail Deer	*Odocoileus virginianus*
Eastern Cottontail	*Sylvilagus floridanus*
Woodchuck	*Marmota monax*
Indiana Bat	*Myotis sodalis*
Gray Bat	*Myotis grisescens*
Big Eared Bat	*Corynorhinus townsendii*
Little Brown Bat	*Myotis lucifugus*

Amphibians and Reptiles Documented at Pilot Knob NWR

Common Name	Scientific Name
Black Rat Snake	*Elaphe obsoleta*
Mole Salamander	*Ambystoma talpoideum*
Box Turtle	*Terrapene carolina*
Ribbon Snake	*Thamnophis sauritus*
Broad Headed Skink	*Eumeces laticeps*
Ringneck Snake	*Diadophis punctatus*
Copperhead	*Agkistrodon contortrix*
Speckled Kingsnake	*Lampropeltis getula holbrooki*
Five-lined Skink	*Eumeces fasciatus*
Tiger Salamander	*Ambystoma tigrinum*
Garter Snake	*Thamnophis sirtalis*
Toads	*Various Species*
Green Treefrog	*Hyla cinerea*
Upland Chorus Frog	*Pseudacris feriarum feriarum*

Appendix D: Compatibility Determinations

Appendix D: Compatibility Determinations

In accordance with the Refuge Improvement Act of 1997, no uses for which the Service has authority to regulate may be allowed on a unit of Refuge System unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge. Managers must complete a written compatibility determination for each use, or collection of like-uses, that is signed by the manager and the Regional Chief of Refuges in the respective Service region.

Draft compatibility determinations were included in the Draft CCP to allow public review and comment.

The following compatibility determinations have had public review. Copies of the signed documents are available for viewing at Mingo NWR Headquarters:

Hunting
Fishing
Wildlife Observation and Wildlife Photography
Environmental Education
Interpretation and Special Events
Boating, Canoeing and Kayaking
Horseback Riding, Recreational Biking, Hiking and Jogging
Firewood Harvest
Gather Wild Edibles: Berry, Mushroom, Pokeweed
Research by a Third Party
Farming
Haying

The following compatibility determinations for Ozark Cavefish NWR have had public review. Copies of the signed documents are available for viewing at Mingo NWR Headquarters:

Wildlife Observation, Photography, Interpretation, and Environmental Education
Fishing
Hunting
Research by a Third Party

The following compatibility determinations for Pilot Knob NWR have had public review. Copies of the signed documents are available for viewing at Mingo NWR Headquarters.

Environmental Education, Wildlife Observation, Photography and Interpretation
Research by a Third Party

Appendix E: Compliance Requirements

Appendix E / 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 (1906)

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 (1918)

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 (1929)

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

Fish and Wildlife Coordination Act (1934), as amended

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 values into account and adopt justifiable protection measures to obtain maximum overall project benefits. A 1958 amendment added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs. It also authorized the Secretary of Interior to provide public fishing areas and accept donations of lands and funds.

Migratory Bird Hunting and Conservation Stamp Act (1934)

Authorized the opening of part of a refuge to waterfowl hunting.

Historic Sites, Buildings and Antiquities Act (1935), as amended

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 (1935), as amended:

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 (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 (1950)

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

Fish and Wildlife Act (1956)

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

Refuge Recreation Act (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 (1964), as amended

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 (1965):

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 (1966), as amended by the National Wildlife Refuge System Improvement Act (1997)16 U.S.C. 668dd668ee. (Refuge Administration Act)

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 (1966), as amended:

Establishes as policy that the Federal Government is to provide leadership in the preservation of the nation's prehistoric and historic resources.

Architectural Barriers Act (1968)

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

National Environmental Policy Act (1969)

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

Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended:

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 (1973)

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

Rehabilitation Act (1973)

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 (1974)

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

Clean Water Act (1977)

Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

Surface Mining Control and Reclamation Act (1977) as amended (Public Law 95-87) (SMCRA)

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 nat-

ural 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 (1978)

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

Fish and Wildlife Improvement Act (1978)

Improves the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, 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 (1979), as amended

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

Federal Farmland Protection Policy Act (1981), as amended

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

Emergency Wetlands Resources Act (1986)

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 (1990)

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 (1990)

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

Americans With Disabilities Act (1992)

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 (1997)

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.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act (1998)

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

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 of 2001 (Public Law 106-554)

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 archaeological resources." This Act requires protection of all archeological sites more than 100 years old (not just sites meeting the criteria for the National Register) on Federal land, and requires archeological investigations on Federal land be performed in the public interest by qualified persons.

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

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

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 F: Refuge Operating Needs System and Maintenance Management System

Appendix F: Refuge Operating Needs System (RONS) and Maintenance Management System (MMS) Priorities

Refuge Operating Needs System Projects

Project Number	Project Title	Estimated Cost ($1,000s)
00003	Investigate mercury levels in the Mingo ecosystem	54
00007	Improve volunteer program by providing bunkhouse	170
98006	Monitoring of Mingo NWR reptiles and amphibians	74
99001	Enhance Visitor Services by providing information	24
03002	Design and implement effective kiosks, directional signs, and outdoor interpretive panels	28
03004	Provide fishing opportunities for mobility impaired visitors	129
03005	Develop and implement a Watchable Wildlife nature trail	37
03006	Improve marsh and moist soil access for management and wildlife observation	27
03007	Provide shelter for visitors utilizing boardwalk	25
03009	Construct an environmental education classroom	65
98003	Expand the Refuge biological program	114
98010	Inventory biological features of the Class I Wilderness Area on Mingo	31
98011	Compile biotic inventory for sensitive species occurring in the Wilderness Area of Mingo NWR	27
98012	Monitoring of dry and wet deposition in the Class I Wilderness Area of Mingo NWR	51
98014	Install optical monitoring equipment in the Wilderness Area of Mingo NWR	63
98017	Install automatic gates to protect closed area resources	36
98019	Increase management capabilities through implementation of a Geographical Information System	170
98020	Conduct swamp rabbit survey	26
98021	Reestablish the boundary along the west side of the Mingo NWR	36
98022	Create and install an interactive computer station at the Visitor Center	29
00002	Ensure visitor and resource protection of Mingo NWR	136
01005	Transition of 1,000 acres of fescue pasture to native prairie	75
01006	Preserve the ecological health and integrity of Mingo NWR by removing exotic and invasive species	40
01009	Improve and enhance public use program	30
01012	Organize public use supplies and materials for easy access	22
01013	Enhance audio-visual programming and develop a Mingo NWR specific video	42

Maintenance Projects, Mingo NWR

Project Title	Estimated Cost ($1,000s)
Replace high mileage 1991 model full size dodge pickup	30
Replace worn-out 1982 Jeep CJ7 utility vehicle.	31
Replace deteriorated vault toilet at Ditch 1.	32
Remove damaged fences on retired pasture units.	39
Repair Deteriorated Boardwalk on the Nature Trail	510
Replace worn-out Crisafulli Trailer Mounted Pump, 16", Centrifugal Humpback	13
Replace worn-out Western Slip on Pumper, 200 Gal, 20 hp engine	13
Replace JI Case 2090 Ag Tractor, 108hp, w/ Cab	64
Replace Chevrolet S10 Cargo Truck	26
Replace worn-out Ford L9000 Dump Truck, 12 CY 14', 350 HP, 52000 GVWR	90
Replace deteriorated siding on the Storage / Carpenter Shop Building	52
Replace worn-out Reynolds Earth Scraper, Towed, 10 CY, Hydraulic	21
Replace worn-out Caterpillar 426C Backhoe / Loader, w/ Cab	79
Replace worn-out Gorman / Rupp Wheel Mounted Pump, 350 gpm, 4" intake/outlet	15
Replace worn-out Gorman / Rupp Wheel Mounted Pump, 350 gpm, 4" intake / outlet	15
Replace Chevrolet Astro Passenger Van	21
Replace Aero Welding Water Tank Trailer, 400 Gal, 1.5 Ton	19
Replace worn-out Motorola Quantar (C99ED) Radio Base Station	17
Replace Ford F709E Dump Truck, 5 CY, 24000 GVWR	74
Replace John Deere 2640 Ag Tractor, 70hp	53
Replace worn-out Crisafulli 16" Centrifugal Pump	13
Replace John Deere 4640 Ag Tractor, 150 hp	85
Replace worn-out John Deere 455 Plow Disk	17
Remove Debris and Silt from Drainage Ditches - Phase II [cc]	1,259
Remove Debris and Silt from Drainage Ditches - Phase I [p/d]	321
Replace corroded pipes at the Ditch 2 Pumping Station	44
Energy Retrofit the Visitor Center	264
Replace deteriorated Lick Creek Bridge on the Auto Tour Route.	112
Replace deteriorated Lateral Ditch Bridge	112
Replace deteriorated roof on the Visitor Center.	52
Replace worn-out Side Mount Mower Rotary 6'	13
Replacement of Suzuki All Terrain Vehicle	7
Repair Surfacing on Visitor Center Entrance - FHWA Route No. 010	40
Repair Surfacing on Refuge Auto Tour Route - FHWA Route No. 011	4,109
Repair Surfacing on Red Mill Entrance Road - FHWA Route No. 100	277
Repair Surfacing on Red Mill Drive - FHWA Route No. 101	1,343
Repair Surfacing on Bluff Road - FHWA Route No. 102	1,142
Repair Surfacing on Job Corps Entrance Road - FHWA Route No. 104	370
Repair Surfacing on Flat Banks Road - FHWA Route No. 105	146
Repair Surfacing on May Pond Entrance Road - FHWA Route No. 200	27
Repair Surfacing on Bow Hunters Parking Area - FHWA Route No. 902	20
Repair Surfacing on Red Mill Parking Area - FHWA Route No. 903	25

