DRAFT COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL ASSESSMENT

REELFOOT AND LAKE ISOM NATIONAL WILDLIFE REFUGES

Lake and Obion Counties, Tennessee
Fulton County, Kentucky

U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region
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I. Background

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this Draft Comprehensive Conservation Plan to guide the management actions and direction of Reelfoot and Lake Isom national wildlife refuges over the next 15 years. When fully implemented, this plan would strive to achieve the vision, goals, and objectives for the two refuges. The plan's overriding considerations are that fish and wildlife conservation requires first priority in refuge management, and that wildlife-dependent recreational uses are allowed and encouraged as long as they are is compatible with or do not detract from the mission of the National Wildlife Refuge System and the purposes for which the two refuges were established.

In conjunction with comprehensive conservation planning in west Tennessee, a collaborative planning process was performed simultaneously with the State of Tennessee. The area for this joint planning study includes all of west Tennessee from the Mississippi River to the Tennessee River, and from border to border between the states of Kentucky and Mississippi. This area covers approximately six million acres of private, state, and federal lands, including national wildlife refuge lands (Figure 1). This cooperative planning effort is described more fully in subsequent sections of this chapter, and in Chapter II, The Planning Process.

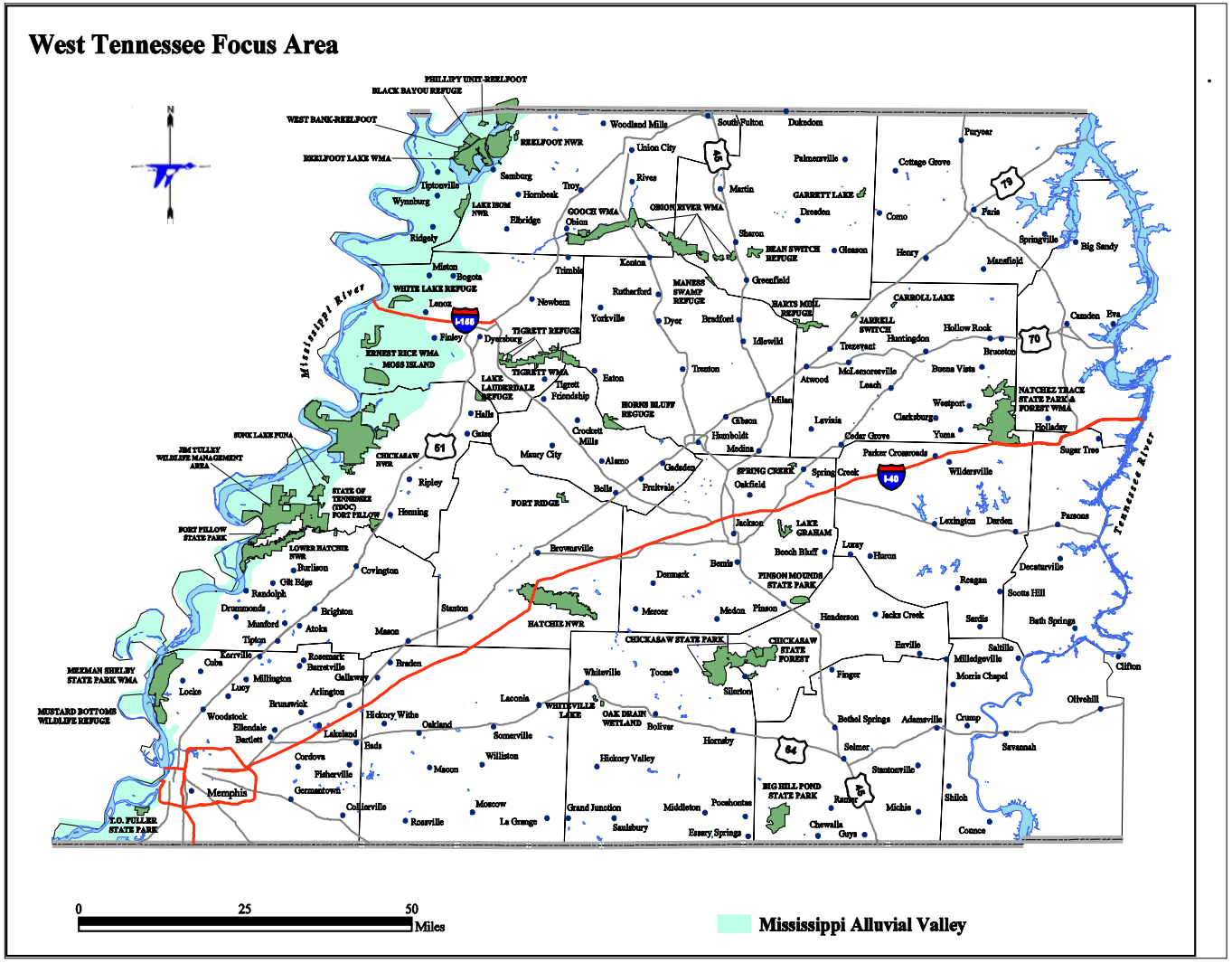
During the planning process, a range of four management alternatives was developed for the Reelfoot and Lake Isom refuges in an effort to determine how best to manage the two refuges over the next 15 years. The alternatives covered a broad spectrum of comments from the refuge staff, the general public, and others during the scoping process. After reviewing the two refuges' management needs, the priorities of regional and national resource management plans, comments from the staff and public, the four alternatives were evaluated and a proposed action was then selected. The proposed action is described in Chapter V, Plan Implementation. The other alternatives considered during the planning process are addressed in the Draft Environmental Assessment (Section B).