Maintenance Projects, Mingo NWR

Project Title	Estimated Cost ($1,000s)
Repair Surfacing on Visitor Center Parking Area - FHWA Route No. 905	28
Construct Covered Fishing Dock	28
Construct an Environmental Education Classroom	68
Rehabiliate Bluff Road by Installing Asphalt Surfacing - Phase I	125
Rehabiliate Bluff Road by Installing Asphalt Surfacing - Phase II	160
Rehabilate Marsh and Moist Soil Unit Access for Management and Wildlife Observation	28
Construct water delivery system for Moist Soil Units.	41
Construct Wildlife Observation Platform Along State Highway 51	37
Construct a Spillway in an Existing Roadway / Low Level Dam	21
Construct Kiosks, Directional Signs, and Outdoor Interpretive Panels	365
Construct a Watchable Wildlife Nature Trail	39
Seismic Safety Rehabilitation - Phase I [p/d]	50
Construct a Bunkhouse for Volunteers, Students and Interns.	522

Appendix G: Mailing List

Appendix G: 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 will continue to add to this list throughout the planning process

Federal Elected Officials
Sen. Jim Talent
Sen. Christopher Bond
Rep. Jo Ann Emerson
Rep. Roy Blunt

State Elected Officials
Sen. Rob Mayer

Cities
Puxico
Arcadia
Pilot Knob
Neosho
Dexter
Poplar Bluff
Advance

Counties
Stoddard
Butler
Wayne
Bollinger
Lawrence
Newton
Iron

Organizations
The Nature Conservancy
Pheasants Forever
Ducks Unlimited
National Audubon Society
Wildlife Management Institute
PEER Refuge Keeper
The Wilderness Society
National Wildlife Federation
Sierra Club
The National Wildlife Refuge Association
The Conservation Fund, Arlington, Virginia
Native Plant Society
Trust for Public Land
Defenders of Wildlife
Crappie Company

Appendix H: List of Preparers

Appendix H: List of Preparers and Contributors

Refuge Staff:

Kathleen Burchett, Refuge Manager

Phyllis Ford, Administrative Technician

Vergial Harp, Park Ranger

Julia Horrell, Park Ranger

Ray Placher, Maintenance Worker (retired)

Judy Plunkett, Park Ranger

Charles Shaiffer, Biologist (retired)

Doug Siler, Heavy Equipment Operator

Richard Speer, Assistant Refuge Manager

Rudy Williams, Heavy Equipment Operator

Daniel Wood, Biological Technician

Division of Conservation Planning Staff:

Dean Granholm, Refuge Planner

Gabriel DeAlessio, GIS/Biologist

Jane Hodgins, Technical Writer/Editor

Region Office Staff

H. John Dobrovolny, Regional Historic Preservation Officer, Region 3. Historian.

Missouri Department of Conservation

Harriet Weger, Southeast Regional Supervisor

Dave Wissehr, former Duck Creek Conservation Area Manager

Collin Smith, former Duck Creek Conservation Area Manager

Mangi Environmental Group

Leon Kolankiewicz, Biologist/Environmental Planner/Consultant

Others

Leigh Fredrickson

Mickey Heitmeyer

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Appendix I: Bibliography

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Appendix J: Resource Conservation Priority Lists

Resource Conservation Priority Lists

Resource Conservation Priority List / Mingo NWR / Bird Species

Common Name	Scientific Name
Greater Yellowlegs	*Tringa melanoleuca*
Blue-winged Warbler	*Vermivora pinus*
Double-crested Cormorant	*Phalacrocorax auritus*
Upland Sandpiper	*Bartramia longicauda*
Golden-winged Warbler	*Vermivora chrysoptera*
American Bittern	*Botaurus lentiginosus*
Stilt Sandpiper	*Micropalama himantopus*
Cape May Warbler	*Dendroica tigrina*
Least Bittern	*Ixobrychus exilis*
American Woodcock	*Scolopax minor*
Black-throated Blue Warbler	*Dendroica caerulescens*
Black-crowned Night-Heron	*Nycticorax nycticorax*
Wilson's Phalarope	*Steganopus tricolor*
Prairie Warbler	*Dendroica discolor*
Trumpeter Swan	*Cygnus buccinator*
Common Tern	*Sterna hirundo*
Cerulean Warbler	*Dendroica cerulea*
Snow Goose	*Anser caerulescens*
Forster's Tern	*Sterna forsteri*
Prothonotary Warbler	*Protonotaria citrea*
Canada Goose	*Branta canadensis*
Least Tern	*Sterna antillarum*
Worm-eating Warbler	*Helmitheros vermivorus*
Wood Duck	*Aix sponsa*
Black Tern	*Chlidonias niger*
Swainson's Warbler	*Limnothlypis swainsonii*
American Black Duck	*Anas rubripes*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Louisiana Waterthrush	*Seiurus motacilla*
Mallard	*Anas platyrhynchos*
Barn Owl	*Tyto alba*
Kentucky Warbler	*Oporornis formosus*
Northern Pintail	*Anas acuta*
Short-eared Owl	*Asio flammeus*
Canada Warbler	*Wilsonia canadensis*

Resource Conservation Priority List / Mingo NWR / Bird Species

Common Name	Scientific Name
Blue-winged Teal	*Anas discors*
Long-eared Owl	*Asio otus*
Dickcissel	*Spiza americana*
Canvasback	*Aythya valisineria*
Chuck-will's-widow	*Caprimulgus carolinensis*
Field Sparrow	*Spizella pusilla*
Lesser Scaup	*Aythya affinis*
Whip-poor-will	*Caprimulgus vociferus*
Grasshopper Sparrow	*Ammodramus savannarum*
Bald Eagle	*Haliaeetus leucocephalus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Henslow's Sparrow	*Ammodramus henslowii*
Northern Harrier	*Circus cyaneus*
Northern Flicker	*Colaptes auratus*
Le Conte's Sparrow	*Ammodramus leconteii*
Northern Goshawk	*Accipiter gentilis*
Olive-sided Flycatcher	*Contopus cooperi*
Bobolink	*Dolichonyx oryzivorus*
Red-shouldered Hawk	*Buteo lineatus*
Acadian Flycatcher	*Empidonax virescens*
Eastern Meadowlark	*Sturnella magna*
Peregrine Falcon	*Falco peregrinus*
Bewick’s Wren	*Thryomanes bewickii*
Western Meadowlark	*Sturnella neglecta*
Yellow Rail	*Coturnicops noveboracensis*
Sedge Wren	*Cistothorus platensis*
Rusty Blackbird	*Euphagus carolinus*
Black Rail	*Laterallus jamaicensis*
Wood Thrush	*Catharus mustelinus*
Orchard Oriole	*Icterus spurius*
King Rail	*Rallus elegans*
Loggerhead Shrike	*Lanius ludovicianus*
Common Moorhen	*Gallinula chloropus*
Bell's Vireo	*Vireo bellii*

Resource Conservation Priority List / Mingo NWR / Reptiles

Common Name	Scientific Name
Timber Rattlesnake	*Crotalus horridus horridus*

Resource Conservation Priority List / Pilot Knob NWR / Mammals

Common Name	Scientific Name
Gray Bat	*Myotis grisescens*
Indiana Bat	*Myotis sodalist*

Resource Conservation Priority List / Ozark Cavefish NWR / Fish

Ozark Cavefish	*Amblyopsis rosae*
Bristly Cave Crayfish	*Cambarus setosus*

Appendix K: Response to Comments Received on the Draft Comprehensive Conservation Plan and Environmental Assessment

Appendix K: Response to Comments Received on the Draft CCP and EA / Mingo NWR

Wildlife Dependent Recreation

Comments 1-3

Ensure adequate fish passage between Monopoly Marsh and the ditch system during drawdowns.

Monopoly Lake should always contain a large pool of water to prevent fish die off.

Hold water longer in Monopoly Marsh and Rockhouse Marsh to allow more fishing opportunities.

Response

Monopoly Marsh and Rockhouse Marsh contain fish and provide fishing opportunities, but are managed primarily to provide habitat for migrating waterfowl. As part of that management the marshes are periodically drawn down to maintain the appropriate mix of vegetation and open water. We agree that maintaining fish passage during draw downs is important and have modified strategy 3 under *Objective 1.3 Open Marsh* of the selected management alternative (Alternative 4).

Comment 4

Allow overnight trotline fishing on Refuge waters.

Response

The Refuge is open to the public daily from one hour before sunrise to one hour after sunset. It is closed to the public at night, the time when most trotlines are run. There is no proposal to open the Refuge during night time hours for this use.

Comments 5-6

Reintroduce alligator gar if it will improve the system.

Reintroducing alligator gar will adversely affect game fish numbers, and decrease the quality of fishing.

Response

The reintroduction of alligator gar is not expected to adversely affect game fish numbers or decrease the quality of fishing, and it may have a beneficial effect. Alligator gar are native to the Mingo basin and were found within Refuge waterways until at least the late 1960s. They are opportunistic feeders with a diet that includes game fish as well as shad, carp, buffalo and any other easily captured prey. Prey available in greatest abundance is likely to make up the bulk of the alligator gar's diet. Recent fisheries surveys of Refuge waters show rough fish and other non-game fishes to comprise approximately 80 percent of total fish numbers on the Refuge. The high occurrence of these species is one factor limiting higher populations of other game fish. Alligator gar may help reduce numbers of these fish.

Game fish are adapted to coexist with gar. Gar live and feed in open water, while bass, crappie, bluegill, and catfish live around submerged structures. Alligator should reduce the numbers of non-game fish within the Refuge such as larger shad, carp, and buffalo. This will result in more small and medium-sized shad, carp, and buffalo, which are perfect prey fish for game fish. Both the USFWS and the Missouri Department of Conservation believe that the reintroduction of Alligator gar will help re-balance the fish ecology at the Refuge.

Comment 7

Reintroducing alligator gar will increase wanton waste.

Response

Discarding wildlife or fish unused, often referred to as wanton waste, is a violation of the Wildlife Code of Missouri. Gar species are common wanton waste victims probably because they are easy targets, are widely considered undesirable for food, and are seen as competitors or predators of more popular game fish.

There is no direct link between reintroducing alligator gar and an increase in wanton waste. Low proposed stocking rates make it unlikely alligator gar will come in contact with people for years. Although

there are those that would wantonly waste resources it is not a reason to avoid reintroducing a native species. The selected management alternative (Alternative 4) does prohibit bowfishing on the Refuge in part to reduce the occurrence of wanton waste.

Comment 8

Do not eliminate bowfishing, but do consider imposing an arrow restriction.

Response

The selected management alternative (Alternative 4) prohibits bowfishing on the Refuge. We chose to eliminate bowfishing for two reasons: 1) popular bowfishing sites on the Refuge such as the Spillway are in an area where possession and use of weaponry is prohibited, and 2) the sight and smell of discarded fish carcasses is chronically associated with these sites. Beyond wanton waste of fish, this creates an unpleasant environment that decreases the quality of other wildlife dependent recreation opportunities. Imposing an arrow restriction would not resolve these problems.

Comment 9

Creating more open water to provide additional fishing opportunities is a good idea, but the amount of open water created within the Binford Unit should be no less than 40 acres.

Response

The details of this project are being considered in a separate environmental assessment. In summary, the Binford Unit, a failed moist soil management area, is bounded by a low levee that encloses approximately 40 acres. The proposal is to excavate within the Binford Unit to increase the depth and to obtain fill to modify the existing levees. Although the entire 40-acre area enclosed by the levee would be flooded it would range in depth from 0-12 feet and may not all be considered open water.

Comment 10

Improve bass fishing on the Refuge, especially in Monopoly Lake. Monopoly Lake provides a quiet fishing opportunity away from outboard motors, but bass are scarce.

Response

The selected management alternative (Alternative 4) contains a number of objectives and strategies directed at maintaining or restoring diverse fisheries within Refuge waters including bass. Monopoly Marsh is considered an open marsh, not a lake. It does contain fish and provides fishing opportunities, but it is managed primarily to provide habitat for migrating waterfowl.

Comment 11

Include rotating the archery hunt into the Wilderness Area as part of the Preferred Alternative (Alternative 4).

Response

Rotating the archery hunt was considered within Alternative 2, but was not included as part of the selected management alternative (Alternative 4) because it would create additional administrative and management burdens that include: conflicts with other user groups, confusion among some hunters, increased road maintenance, and additional costs.

Comments 12-13

Do not require tree stands to be removed at the end of each day. This limits opportunities for the elderly or those with disabilities.

Oppose having to remove tree stands daily.

Response

We eliminated the strategy under *Objective 3.1 Hunting* that called for removing tree stands daily. The Refuge regulation regarding tree stands is summarized below.

Portable trees stands (as defined in the Wildlife Code of Missouri) for archery deer hunting may be placed on the first day of season and must be removed on the last day of the season. Stands are limited to one per hunter and must be plainly labeled on a durable material with the full name and address of the owner. Use of nails, screw-in steps, and any material or method that would damage the tree is prohibited.

We believe portable stands, designed to be easily transported and positioned, do not limit opportunities. Additionally, the Refuge offers five universally accessible hunting blinds.

Comment 14

Do not host the MDC Spring Turkey Women's Outdoor Skills Event within the Wilderness Area.

Response

None of the alternatives contain a proposal to host the MDC Spring Turkey Women's Outdoor Skills Event within the Wilderness Area.

Comment 15

Why is lengthening the squirrel season not included in the Preferred Alternative (Alternative 4)?

Response

Lengthening the squirrel season was proposed under Alternative 2, but was not included in the selected management alternative (Alternative 4) because it would likely decrease the quality of experience for squirrel hunters and archery hunters. Separating uses by season and location is a long-standing practice at Mingo NWR to promote safety and maintain minimal conflicts between user groups, two elements the Service recognizes as important to quality hunting experiences.

Squirrel season closes on September 30 within the Refuge but continues until February 15 across much of Missouri. The shorter Refuge squirrel season originated to avoid an overlap with archery season and any conflicts between squirrel hunters and bow hunters. We feel this arrangement provides each group quality hunting opportunities as well as roughly equal seasons. In recent years, the Missouri Department of Conservation altered the opening date of archery deer season from October 1 to September 15, creating an overlap with Refuge squirrel season. Since this regulation change, we have chosen to allow the two activities to overlap from September 15 to September 30 to avoid shortening either season. During this time we require all hunters to wear orange clothing that complies with the Wildlife Code of Missouri. We feel this measure, reasonable for a short duration, would adversely impact the quality of bow hunting if imposed over a longer duration. If squirrel season were extended this would be the case. Finally, squirrel season does not resume after the close of archery season to avoid disturbance to waterfowl using the bottomland forest for pair bond formation. Ultimately, we feel the present arrangement is fair to both groups of hunters and best meets Refuge and Service objectives.

Comment 16

The Service should play a greater role in the management of waterfowl hunting at Pool 8.

Response

Mingo NWR's Pool 8 adjoins MDC's Duck Creek Conservation Area. Both sites offer waterfowl hunting and for many years the daily drawing used to select hunters for the limited number of spots has included both areas. This is done to maximize hunting opportunities and for the convenience of hunters. In recent years, Refuge staff has helped administer the drawing, monitor use, and answer questions. Under the selected management alternative, this will continue. There will also be increased efforts to communicate management objectives and their effect on hunting opportunities.

Comment 17

Hunting should be prohibited at Mingo National Wildlife Refuge because it kills, harms, and disturbs wildlife; it is expensive to implement; and hunters comprise a small segment of the population. Also, allowing hunting is not consistent with the terms "Wildlife First" and "Refuge".

Response

We understand some citizens' concern with hunting on national wildlife refuges. Mingo NWR, as well as the entire National Wildlife Refuge System, is guided by laws enacted by Congress and the President as well as policy derived from those laws. The 1997 National Wildlife Refuge System Improvement Act identifies hunting as one of six priority public uses to be facilitated when compatible with the purposes of a refuge and the mission of the Refuge System.

Hunting is consistent with the purposes of the Refuge. Those purposes derive from the Migratory Bird Conservation Act and the Wilderness Act, neither of which precludes hunting. In 1949 Congress amended the Migratory Bird Conservation Act to allow waterfowl hunting on 25% of areas acquired under its authority. Congress increased the figure to the present level of 40% in 1958. In 1978 Congress added a provision granting the Secretary of Interior discretion to exceed the 40% standard by an unlimited extent when it is beneficial to the species.

While National Wildlife Refuges are managed first and foremost for wildlife the focus is on perpetuating populations not individuals. Hunting does adversely affect individual animals, but is allowed

when it will not threaten the perpetuation of the population being hunted.

Comment 18

It is unsafe to allow hunting at the same time other uses occur on the Refuge.

Response

The safety of visitors and staff is top priority at Mingo NWR and is considered whenever an existing use is changed or expanded. Except for the three day muzzleloader hunt within the Mingo Wilderness Area, all hunting occurs within the General Hunt Area. Other public uses are permitted in the General Hunt Area during hunting seasons, but most are confined to roadways. Separating uses by season and location is a longstanding practice at Mingo NWR to promote safety and maintain minimal conflicts between user groups, two elements the Service recognizes as important to quality wildlife dependent recreation experiences. We believe these measures provide safe opportunities for Refuge visitors. It is common for hunting and other recreational activities to occur at the same time on State (Conservation Areas) and other Federal (National Forests and Corps of Engineers) lands.

Comment 19

Do not allow center fire rifle hunting on the Refuge.

Response

This comment is most likely directed at the weaponry permitted during the muzzleloader hunt within the Mingo Wilderness Area and/or the addition of a youth deer firearms hunt. Hunters are permitted to use any muzzleloading firearm that conforms to the Wildlife Code of Missouri. The 2006 version of the code defines a muzzleloading firearm as any firearm capable of being loaded only from the muzzle. This definition places no restrictions on firing mechanisms and there are no plans to do so during the Refuge muzzleloader hunt.

The selected management alternative (Alternative 4) also adds a youth firearms deer hunt that would include the use of center fire rifles. This hunt will be conducted in cooperation with MDC as part of their efforts to prepare the next generation of hunters. The hunt will occur within a designated portion of the General Hunt Area to avoid conflicts with other user groups. Young hunters, each accompanied by a mentor, will learn safe and ethical hunting practices.