PURPOSE AND NEED FOR THE PLAN

The purpose of the plan is to identify the role the refuges would play in support of the National Wildlife Refuge System and to provide guidance in refuge management activities. The plan is needed to:

- provide a clear statement of direction for the future management of the refuges;
- ensure that management of the refuges is in keeping with the purposes for which the two refuges were established;
- provide refuge neighbors, visitors, and government officials with an understanding of the Service's management actions on the refuges and its partnerships around the refuges;
- ensure that the Service's management actions, including its land protection, recreation, and education programs, are consistent with the mandates of the National Wildlife Refuge System, including the National Wildlife Refuge System Improvement Act of 1997;
- ensure that the management of the refuges is consistent with federal, state, and county plans; and
- provide a basis for the two refuges' operational, maintenance, and capital improvement needs.

Figure 1. Focus area for west Tennessee planning effort



To better accomplish the mission of the National Wildlife Refuge System, the Service continues to seek cooperative working relationships with numerous agencies, organizations, and businesses. In keeping with this partnering concept, this draft comprehensive conservation plan supports other significant regional, national, and international resource management plans. These include the North American Waterfowl Management Plan; the Lower Mississippi River Joint Venture Project; the Lower Mississippi Valley Migratory Bird Wetlands Conservation Initiative; the National Wetlands Priority Conservation Plan; the Partners-in-Flight Initiative; the Western Hemisphere Shorebird Reserve Network; the Lower Mississippi River Ecosystem Plan; the Southeast Region Fisheries Strategic Plan (2004-2008); the Tennessee Wildlife Resources Agency–Scientific Ecology Group Plan; and the West Tennessee Wildlife Resources Conservation Plan.

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service is the primary federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations and their habitats. The Service also has specific trustee responsibilities for migratory birds, threatened and endangered species, anadromous fish, and certain marine mammals, as well as for lands and waters administered by the Service for the management and protection of these resources. For further information regarding migratory birds, see the Service website at http://birds.fws.gov/. The Service also shares some conservation responsibilities with other federal, state, tribal, local and private entities.

As part of its mission, the Service manages 545 national wildlife refuges covering a total of more than 96 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands and waters dedicated to wildlife conservation. About 77 million acres are in Alaska; the remaining acreage is spread across the other 49 states and several island territories.

NATIONAL WILDLIFE REFUGE SYSTEM

The mission of the National Wildlife Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997, 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 National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife Refuge System. Activities were initiated in 1997 to fulfill the direction of this new legislation, including an effort to complete comprehensive conservation plans for all refuges. These plans, which are prepared with extensive public involvement, help guide the future management of the refuges by establishing natural resources and recreation/education programs. The Act states that each refuge shall be managed to

- fulfill the individual purpose for which it was established;
- fulfill the mission of the National Wildlife Refuge System;
- consider the needs of wildlife first;
- fulfill requirements of comprehensive conservation plans that are prepared for each unit of the Refuge System;
- maintain the biological integrity, diversity, and environmental health of the National Wildlife Refuge System;

- recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and
- allow refuge managers the authority to determine compatible public uses.

Approximately 37.5 million people visited National Wildlife Refuges in 1998, most to observe wildlife in their natural habitats. As this visitation grows, the economic benefits to local communities will continue to increase. Nearly 40 percent of the country's adults spent $101 billion on wildlife-related pursuits in 1996, according to *Banking on Nature: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation* (U.S. Fish and Wildlife Service 1997a). An updated version of this report (U.S. Fish and Wildlife Service 2003b) found that in 2002, more than 35.5 million visits to national wildlife refuges fueled more than $809 million in sales of recreation equipment, food, lodging, transportation, and other expenditures. In addition, volunteers continue to be a major contributor to the success of the Refuge System. In 1998, volunteers contributed more than 1.5 million hours on the refuges nationwide, a service valued at more than $20.6 million.

The wildlife and habitat vision for national wildlife refuges stresses that wildlife comes first; that ecosystems, biodiversity, and wilderness are vital concepts in refuge management; that refuges must be healthy; that the growth of refuges must be strategic; and that the Refuge System serves as a model for habitat management with broad participation from others.