Comment 20

Increasing the number of waterfowl hunters on Pool 8 above present levels, a likely outcome of initiating self-regulated hunting as proposed under Alternative 2, would increase the number of hunters and consequently decrease hunting quality, success, and safety as well as increase the amount and duration of disturbance to waterfowl.

Response

Self-regulated waterfowl hunting on Pool 8 was considered as part of Alternative 2, but is not included in the selected management alternative (Alternative 4).

Comment 21

Present waterfowl hunting policy for Pool 8 that includes a daily drawing for up to 40 hunters and prohibits hunting after 1:00 PM promotes safe, high quality hunting experiences.

Response

Comment noted. This is the waterfowl hunting policy included in the selected management alternative (Alternative 4).

Comment 22

Do not eliminate the muzzleloader hunt as proposed under Alternative 3.

Response

The muzzleloader hunt is included in the selected management alternative (Alternative 4).

Comment 23

Hunting opportunities should remain at present levels. There is no basis for increasing the amount of hunting opportunities on the Refuge. Past hunts, intended for women and youth and similar to those included under the Preferred Alternative, generated little interest relative to the resources required to initiate and maintain them. Present hunting opportunities are sufficient and do not adversely affect wildlife populations.

Response

The selected management alternative (Alternative 4) does include two additional hunting opportunities. The youth firearms deer hunt and the women's outdoor skills spring turkey hunt were added to support Missouri Department of Conservation programs intended to promote interest in hunting.

The Refuge and MDC will work together to ensure adequate resources for administering the hunts. Participation rates will guide future planning and implementation of these hunts. Finally, the two new hunts will occur within the General Hunt Area and are not expected to adversely affect wildlife populations.

Comment 24

Waterfowl hunting on Pool 8 should be operated as described under Alternative 1 to help relieve political pressure and improve public relations.

Response

Under the selected management alternative (Alternative 4), waterfowl hunting on Pool 8 would be limited to 40 individuals when water levels reach a suitable elevation. This is identical to the current condition described for Alternative 1.

Comment 25

Recreational activities, especially hunting, are acceptable only to the extent they do not interfere with resource protection, restoration of bird habitats, and wildlife viewing.

Response

The 1997 National Wildlife Refuge System Improvement Act and Service policy recognize six priority public uses: hunting, fishing, wildlife observation, photography, environmental education, and interpretation. We are directed to facilitate these uses when compatible with the purposes of a refuge and the mission of the Refuge System. We believe the selected management alternative (Alternative 4) balances opportunities for each of the priority public uses. Compatibility Determinations addressing each use were included as Appendix D of the draft CCP/EA.

Comment 26

Extend the seasonal duration of the Auto Tour Route.

Response

The selected management alternative (Alternative 4) does extend the seasonal duration of the Auto Tour Route by 5 months.

Comment 27

Extending the seasonal duration of the Auto Tour Route will increase traffic and road maintenance which will adversely affect wildlife, especially reptiles and amphibians.

Response

The Environmental Assessment addressed the effects of each alternative on vehicle-caused mortality of reptiles and amphibians. In summary, much of the vehicle-caused mortality occurs when reptiles and amphibians are migrating between the bluffs where they spend the winter and the bottomland forest where they spend the remainder of the year breeding and feeding. Extending the season of the Auto Tour Route will mean more traffic over a longer period of time which is likely to increase vehicle-caused mortality of reptiles and amphibians. The selected management alternative includes the following measures to minimize mortality: 1) closing the Auto Tour Route during reptile and amphibian migrations, 2) emphasizing reptile and amphibian conservation in environmental education and interpretive programming, 3) increasing law enforcement efforts, and 4) increasing monitoring to guide Refuge policy and management regarding reptiles and amphibians.

Comment 28

Do not close the Auto Tour Route during reptile and amphibian migrations.

Response

Closing the Auto Tour Route during migrations of reptile and amphibians is intended to reduce vehicle-caused mortality of these species. Aside from these closures, the open season of the Auto Tour Route is extended by five months under the selected management alternative (Alternative 4). See also the response to comment 27.

Comment 29

Do not implement Alternative 3 because it will have an adverse effect on wildlife observation and photography.

Response

The selected management alternative is Alternative 4.

Comment 30

I support having the Visitor Center open on weekends.

Comment noted. The selected management alternative (Alternative 4) includes a strategy under *Objective 3.5 Interpretation* to expand Visitor Center hours to include weekends from March 1 through

November 30. It is important to note that this proposal, as well as all others in the plan, is contingent on adequate staffing and funding.

Comment 31

Support environmental education efforts.

Response

Comment noted.

Comment 32

The Mingo Swamp Friends should initiate an educational program that has students harvest corn grown on the Refuge to be distributed for wildlife and sold at the Visitor Center.

Response

The Mingo Swamp Friends is a non-profit group formed to support the Refuge. It is an independent organization and the CCP does not directly guide the actions or proposals of Mingo Swamp Friends.

Comment 33

Do not close Monopoly because of nesting eagles.

Response

One of the goals of the National Wildlife Refuge System includes conserving endangered or threatened species. Since 1967 the Bald Eagle has been listed as a threatened species, and in compliance with the mission and goals of the Refuge System Mingo NWR implements management guidelines contained in the Northern States Bald Eagle Recovery Plan. These include limiting human disturbance of nesting eagles. At times this has included closing Monopoly Marsh to the public. Presently, the Service is in the process of delisting the Bald Eagle, and it is uncertain how this will affect restrictions regarding nesting eagles.

Other Recreation

Comment 34

Do not eliminate wild edibles gathering.

Response

The selected management alternative (Alternative 4) does not eliminate wild edibles gathering.

Comments 35-36

Increase the daily limit for mushroom gathering to 5 gallons.

The proposed area for mushroom gathering it too limiting. Allow mushroom gathering wherever they occur.

Response

Restrictions on location and amount of wild edibles gathering are necessary to ensure compatibility of this activity. This is documented in a compatibility determination that was included in Appendix D of the draft Comprehensive Conservation Plan and Environmental Assessment. We did increase the daily limit for mushroom gathering to one gallon, as reflected in strategy 12 under *Objective 3.6 Other Compatible Recreational and Consumptive Uses*. We believe the size and resources of the designated area provide reasonable and compatible opportunities for wild edibles gathering.

Comment 37

Do not phase out picnic tables and grills.

Response

The selected management alternative (Alternative 4) does phase out grills, but retains picnic tables, concentrating them near areas of high public use. Grills were eliminated because grilling is not wildlife dependent recreation, does not directly support wildlife dependent recreation, and could potentially cause wildfires.

Comment 38

Why does the Preferred Alternative increase the amount of roads open to horseback riders?

Response

Wildlife observation is the most popular use of Mingo NWR. Horseback riding facilitates this wildlife dependent recreation activity. We increased the amount of roads open to horseback riding along with recreational biking, hiking, and jogging to provide additional non-motorized wildlife observation opportunities. A compatibility determination included in Appendix D of the draft CCP/EA contains a complete analysis of this activity and the stipulations necessary to assure it is compatible with the purposes of the Refuge and the Refuge System mission.

Comment 39

The plan should ban horseback riding, jogging, hiking, and recreational biking on Mingo NWR. These are traditional uses, not necessary to participate in wildlife dependent recreation, and are offered at other nearby areas. If allowed they should be tightly regulated with fees and permits, and offered in a much smaller portion of the Refuge than is proposed. These activities detract from the quality of experience for other visitors.

Response

As documented in the compatibility determinations included as Appendix D of the draft CCP/EA, we believe horseback riding, jogging, hiking, and recreational biking are compatible uses of Mingo NWR. The most popular activity at Mingo NWR is wildlife observation and these activities, although not necessary to observe wildlife, do facilitate it. These activities are confined to existing road corridors and have occurred together with wildlife dependent recreation for years with few conflicts.

Comment 40

The plan should ban the use of motors on Refuge waters except to provide universal access to persons with special needs.

Response

Electric trolling motors are allowed on Refuge waters outside of the Mingo Wilderness Area. The compatibility of this activity with the purposes of the Refuge and the Refuge System mission is documented in a compatibility determination that was included in Appendix D of the draft CCP/EA. The use of motors on Refuge waters is restricted by season and location and is not expected to adversely affect wildlife populations.

Comment 41

Hayrides should not be permitted on the Refuge.

Response

Hayrides are authorized by the Refuge Manager on a case by case basis when they facilitate wildlife dependent recreation.

Comment 42

Horse traffic can damage unpaved roads especially during wet conditions.

Response

Horses have routinely traveled graveled Refuge roads for years with no evidence of road damage. We will continue to monitor this activity and adjust management as necessary if road damage occurs.

Habitat Management

Comments 43-47

The Refuge has 15,000 acres of forest and few openings. Do not convert openings to forest.

Do not convert grassy openings, cropland, and food plots to bottomland forest or cane.

Maintain existing food plots and consider additional food plots because they are important to wildlife and provide visitors wildlife viewing opportunities.

Reestablish openings that are converting to forest.

Creating edge habitat would benefit wildlife.