LEGAL POLICY CONTEXT

The administration of national wildlife refuges is guided by National Wildlife Refuge System policy; congressional legislation; presidential executive orders; and international treaties. Policies for refuge management are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. The refuge's establishing authorities; Public Law 104 (Stat. 2957, Section 108, H.R. 3338) and the National Wildlife Refuge System Improvement Act of 1997; and the legal and policy guidance for the operation of national wildlife refuges are summarized in Appendix III.

Guidance and direction can also be found in the following:

- National Wildlife Refuge System Administration Act of 1966
- Refuge Recreation Act of 1962
- Title 50 of the Code of Federal Regulations
- Fish and Wildlife Service Manual
- National Wildlife Refuge System Improvement Act of 1997

Lands within the National Wildlife Refuge System are closed to public uses until specifically and legally opened. All programs and uses must be evaluated based on mandates set forth in the National Wildlife Refuge System Improvement Act. Those mandates are to

- contribute to ecosystem goals, as well as to the refuge's purposes and goals;
- conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
- monitor the trends of fish, wildlife, and plants;
- manage and ensure appropriate visitor uses as those uses benefit the conservation of fish and wildlife resources and contribute to the enjoyment of the public (these uses include hunting, fishing, wildlife observation, wildlife photography and environmental education and interpretation); and

- ensure that visitor activities are compatible with the purposes for which the refuges were established.

RELATIONSHIP TO STATE WILDLIFE AGENCY

A provision of the National Wildlife Refuge System Improvement Act of 1997, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other federal agencies and state fish and wildlife agencies during the course of acquiring and managing refuges. State wildlife management areas, state wildlife refuges, and national wildlife refuges together provide the foundation for the protection of species and biological diversity, and contribute to the overall health and conservation of fish and wildlife in Tennessee.

The Tennessee Wildlife Resources Agency (http://www.state.tn.us/twra/) is charged with game enforcement responsibilities and management of the state's wildlife resources. The TWRA manages approximately 1.35 million acres of state wildlife management areas and state wildlife refuges. It also coordinates the state's wildlife conservation program and provides public recreation opportunities, including an extensive hunting and fishing program on state wildlife management areas.

An important part of the comprehensive conservation planning process is the integration of common mission objectives where appropriate. The TWRA's participation and contribution throughout this planning process provide for ongoing opportunities and open dialogue to improve the management of fish and wildlife resources in Tennessee.

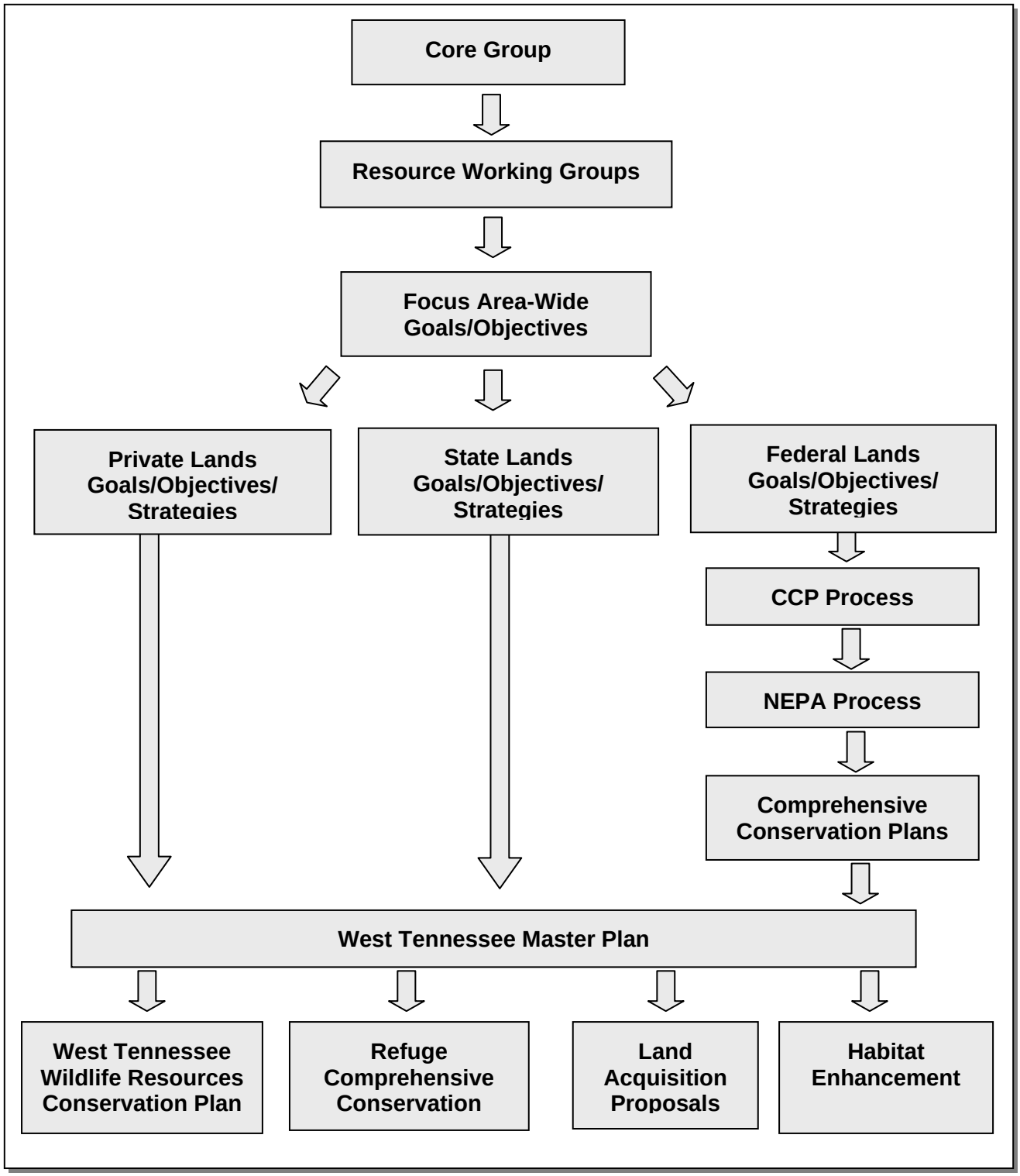
As previously mentioned, a joint interagency planning process was performed simultaneously with the TWRA, in collaboration with the Service's comprehensive conservation planning in west Tennessee. This joint planning study area encompassed approximately ten thousand square miles of private, state, and federal lands, including national wildlife refuge lands (Figure 1). It was determined that this cooperative planning effort would develop comprehensive plans for state, private, and federal lands.

In order to perform this joint planning effort, the cooperating agencies had to consider differences in their mandates and requirements. Whereas the Service is required in all significant management actions to satisfy the mandates of the National Environmental Policy Act of 1969 (NEPA) (including opportunities for public comment and participation, and required documentation), state agencies are not required to satisfy NEPA. In essence, certain regulations that dictate federal planning requirements do not apply to the Tennessee Wildlife Resources Agency. So the two agencies sought to combine their planning to the extent possible, while still providing the necessary autonomy for each agency to accomplish its desired objectives.

A planning process outline was developed (Figure 2) to allow both agencies to accomplish their planning objectives in a cooperative fashion. This process will produce joint objectives for west Tennessee lands, and will allow the Service to plan according to its NEPA requirements, while providing the TWRA the freedom to accomplish its planning objectives without NEPA provisions.

A core group was formed to oversee the planning process. This group consists of TWRA and Service project leaders, planners, and biologists who serve to guide the overall effort. Under the leadership of the core group, nine resource working groups were recruited and developed to study nine specific resource categories, including waterfowl; shorebirds; songbirds; big game; farm game; mammals; reptiles; amphibians; aquatic resources; and public use. Each group was composed of experts from various agencies, organizations, and universities, as well as private sector individuals with expertise in particular resources. The groups gathered information on species, critical habitats, and opportunities, and developed management strategies for the west Tennessee resource groups.

Figure 2. West Tennessee planning process.



The nine resource working groups developed a set of focus area-wide goals and objectives, which were then translated into a series of map overlays that rank the areas of specific interest and provide a simple means for interrelating the various types of resource information included in each map. In addition, each working group developed a text describing the goals, objectives, and strategies for implementing the desired goals and objectives for each specific resource category.

The map overlays and accompanying texts were interpreted into goals, objectives, and strategies for private, state, and federal lands, and then incorporated into the West Tennessee Wildlife Resources Conservation Plan (TWRA and USFWS 2002). The goals, objectives, and strategies developed for federal lands were used by the Service as the biological foundation for its refuge comprehensive conservation planning process. Based on these biological foundations for west Tennessee lands, the planning process will produce a comprehensive conservation plan (CCP) for each national wildlife refuge in west Tennessee, including Reelfoot; Lake Isom; Chickasaw; Lower Hatchie; and Hatchie.

Once finalized, the refuge CCPs will be combined with the map overlays and texts of the West Tennessee Wildlife Resources Conservation Plan to form the master document for the entire west Tennessee planning effort, called the West Tennessee Master Plan. This final product is expected to be compiled in 2005. It will serve as a valuable resource for state and federal managers alike, especially from a standpoint of cooperative interagency management and administration of west Tennessee resources.

ECOSYSTEM CONTEXT

OVERVIEW

On a national level, the Service has adopted an ecosystem approach to resource management and has identified 52 ecosystems in the United States. The Reelfoot and Lake Isom national wildlife refuges are located within the Lower Mississippi River Ecosystem (Figure 3).

The Service's resource priorities for the Lower Mississippi River Ecosystem are as follows:

- Conserve, enhance, protect, and monitor migratory bird populations and their habitats in the Lower Mississippi River Ecosystem.
- Protect, restore, and manage the wetlands of the Lower Mississippi River Ecosystem.
- Protect and/or restore imperiled habitats and viable populations of all endangered, threatened, and candidate species and species of concern in the Lower Mississippi River Ecosystem.
- Protect, restore, and manage the fisheries and other aquatic resources historically associated with the wetlands and waters of the Lower Mississippi River Ecosystem.
- Restore, manage, and protect national wildlife refuges and national fish hatcheries (U.S. Fish and Wildlife Service Ecosystem Plan 2000).