Response

We agree that grassy openings, cropland, and food plots attract wildlife, providing visitors with wildlife viewing opportunities. The alternatives included a range of options for these sites, and the selected management alternative (Alternative 4) converts some and retains others, in most cases those closely associated with wildlife viewing. Present Service policy favors restoring native habitat. In some locations grassy openings are native habitat and are beneficial to wildlife as well as those interested in viewing wildlife. Cropland and food plots are not native habitat, and although they attract wildlife, are not as diverse as native habitat. Despite this some cropland and food plots are included in the selected management alternative, primarily to provide wildlife viewing opportunities.

We also agree that grassy openings, cropland, and food plots are early successional habitats and create edge where they border other habitats. Although the amount of grassy openings, cropland, and food plots will decrease, the overall amount of early successional habitat and edge will increase. Forest, marsh, and moist soil management practices included in the selected management alternative all

promote the creation or maintenance of early successional habitat important to some types of wildlife.

Grassy openings, cropland, and food plots do create habitat diversity at the local level, but these habitats are not rare within the broader landscape while bottomland forest is. Mingo NWR is part of a larger conservation network, the National Wildlife Refuge System, and is not solely dedicated to maximizing diversity at the local level. 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 closely associated with bottomland forest. We believe the selected management alternative provides a balance of grassy openings, cropland, food plots, early successional habitat, and bottomland forest that provides migratory bird habitat and wildlife dependent recreation opportunities in a manner consistent with Service land management policy.

Comment 48

Continue efforts to maintain openings with native grasses that are beneficial to grassland birds such as Henslow's Sparrow.

Response

Efforts to convert fescue to warm season grasses at sites where Henslow's Sparrows have been documented will continue under the selected management alternative (Alternative 4).

Comment 49-50

Eliminate fescue at Flat Banks.

Eliminate autumn olive and Sericea lespedeza.

Response

Objective 1.7 of the CCP addresses invasive, exotic, and nuisance plant species such as fescue, autumn olive and *Sericea lespedeza*. These species as well as others are well established in many places on the Refuge. Also, seeds of these plants are likely transported into the Refuge from a variety of sources including annual floodwaters. Eliminating these species from the Refuge is probably not possible, but we will try to slow the spread through a variety of means.

Comment 51

Quail would disappear from the Refuge if all openings were eliminated as indicated under alternative 3.

Response

The selected management alternative (Alternative 4) will maintain 205 acres of grassy openings, 253 acres of cropland, and 73 acres food plots. Quail are expected to continue using habitats on and adjacent to the Refuge.

Comment 52

Maintain Sandblow as an opening alternating one half in cropland and one half fallow each year and keep Company Farms in an open condition.

Response

Present Service policy favors restoring native habitat. In some locations grassy openings are native habitat and are beneficial to wildlife as well as those interested in viewing wildlife. We are reevaluating the historic habitat types of Sassafrass and Sandblow ridges which include the following openings: Sandblow, Sassafras West, Sassafras East, and Company Farm. These areas may have been historic sand ridges that included natural openings dominated by grasses or other early successional vegetation. In any case, these areas will have a transitional zone between the surrounding bottomland hardwood forest and the opening. The CCP includes a provision to complete a Habitat Management Plan to address specific habitat management practices. Methods for maintaining the openings referenced above will be addressed in the Habitat Management Plan.

Comment 53-54

Consider broadcasting milo within openings.

Manage openings on a three year rotation that has one third in crops in any given year.

Response

The two practices mentioned have been used successfully on the Refuge. The CCP includes a provision to complete a Habitat Management Plan to address specific habitat management practices. Methods for maintaining the openings will be addressed in the Habitat Management Plan.

Comment 55

Allowing openings and marshes to close in is not taking care of the property.

Response

The selected management alternative (Alternative 4) maintains open marsh habitat as well as other types of openings. All of the alternatives analyzed in the environmental assessment, were developed to fulfill the purposes of the Refuge and the Refuge System mission and to be consistent with present Service land management policy, and Refuge goals. This includes restoring some open habitats to bottomland forest or other early successional habitat.

Comments 56-57

Through forest management increase the amount of early successional habitat favored by quail, turkey, doves, and swamp rabbits.

Thinning in some areas would benefit wildlife including swamp rabbits.

Response

The selected alternative (Alternative 4) includes forest management activities that will increase the amount of early successional forested habitat (young forest) favored swamp rabbits, turkey, quail and others.

Comment 58

Reduce the amount of willow within Rockhouse Marsh and maintain it as an open marsh to allow wildlife viewing.

Response

We agree as reflected in the selected management alternative (Alternative 4).

Comment 59

Use openings to grow crops to attract deer away from private property.

Response

Some cropland and food plots are included in the selected management alternative, primarily to provide wildlife viewing opportunities. The Refuge does not plant crops as a means of attracting deer away from private property. White-tailed deer are highly mobile, range over wide areas, and are abundant in southeast Missouri. Although deer do feed within the Refuge, food plots and cropland do little to attract deer away from surrounding property and increase local deer populations.

Comment 60

It is a waste of taxpayer dollars to create and maintain open areas that attract wildlife where it can be killed by hunters.

Response

A number of openings will be maintained under the selected management alternative (Alternative 4). These openings will be maintained to provide habitats consistent with historic conditions or to provide enhanced wildlife observation opportunities. Maintaining these open habitats, work often accomplished by volunteers, is consistent with current Service policy derived from the 1997 National Wildlife Refuge System Improvement Act. Congress passed the legislation, the President signed it into law, and the Fish and Wildlife Service is obligated to implement it. See also the response to comment 17 regarding hunting on National Wildlife Refuges.

Comment 61

Manage the moist soil units in the southeast corner of the Refuge to accommodate migrant shorebirds.

Response

The selected management alternative (Alternative 4) includes two strategies under *Objective 1.5 Moist Soil Units* that specify measures to accommodate migrant shorebirds.

Comment 62

Do not manage any moist soil units for rails as proposed under the Preferred Alternative (Alternative 4).

Response

The primary purpose of the Refuge is to provide habitat for migratory birds. King Rails and Black Rails are migratory birds that are rare and declining in number. Mingo NWR is within the breeding range of these species and is capable of providing breeding habitat. The management of 80-100 acres of moist soil for rails included in the selected alternative (Alternative 4) is consistent with Refuge purposes and Service policy.

Comment 63

I concur with the concern expressed in the CCP that some emphasis be given to creation or restoration of rail habitat on the refuge.

Response

Comment noted. The selected management alternative (Alternative 4) includes strategies to provide habitat for rails under *Objective 1.5 Moist Soil Units*.

Comment 64

Carefully monitor Monopoly Marsh and alter management actions if they are not meeting objectives.

Response

We agree. Monitoring of Monopoly Marsh is included under *Objective 1.3* of the selected management alternative.

Comment 65

Lowering the level of Monopoly Marsh is a good idea as long it does not affect fish spawning.

Response

We do not expect fish spawning to be adversely affected by lowering the level of Monopoly Marsh.

Comment 66

Do not reduce the amount of open water within Monopoly Marsh.

Response

The decrease of Monopoly Marsh included in the selected management alternative would convert open marsh habitat along the perimeter to bottomland forest, most likely bald cypress and tupelo. The amount of open water within Monopoly Marsh would not change.

Comment 67

Maintain the rate of flow within the ditch system at no greater than 2005 levels.

Response

The selected management alternative (Alternative 4) calls for additional sediment removal from Refuges ditches. This is likely to increase the rate of flow within the ditch system beyond 2005 levels. Improved water transport is expected to reduce flood duration, improve bottomland forest dynamics, and provide additional deep water habitat for aquatic species. It also helps meet the Refuge purposes of providing habitat for migratory birds.

Comment 68

Manually altering water levels is not consistent with restoring natural conditions.

Response

The ditch network and the water level management it allows, although not part of the historic habitat conditions of the Refuge, do help approximate drainage and flooding patterns similar to those that occurred prior to changes on the Refuge and within the surrounding landscape.

Comment 69

The marshes are converting to scrub-shrub habitat and are less attractive as habitat for migrating Trumpeter Swans.

Response

Objective 1.3 Open Marsh and the associated strategies that are part of the selected management alternative (Alternative 4) prescribe a number of measures to maintain open marsh habitat on the Refuge.

Comments 70-71

I support the forest management direction contained in alternative 2.

Implement the forest management objective and strategies described for alternative 1 or 2.

Response

We considered a range of forest management options as reflected in the alternatives, and believe the objectives and strategies included in the selected management alternative (Alternative 4) best fulfill the purposes of the Refuge and the Refuge System mission. Specifically, the selected management alternative restores bottomland forest to 547 acres and promotes active forest management to achieve a diversity of species and age classes, something absent from alternatives 1 and 2. Considering the age of the bottomland forest and the lack of regeneration we believe active management is best.

Comment 72

The bottomland forest needs to be managed.

Response

We agree as reflected in the selected management alternative (Alternative 4).

Comments 73-74

Any trees felled or killed as part of a management action should be removed and sold, including those within the Wilderness Area.

Any trees harvested as part of a management action should be left on the forest floor.

Response

The CCP includes a provision to complete a Habitat Management Plan and a Wilderness Management Plan to address specific management practices. Specific methods to be used in forest management will be addressed in these plans.

Comment 75

Promote oak regeneration and eliminate maple through proper selective cutting.

Response

We agree as reflected in the selected management alternative (Alternative 4).

Wildlife and Fish

Comment 76

I support the strategy to work with MDC to stock catfish and other native game fish included in the Preferred Alternative (alternative 4).

Response

Comment noted. This is included in the selected management alternative (Alternative 4) as a strategy under *Objective 2.2 Fish/Aquatic Species*.