The Lower Mississippi Valley (which is a geographic subset of the Lower Mississippi River Ecosystem) once supported a vast complex of bottomland hardwood forests that extended along the Mississippi River from Illinois to Louisiana. Today, less than 20 percent of this bottomland hardwood forest remains. Most of it is fragmented or remains in scattered patches throughout the region (Figure 4). Floodwaters once recharged the valley's wildlife habitats and created rich, dynamic systems that supported a diverse abundance of fish and wildlife species. Today, the Lower Mississippi Valley is fragmented by levees, and its water flows are restricted by flood control projects and agricultural diversions. Its water quality is heavily impacted by agricultural and industrial runoff.

Figure 3. Lower Mississippi River Ecosystem

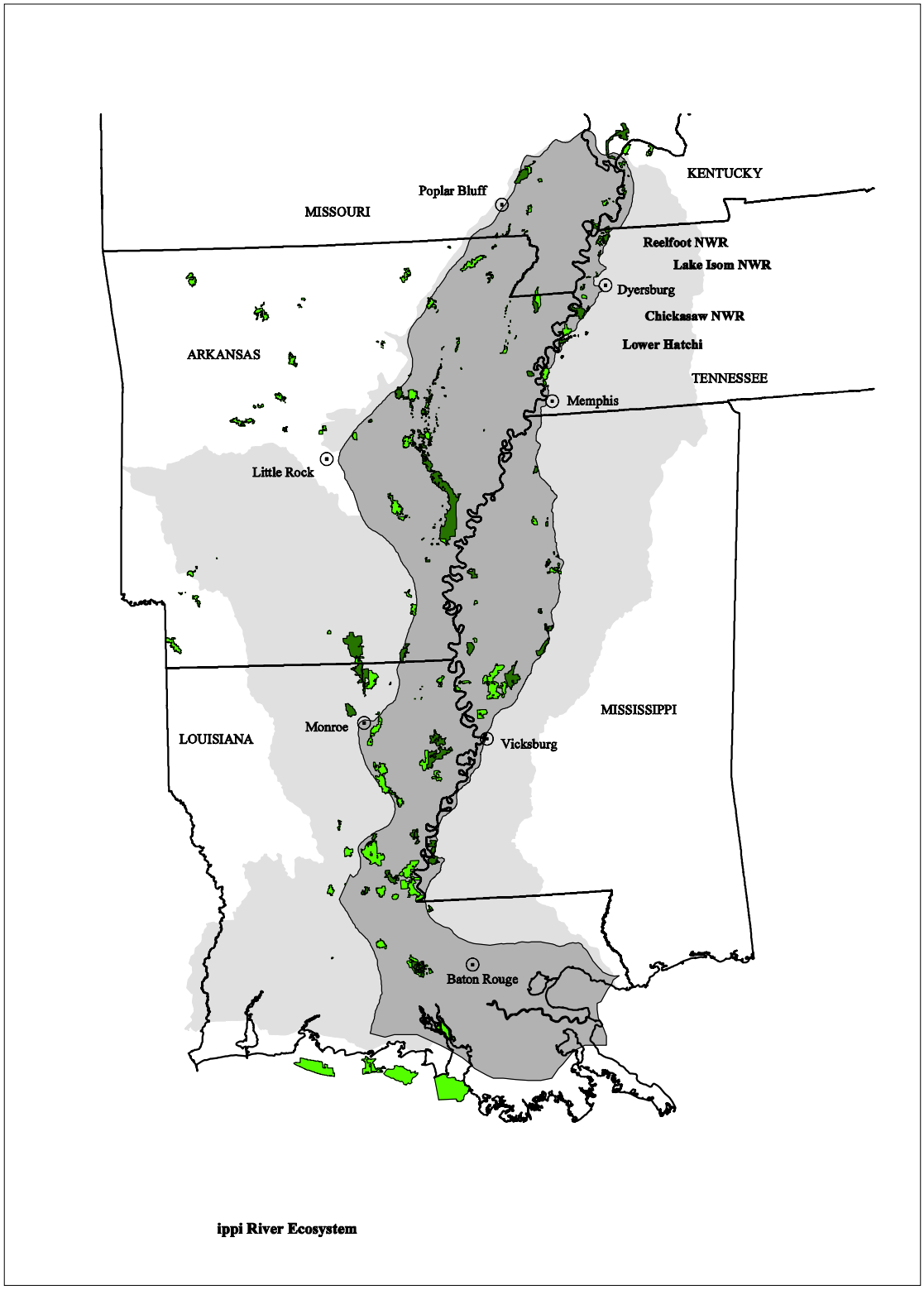
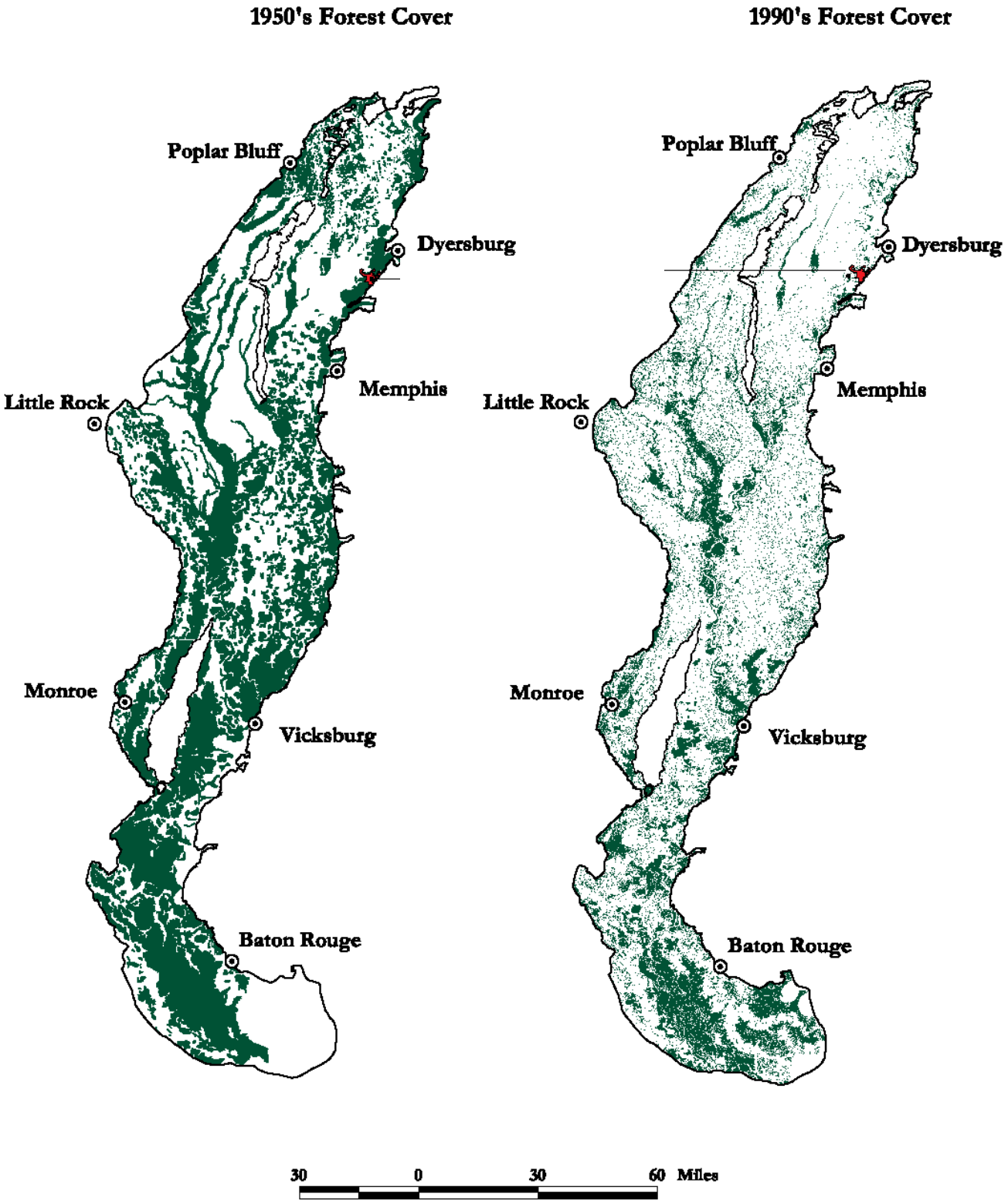