Comment 77

I support the strategy to work with the Corps of Engineers to modify water discharge rates at Lake Wappapello to improve fish passage on the Refuge.

Response

Comment noted. The is included in the selected management alternative (Alternative 4) as a strategy under *Objective 2.2 Fish/Aquatic Species*..

Comment 78

The Refuge can sustain a far greater deer density than 35 per square mile.

Response

The deer density goal of 24-35 deer per square mile is consistent with known carrying capacity of Refuge habitats and MDC deer management goals for southeast Missouri.

Comment 79

Alligator gar are fish of large rivers, Mingo NWR is not a good site for reintroduction.

Response

Alligator gar were present throughout the Mississippi River and its tributaries, including the Mingo Basin and St. Francis River, in Southeast Missouri until the 1950s and early 1970s. They declined throughout the State due to the loss of spawning habitat and over-fishing. The reintroduction of alligator gar will be returning the species to its former range, which includes open water habitat and suitable spawning habitat.

Comment 80

Maintain a diverse fishery of native species with abundant game fish including spotted brown willow catfish (channel catfish) and bowfin.

Response

The selected management alternative (Alternative 4) contains a number of objectives and strategies directed at maintaining or restoring diverse fisheries within Refuge waters. This includes catfish and bowfin as well as other game fish.

Trapping and Animal Control

Comment 81

Control the number of river otter as a means of increasing fish populations.

Response

The selected management alternative (Alternative 4) includes a number of proposals directed at increasing fish populations and fishing opportunities. Predator control (including river otter) is not among them. This is because it is unlikely otter dramatically affect fish populations, furthermore, otters are popular with wildlife observers, the largest user group of the Refuge. Although otters do eat fish and may decrease fish numbers in stocked ponds and commercial operations it is unlikely they adversely affect fish populations within the Refuge. Otters, like most predators, focus on prey that is most abundant and easiest to catch. Recent fisheries surveys of Refuge waters show game fish to comprise at most 20 percent of total fish numbers. This means approximately 80 percent are rough fish and

other non-game species. Otter are most likely to feed on these more abundant slower swimming fishes. Low game fish numbers are more likely related to the quality of aquatic habitat than to the presence of river otters. Improving the quality of aquatic habitats is one focus of the selected management alternative.

Comment 82

Include a through analysis of the effects of current methods of beaver control and an evaluation of non-lethal options of beaver control within the final Comprehensive Conservation Plan and Environmental Assessment.

Response

We do not believe the suggested analysis is necessary. While National Wildlife Refuges are managed first and foremost for wildlife the focus is on perpetuating populations not individuals. Beaver control does adversely affect individual animals, but it does not threaten the perpetuation of the beaver population on the Refuge.

Comments 83-84

If traps are used they should be padded traps equipped with pan tension devices.

The Environmental Assessment does not address the incidental take of threatened and endangered species by traps.

Response

Trapping does not occur at Mingo, Pilot Knob, or Ozark Cavefish NWRs.

Comment 85

The Service should consider non-lethal methods of beaver control such as water level control devices that have been successful in other locations.

Response

We have tried a number of water level control devices including the Beaver Baffler, dam modifications, and strategic draw downs. These methods were largely unsuccessful or required excessive maintenance.

Comment 86

Killing wildlife to resolve human/wildlife conflicts is ineffective in the long run because new individuals soon recolonize the site.

Response

The selected management alternative (Alternative 4) contains objectives and strategies to help fulfill the purposes of the Refuge and the Refuge System mission. In some circumstances the actions of wildlife such as beaver or nutria threaten or prevent the implementation of Refuge management activities necessary to meet these ends. Where this occurs animals are eliminated. Improved drainage across the Refuge is expected to alter habitat conditions over the long term and shift most beaver activity to locations where they will not be in conflict with Refuge management activities.

Comment 87-90

Allow trapping on at least a limited basis at Mingo NWR because it is a traditional practice, is compatible with other uses, helps maintain healthy furbearer populations, protects infrastructure, decreases refuge expenses, and is allowed on other national wildlife refuges.

Allow trapping at Mingo, Pilot Knob, and Ozark Cavefish NWRs.

We support prohibiting recreational trapping of beaver.

Any beaver or nutria control that does not make use of the pelts is wasting a resource. The Service should strive to utilize this resource and not wantonly destroy or waste it.

Response

Trapping is viewed by the Service as a legitimate recreational and economic activity when there are harvestable surpluses of furbearing mammals. It is used on some refuges to control predators and manage populations that impact refuge habitats and infrastructure. Trapping is not allowed at Mingo, Pilot Knob, or Ozark Cavefish NWRs because there are few problems with furbearer populations. At Mingo NWR beaver control is necessary, but it is most often required for a short duration in specific locations during seasons when pelts are not in prime condition. Other furbearers, notably otter, are popular with wildlife observers, the largest user group of Mingo NWR. See also the response to comment 86.

Comment 91

Trapping should be added to the list of wildlife dependent recreation activities noted in the "Purpose of and Need for Plan" section.

Response

While trapping is wildlife dependent recreation, it is not one of the six priority public uses identified in the 1997 National Wildlife Refuge System Improvement Act. This is why it is not included as such in the *Purpose of and Need for Plan* section of the CCP.

Comment 92

The term "control nutria" is misleading because it does not convey the idea that the animals will be killed.

Response

Control of nutria does include killing individual animals, but may also include other non-lethal means of limiting their numbers.

Air Quality and Contaminants

Comment 93

Expand contaminants monitoring beyond that proposed in the plan. The Refuges are all located near areas that have past mining activity and may contain a variety of soil, sediment, or water contaminants. If contaminants are discovered assess their extent and source.

Response

We will continue to work with the Service's Division of Environmental Quality as well as the Missouri Department of Natural Resources in developing contaminants monitoring that assists in achieving the plan objective of maintaining environmental quality.

Comment 94

The Missouri Department of Natural Resources concurs with the emphasis on air quality within the Mingo Wilderness.

Response

Comment noted.

Comment 95

Extending the seasonal duration of the Auto Tour Route would increase automobile emissions within the Wilderness Area and decrease air quality.

Response

Air quality within the Class I Air Quality Area associated with the Mingo Wilderness Area is a regional issue. Tailpipe emissions do affect air quality and increasing the open season of the Auto Tour Route would mean more cars and more emissions. But tailpipe emissions play a minor role in regard to air quality at Mingo NWR.

Wildlife observation is consistently the heaviest use at Mingo NWR and the Auto Tour Route is the most popular method for viewing wildlife. Extending the open season of the tour route facilitates wildlife dependent recreation, and helps build support for the Refuge. The expected increase of tailpipe emissions within the Refuge is small relative to other pollution sources within the Class I air shed.

The Refuge will continue to work with the Service's Air Quality Branch to monitor air quality within the Mingo Wilderness. We will adjust management activities, including the open season of the Auto Tour Route, based on monitoring data and recommendations of the Air Quality Branch.

Facilities and Infrastructure

Comment 96

I support the strategies to provide overlooks and footbridges.

Response

Comment noted. These are included in the selected management alternative (Alternative 4) as strategies under *Objective 3.3 Wildlife Observation and Photography.*

Comment 97

Ensure boat access to Monopoly Marsh at any water level.

Response

We agree this is important and possible except during complete draw downs of Monopoly Marsh. We added a strategy to *Objective 3.2 Fishing* to reflect this.

Comment 98

To avoid seasonal road closure, install a culvert at the low water crossing near Ditch 3 structure.

Response

In recent years, Sandblow Ridge Road was opened to vehicle traffic, first on a seasonal basis and eventually to all times the road is passable. There are no plans to alter the low water crossing to further accommodate vehicles. Improvements necessary to make the road passable during flood season would further hinder water movement across the Refuge basin and detract from ongoing and planned efforts to restore Refuge hydrology.

Comment 99

Install boat ramps at Pierman Lane, and at the Spillway along Ditch 10.

Response

The CCP calls for the preparation of a Visitor Services Plan. We will consider specific proposals for additional facilities when the plan is prepared. We will not improve boat access at Pierman Lane because; constructing a boat ramp that meets accessibility standards would be costly and impede water flow within Ditch 11.

Comment 100

Install a boat access point along Ditch 4 Road that provides access to Gum Stump Pool and Monopoly Marsh.

Response

Ditch 4 Road is not open to vehicle traffic and there is no plan to open it to vehicle traffic. The road and water crossings would have to be upgraded, further impeding flow across the Refuge basin.

Comment 101

Increase the amount of identification and directional signing within ditches, marshes, and the Mingo River.

Response

We agree and have added a strategy to Objective 4.4 to reflect this.

Comment 102

Permanent blinds do not provide the best photo opportunities.

Response

The selected management alternative (Alternative 4) does provide for the construction of one or more blinds for wildlife photography, but wildlife photography is not restricted to these sites.

Comment 103

Increase the standard of Ditch 6 Road to accommodate 2 way traffic and install a parking area.

Response

Ditch 6 road is bordered on both sides by the Congressionally designated Mingo Wilderness Area, which means the area is to be managed in a manner consistent with the Wilderness Act. The single lane Ditch 6 roadway was specifically excluded from the Wilderness Area. Improving the road to accommodate two way traffic and parking would intrude into the Wilderness. The Wilderness Act prohibits such activity.

Comment 104

Make Sweet's Cabin accessible by vehicles.

Response

Sweet's Cabin is representative of Depression era homesteads in the region and may be eligible for listing on the National Register of Historic Places. In addition to historical significance, the National Register nomination process considers seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. Improving the site to allow vehicle access may affect one or more aspects of the property's integrity and harm its eligibility for listing on the National Register. Also, the present level of access provides a measure of protection, improving access to allow vehicle traffic would likely increase vandalism of the site.

Comment 105

Consider adding camper hook-ups and/or a bunkhouse to provide temporary housing for volunteers.

Response

These facilities are available at Mingo NWR.

Comment 106

Improve the float route that includes the Mingo River as a means of attracting visitors and building support for the Refuge.

Response

The canoe route is within the Congressionally designated Mingo Wilderness Area, which means it must be managed in a manner consistent with the Wilderness Act. The present condition of the canoe route is consistent with wilderness management standards and is intended to provide visitors a wilderness experience.

Comment 107

Support installation of electronic surveillance and electric gates.

Response

Comment noted. The selected management alternative (Alternative 4) includes strategies to conduct electronic surveillance in support of law enforcement and to install electric gates.

Staffing and Funding

Comment 108

The Refuge lacks adequate staff and funding to implement the plan. The amount of staff and funding should be increase to allow the plan to be implemented in one to two years.

Response

The CCP is intended to be implemented over a 15 year period. The plan identifies additional staffing required to implement the plan within that timeframe.

Comment 109

The Refuge has more activities, signs, and general upkeep than they can take care of now.

Response

Refuge staff, volunteers, and partners do operate and maintain an array of programs, facilities, and infrastructure. The plan identifies additional funding and staffing required to implement the plan, but it is important to note that the plan is not a commitment for staffing or funding increases.

Comment 110

It will require all staffing and funding resources to meet the habitat management needs for the next 15 years. Staffing and funding should not be diverted to accommodating additional visitor services. The public will continue to use the Refuge with the present amount of visitor services.

Response

We believe the selected management alternative provides a balance of habitat management and visitor services that best fulfills the purpose of the Refuge and the mission of the Refuge System. The CCP identifies additional funding and staffing required to implement objectives and strategies for visitor services and habitat management included in the plan.

Comment 111

Try to get volunteers or a community organization to help supervise and police Sweet's Cabin.

Response

Maintaining and repairing Sweet's Cabin is a popular volunteer activity that has included Mingo Swamp Friends, Boy Scouts, and Mingo Job Corps. We will continue to promote volunteer assistance at the site, but policing activities will be conducted by authorized law enforcement professionals.

Comment 112

Increase the projected staffing to include two summer time tractor drivers.

Response

We reviewed the scope of work included in the selected management alternative and agree an additional Tractor Operator position is required to complete the work. We modified strategy 9 under *Objective 4.4* to reflect this.

Comment 113

Protection, restoration, and management of wildlife and their habitats are a higher priority for the Refuge than providing recreation opportunities. The Preferred Alternative (Alternative 4) contains too many additional recreation opportunities that will divert staff and funding from habitat management activities and have a detrimental effect on refuge wildlife.

Response

Each of the four alternatives analyzed in the environmental assessment (EA) was developed in response to issues, concerns, and opportunities identified through the CCP scoping process. Also, each alternative was designed to at least minimally achieve Refuge goals, which were derived from the

purposes of the Refuge and the mission of the Refuge System. This includes habitat and wildlife management as well as providing wildlife dependent recreation opportunities. Chapter 4 of the EA considered the effects of each alternative on Refuge wildlife. We believe the selected management alternative (Alternative 4) best fulfills the purposes of the Refuge and Refuge System mission. This includes identifying additional staffing and funding required to implement the alternative.

Comment 114

The Refuge System is not putting wildlife first, as directed by law, when it allows activities such as hunting, fishing, trapping, motor boating, and jet skiing. In many cases these activities are permitted without a thorough analysis of their effects on refuge wildlife.

Response

The 1997 National Wildlife Refuge Improvement Act, the legal basis for putting wildlife first, also directs refuges to facilitate opportunities for six priority public uses: hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Jet skiing and trapping are not allowed on Mingo, Pilot Knob, or Ozark Cavefish NWRs. Hunting and fishing opportunities are included in the selected alternatives for Mingo and Ozark Cavefish NWRs, and boating is included at Mingo NWR because it directly supports the priority public uses of fishing and wildlife observation. Compatibility Determinations analyzing the effects of these activities were included in Appendix D of the draft CCP/EA.

Comment 115

Create an alternative that eliminates additional recreation opportunities, but retains habitat management activities.

Response

We considered a range of alternatives including Alternative 3 which placed more emphasis on habitat management and less on visitor services. We believe the selected management alternative (Alternative 4) provides the best balance of public use and habitat management in a manner consistent with Refuge System policy.

Comment 116

Do not reduce the amount of visitor services below present levels.

Response

The selected management alternative (Alternative 4) includes visitor services at or above present levels.

Other Comments Regarding Mingo NWR

Comment 117

Do not implement a year round fee system.

Response

The selected management alternative (Alternative 4) does include a year round fee system. Fees are primarily used at the site they are collected and are an important source of revenue to enhance services for hunters, anglers, and others visiting national wildlife refuges. We understand that some oppose charging fees at Mingo NWR, but Congressional actions in recent years encourage user fees on federal public lands. In 2004 Congress passed the Federal Lands and Recreation Enhancement Act that included the recreation fee program. Authorized through 2014, this program is intended to demonstrate the feasibility of user fees in funding operation and maintenance of recreation areas, visitor services improvements, and habitat enhancement projects on federal lands.

Comment 118

Offer an all season pass for purchase.

Response

The Refuge currently offers an annual pass for purchase.

Comment 119

Preserve and protect Sweet's Cabin.

Response

We agree. Objective 4.1 and associated strategies are directed in part at historic protection.

Comment 120

The term "squirrel season" is misleading and should be replaced with the term "squirrel killing season".

Response

Each occurrence of the term "squirrel season" is within a portion of the document related to hunting. We believe it is clear that the term "squirrel season" describes a hunting season on squirrels.

Comment 121

There is enough land within the Refuge to provide a little of everything.

Response

Comment noted. We feel the selected management alternative (Alternative 4) provides a mixture of habitat and wildlife management as well as wildlife dependent recreation that best fulfills the purposes of the Refuge and the Refuge System mission.

Comment 122

Support fire break along boundary by Mingo Job Corps.

Response

Comment noted.

Comment 123

Ban new roads, hunting, trapping, prescribed burning, and logging within the Refuge.

Response

There are no new roads proposed in the selected management alternative (Alternative 4). Hunting is identified as a priority public use in the 1997 National Wildlife Refuge System Improvement Act, and national wildlife refuges are directed to facilitate this use when it does not interfere with fulfilling the Refuge purposes or Refuge System mission. Trapping is not allowed on the Refuge nor is it included in the selected management alternative. Prescribed burning and logging are included as part of the selected management alternative because they are necessary to maintain habitats to fulfill the Refuge purposes.

Comment 124

The smoke from prescribed burning travels long distances and is hazardous to human health.

Response

Smoke and its management is a concern associated with prescribed burning. The Mingo NWR Fire Management Plan addresses air quality and smoke management guidelines associated with prescribed fire. Individual prescribed burn plans address smoke management and actions required to ensure public safety and prevent negative impacts from smoke.

Comment 125

In the list of maintenance needs include the age of equipment due for replacement.

Response

Age is not included because vehicles and other equipment are replaced at specified age and mileage standards as indicated by Service policy.

Comment 126

A number of groups that support hunting are listed as partners of the Refuge, but no animal protection groups are listed, why?

Response

The Refuge develops partnerships with organizations to help fulfill Refuge purposes and the Refuge System mission. The Refuge welcomes new partners interested in migratory bird habitat, Wilderness, and wildlife dependent recreation, especially the six priority uses identified in the 1997 National Wildlife Refuge Improvement Act.

Comment 127

The National Wildlife Refuge System Improvement Act requires refuges to conduct rigorous scientific research on the status of refuge wildlife populations and to use this information to guide refuge planning.

Response

Comment noted. The Refuge does participate in scientific wildlife studies and the information gained from such studies does guide Refuge planning. A continued commitment to monitoring and research is reflected in the selected management alternative (Alternative 4). This includes completing an Inventory and Monitoring Step-down Management Plan.

Comment 128

It is our hope that the Mingo NWR management team will help to restore this public land system to its original purpose of providing a "refuge and breeding place" for "migratory birds, other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and aquatic plants." (Per Public Law 268).

Response

The law and purposes cited are specific to the Upper Mississippi River Wildlife and Fish Refuge. Mingo NWR derives its purposes from the Migratory Bird Conservation Act and the Wilderness Act. We believe the selected alternative (Alternative 4) best fulfills the purposes of the Refuge and the Refuge System mission.

Comment 129

As for Mingo NWR, I read all your alternative plans thoroughly and like numbers two and four the most.

Response

Comment noted. The selected management alternative is Alternative 4 of the Environmental Assessment.

Comment 130

Why were no furbearers listed in the summary of the Draft CCP and EA?

Response

Furbearers do occur at Mingo NWR. A summary contains less information than the source document it summarizes. A list of mammals found at Mingo NWR was included as an appendix to the draft CCP/EA.

Comment 131

I applaud your efforts in preserving part of Southeast Missouri as it was two hundred years ago.