Figure 4. Forest cover changes in the Lower Mississippi River Valley



The rivers and water bodies throughout are highly turbid, laden with pesticides; and support a small fraction of the once-abundant aquatic resources.

Recovery and protection of habitats and wildlife species require the joint efforts of private landowners, local communities, and state and federal agencies. The Service continues to focus its efforts on adopting collaborative resource partnerships in order to reduce the declining trend of fish and wildlife populations and biological diversity; establish conservation priorities; clarify goals; and solve common threats and problems associated with fish and wildlife resources. The biological objectives targeted in this plan reflect the common interests of numerous state and federal agencies, local governments, nongovernmental organizations, and private interests, and are supportive of numerous regionally, nationally, and internationally significant plans, as listed previously.

THREATS AND PROBLEMS

The Lower Mississippi Valley is among the most heavily modified areas in the southeastern United States, and has the dubious distinction of being one of the most deforested of all southeastern physiographic areas (Twedt et al. 1999). Clearing and fragmentation of forests have resulted in irreplaceable losses of wildlife habitats, species, and biological diversity. The national wildlife refuges in the Lower Mississippi Valley serve as a critical safety net for preservation and management of the remaining wildlife resources.

Threats and problems affecting biological diversity in the Lower Mississippi Valley include

- the loss of sustainable communities, including the loss of 20 million acres of bottomland hardwood forests;
- the loss of connectivity between bottomland hardwood forest sites, i.e., fragmentation;
- the effects of constructing navigation and water diversion projects, and the effects of agricultural and timber harvesting practices;
- the homogenization of remaining wildlife habitats and gene pools within the ecosystem; and
- the cumulative habitat effects of land and water resource development activities.

As a result of these large-scale impacts, many species endemic to the Lower Mississippi Valley have become extinct, threatened, or endangered. The red wolf and Florida panther are no longer found in the Lower Mississippi Valley; the ivory-billed woodpecker and Bachman's warbler, once known to occur in the area, are considered critically endangered, if not extinct.

Habitat loss and fragmentation and hydrologic alterations in the Mississippi Alluvial Valley have resulted in population declines in both overwintering waterfowl and migratory forest birds (Bonney et al. 2000). Populations of dabbling ducks have decreased in the past several decades, and the availability of foraging habitat (or lack thereof) has had the greatest influence on the abundance, distribution, and body condition of waterfowl in the Mississippi Alluvial Valley (Loesch et al. 1994).

The species most adversely affected by deforestation and fragmentation are those that are area-sensitive or dependent on special habitat requirements such as large, mature blocks of forest that offer secure nesting habitat and a particular food source. At least 107 bird species nest regularly in the Mississippi Alluvial Valley, excluding wading birds and colonial nesting waterbirds, with at least 70 species occurring in bottomland hardwoods as a primary habitat (Twedt et al,.1999). Less than one percent of the remaining forest patches are large enough to support source populations of area-sensitive species, such as cerulean warblers, Swainson's warblers, and swallow-tailed kites (Bonney et al. 2000).

Modifications to the historic floodplains have caused major declines in fisheries and aquatic resource productivity. Despite efforts by the Service and others to conserve fish and other aquatic resources, a growing number are declining at alarming rates. On a national level, almost 400 aquatic species either have or need special protection in some part of their natural or historic range (Williams et al. 1989; Moyle and Leidy 1992). The number of aquatic species listed in 2002 as threatened or endangered under the Endangered Species Act has increased to 19 amphibian species, 21 crustacean species, 70 mussel species, and 115 fish species. The reasons for these declines are linked largely to habitat loss or alteration (including flow changes, watershed modifications, sedimentation, and pollution) and the impacts of harmful exotic or transplanted species (U.S. Fish and Wildlife Service 2002).

CONSERVATION PRIORITIES AND INITIATIVES

Conservation priorities for National Wildlife Refuges in the Lower Mississippi Valley focus on threatened and endangered species, trust species, and species of area concern. Working with others makes the Service more effective in achieving its overall mission and management goals. The Service and other agencies consider bottomland hardwood forests a high priority on which to focus management efforts. A combination of land protection and habitat management methods is used by the Service and others to compensate for bottomland hardwood habitat loss and to meet shared or common long-term goals established for this area.

The goals of the North American Waterfowl Management Plan and its associated Lower Mississippi Valley Joint Venture Plan have also been considered in the development of this comprehensive conservation plan. The Lower Mississippi Valley serves as the primary wintering habitat for midcontinental waterfowl populations. The goal of the North American Waterfowl Management Plan (North American Waterfowl Management Plan Committee 1998) is to develop partnerships between private and governmental organizations to address the maintenance and management of continental waterfowl populations, and to reverse the persistent loss of wetland habitats in North America. In addition, the Lower Mississippi Valley Joint Venture Plan encompasses a regional approach with the same objectives: to reduce or eliminate habitat losses for wetland-dependent migratory birds. The joint venture has initiated cooperative efforts among public and private conservation groups to restore lands that provide maximum benefits to migratory waterfowl and songbirds, and has identified conservation areas on which to focus future land protection and restoration efforts.

One of the Lower Mississippi Valley Joint Venture's long-term goals is to provide "forest islands" for migratory bird conservation in the Lower Mississippi Valley, ranging in size from 10,000 to more than 100,000 acres. In addition, Partners in Flight has developed a Mississippi Valley Bird Conservation Plan that establishes habitat objectives for the Mississippi Alluvial Valley (Twedt et al. 1998). In order to meet population objectives for migratory land birds, this plan has identified 87 bird conservation areas (BCAs), broken down into blocks of 10,000 to 20,000 acres, 20,000 to 100,000 acres, and more than 100,000 acres of forested wetlands. These targeted land bases, which serve as priority areas for forest restoration, will someday serve as important "anchors" for biological diversity.