Response

Comment noted.

Comment 132

Use best management practices during sediment removal and in the use of herbicides and other hazardous substances.

Response

Service policy requires the use of best management practices in carrying out such activities.

Comments 133-135

Overall I feel that the #4 alternative plan would be the most well rounded solution for the future use of Mingo.

I like Alternative 4 because it better looks to the conservation of a wider selection of plant and animal life.

I like the hunting program included in alternative 4.

Response

Comments noted. Alternative 4 is the selected management alternative.

Comment 136

I support the Preferred Alternative (alternative 4)

Response

Comment noted.

Comment 137

Alternative 2 would make a good plan if the increase in the seasonal duration of the Auto Tour Route was eliminated and replaced with increased habitat management activities.

Response

We considered a range of alternatives and believe the selected management alternative (Alternative 4) balances habitat needs with visitor services in a manner that best fulfills the purposes of the Refuge and the mission of the Refuge System.

Comment 138

I like the idea of a webcam within the Mingo Wilderness Area.

Response

Comment noted. The addition of a webcam within the Mingo Wilderness Area is included as a strategy under *Objective 3.3 Wildlife Observation and Photography.*

Response to Comments Received on the Draft CCP and EA / Pilot Knob NWR

Comment 139

The draft plan does not specify a preferred alternative for Pilot Knob NWR.

Response

This was an error of omission. Alternative 2, Expanded Species Protection and Opportunities for the Public should have been identified as the Preferred Alternative. It is now the selected management alternative.

Comment 140

Why not make the objective to reduce illegal activity to zero instead of 1 incident per 60 hours of law enforcement at Pilot Knob NWR.

Response

The objective has been modified as follows: Throughout the life of the plan, limit the amount of documented incidents of illegal activity to no more than 1 incident per 60 hours of law enforcement.

Comment 141

Establishing legal access to the Refuge must be first priority if other objectives are to be met.

Response

We agree and it is included as a strategy under *Objective 1.1 Law Enforcement.*

Comment 142

The chain link fence is inadequate to prevent illegal entry and repairing the fence is likely to be a short-term fix. A more successful strategy would be to focus protective efforts on the actual mine entrance using modern angle iron picket style fencing. A picket fence surrounding just the main entrance ravine would be a lot more effective in barring casual entry to the mine than the present arrangement and would also be a lot easier to patrol and monitor.

Response

We agree on focusing protective efforts on the mine entrance. This is reflected in the selected management alternative (Alternative 2) in strategy 1 under *Objective 2.1 Public Access and Visitor Services.* Chapter 5 of the CCP calls for completion of a Habitat Step-down management plan that will consider specific measures for implementing objectives and strategies contained in the CCP.

Comment 143

If the refuge area excluding the mine were to be opened to the general public additional picket fencing would probably be needed for safety considerations, to prevent people from entering other unstable mine entrances within the refuge.

Response

Objective 2.1 Public Access and Visitor Services does include strategies to evaluate and if possible mitigate safety hazards. Until these strategies are funded and completed we believe the limited amount of guided access described in the selected management alternative (Alternative 2) for Pilot Knob NWR best fulfills the purposes of the Refuge and the Refuge System mission.

Comment 144

We believe that MDC biologists have already developed a bat survey protocol.

Response

The 1999 Agency Draft Indiana Bat (*Myotis sodalis*) Revised Recovery Plan does contain mist netting guidelines. The recovery plan notes that mist netting is intended to determine presence or probable absence of the species, but provides insufficient data to determine population size or structure. The recovery plan also contains direction to monitor the status of populations in hibernacula but the methods described are not applicable to inaccessible hibernacula like the one at Pilot Knob NWR. It is appropriate for the Indiana Bat Recovery Team to address this.

Comment 145

Stabilizing the mine entrance will be critical in the long term, but instability of the whole hibernaculum is also a problem. One major problem is that the location of the actual hibernaculum is not known. It might be worthwhile to take a

further look inside the mine's several entrances to try to locate the hibernation area and assess stabilization needs.

Response

Stabilizing the entrance to the hibernaculum is included in the selected management alternative (Alternative 2) as a strategy under *Objective 1.2 Bat Recovery.* Further attempts to more accurately locate the hibernaculum are not included in the final CCP, but will be considered as part of a Habitat Management Plan that considers management options in greater detail.

Comment 146

The notion of instituting guided tours is OK as far as it goes, but seems labor intensive and only allows very limited access for local citizens. We believe that if our recommended strategy of securely fencing the mine entrance is successful, then excluding the general public from the refuge as a whole will become unnecessary. Allowing unrestricted access would help to engage the local public and would provide additional education opportunities.

Response

We believe the limited, guided access to the Refuge contained in the selected management alternative (Alternative 2) is appropriate considering the uncertain access and potential hazards. If these conditions change we will reevaluate public access options during development of the Visitor Service Stepdown Management Plan.

Comment 147

If public access is implemented to Pilot Knob NWR it should be on a walk in basis. Establishing vehicular access to the top of the mountain would invite trash, vandalism and erosion of the steeply graded route.

Response

We agree.

Comment 148

For any proposed projects at Pilot Knob NWR, consider the effects to historic properties.

Response

The final CCP includes provisions to ensure historic properties are identified and protected to the extent possible within the established purposes of the Refuge and the Refuge System mission.

Comment 149

What is being done about studying the summer roosting habits of these bats at Pilot Knob and protecting the land/forest they roost on?

Response

We added a strategy to *Objective 1.2 Bat Recovery* to work with partners to investigate the use of the Refuge as summer roosting habitat by the Indiana bat.

Comment 150

Consider expanding the proposed partnership with Fort Davidson Historic Site to include law enforcement assistance.

Response

We agree and modified the strategy in the selected management alternative to reflect this.

Comment 151

Consider forming a partnership with the Fort Davidson Historic Site Friends group.

Response

We agree and added a strategy to the selected management alternative.

Comment 152

Expand Pilot Knob NWR by another 150 acres.

Response

Presently, there is no proposal to expand the Refuge. Pilot Knob NWR was established to protect the abandoned mine used as a hibernaculum by Indiana bats. At this time there is no evidence to suggest expanding the Refuge would further assist Indiana bat recovery.

Comment 153

As for Pilot Knob and Ozark Cavefish NWR, I applaud your efforts to protect the Indiana Bat and Ozark Cavefish and their environment. More of this needs to be done, with other species. As our world gets more crowded with human population, a lot of wildlife species get pushed to the edge and their environment needs to be protected.

Response

Comment noted.

Response to Comments Received on the Draft CCP and EA / Ozark Cavefish NWR

Comment 154

The draft plan does not specify a preferred alternative for Ozark Cavefish NWR.

Response

This was an error of omission. Alternative 2, Expanded Species Protection and Opportunities for the Public should have been identified as the Preferred Alternative. It is now the selected management alternative.

Comment 155

One of the action alternative goals – to collect data on vegetation and identify opportunities for habitat restoration – is peripheral to the purposes of the refuge. While in general we certainly favor surface habitat restoration, we wonder if this may be diverting scarce resources from water quality issues, especially in view of the small size of the reserve.

Response

The purposes of Ozark Cavefish NWR derived from the Endangered Species Act are to conserve fish, wildlife, or plants which are listed as threatened or endangered. The Refuge is within the range of the federally threatened Missouri bladder pod and may be a potential restoration site. We believe collecting vegetation date and evaluating restoration opportunities is consistent with the Refuge purposes.

Comment 156

It is a near certainty that the bristly cave crayfish (Cambarus setosus) and at least two species of stygobitic amphipod (Stygobromus onondagaensis group and S. alabamensis) do occur within the refuge since they occur in Turnback Cave – these species, in addition to Ambylopsis rosae, should be specifically included in the endangered species management goals.

Response

The three species mentioned are not listed as federally threatened or endangered species. *Cambarus setosus* and *Stygobromus onondagaensis* are included on the 2006 Missouri Species and Communities of Concern Checklist, but are not listed as threatened or endangered by MDC. We believe management actions that benefit Ozark Cavefish will also benefit these species should they occur in Turnback Cave.

Comment 157

We strongly support the emphasis on educating private landowners within the Turnback Cave watershed with regard to best management practices and their effect on groundwater quality.

Response

Comment noted.

Comment 158

We question whether sufficient dye-trace data exists to adequately delineate the watershed. If not, research on watershed boundaries should be the first priority.

Response

During the course of the CCP planning effort, the Missouri Department of Conservation contracted Ozark Underground Laboratory to delineate the recharge area of Turnback Creek through the use of dye-trace techniques.

Comment 159

The action alternative does not address the scoping comments that the same effort should be expended on other known Ozark cavefish watersheds.

Response

The Comprehensive Conservation Plan is intended to provide management direction for Ozark Cavefish NWR. Although not addressed in the plan, the Service, MDC, and the Nature Conservancy deliver a number of programs and services directed at protecting subterranean habitats and associated species at other locations. Much of these efforts are

directed at improving water quality by educating land owners within the recharge areas about appropriate management practices to prevent groundwater degradation.

Comment 160

Only allow artificial lures, flies, and baits at Ozark Cavefish NWR.

Response

Sport fishing regulations as defined in the Wildlife Code of Missouri apply at Ozark Cavefish NWR. Use of live bait is permitted within Turnback Creek, but is restricted to those species listed as approved aquatic species in the Wildlife Code to limit introduction of invasive species.