In Tennessee, forested wetland objectives include the acquisition and/or protection of one each of the following blocks: 10,000 to 20,000 acres, 20,000 to 100,000 acres, and more than 100,000 acres. Three Tennessee bird conservation areas in the Mississippi Alluvial Valley (MAV) were identified by Ford (1998) and are delineated in Figure 5. The three Tennessee BCAs are further delineated as the Upper, Middle, and Lower Implementation Zones. The Reelfoot and Lake Isom national wildlife refuges are included within the Upper Implementation Zone, which extends from the Kentucky-Tennessee state line south to the northern boundary of Moss Island Wildlife Management Area

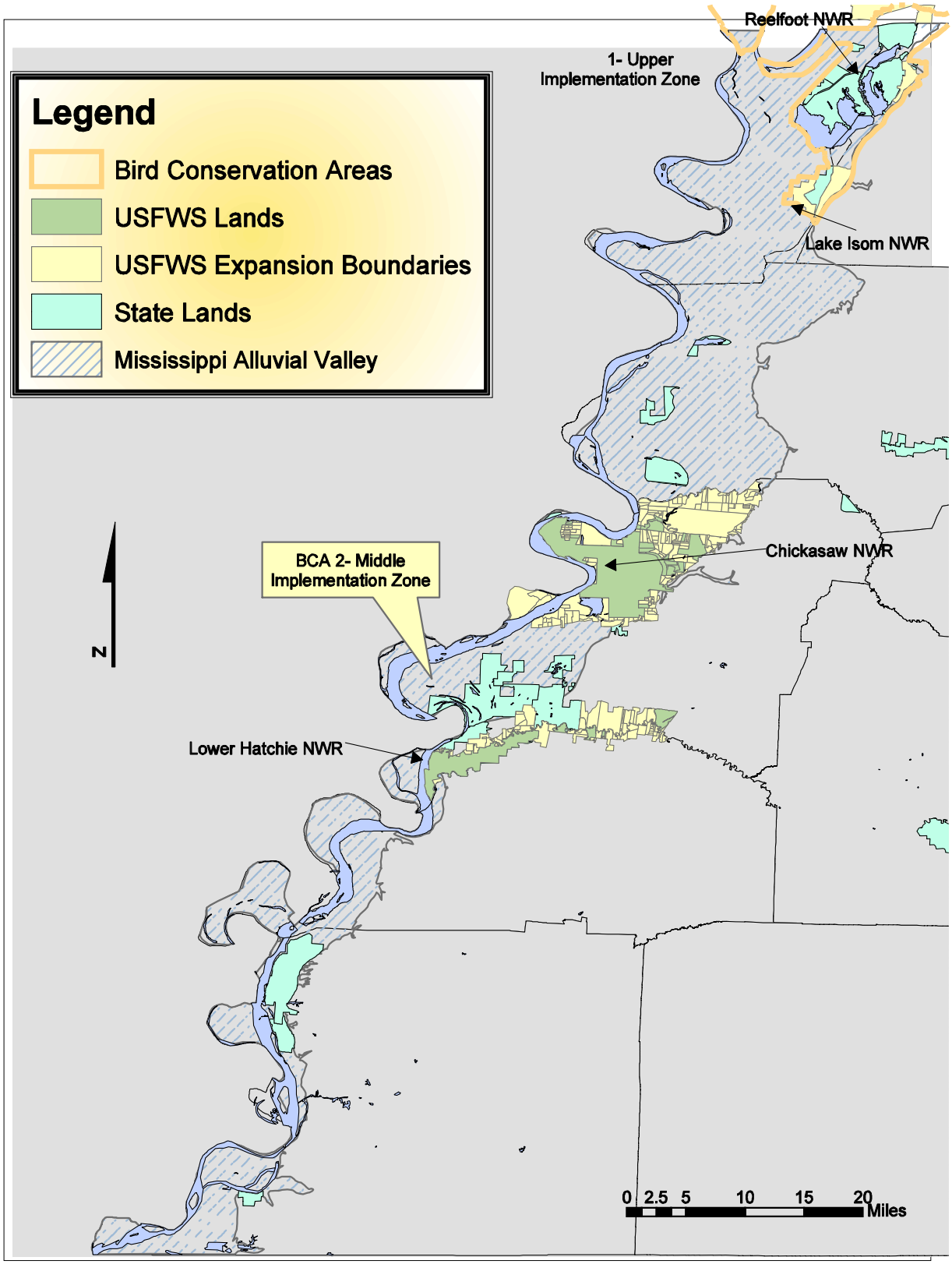


Figure 5. West Tennessee MAV Bird Conservation Areas

(TWRA and USFWS 2002). Future land acquisitions within the two refuges' approved acquisition boundaries would contribute toward achieving these BCA goals.

Restoration of migratory songbird breeding and migration habitat is a high priority of the Partners in Flight Plan (Twedt et al. 1999), a national and regional planning effort developed to emphasize land bird species as a priority for conservation. Habitat loss, land bird population trends, and vulnerability of species and habitats to threats are all factors used in the priority ranking of migratory songbird species (Bonney 1999). Furthermore, biologists are identifying focal species for each habitat type from which population and habitat objectives and conservation actions can be determined. This list of focal species, objectives, and conservation actions will aid migratory bird management on the refuges.

The Service's Lower Mississippi River Ecosystem Plan (U.S. Fish and Wildlife Service 2000b) has established five resource ecosystem goals, which have also been considered in the development of this comprehensive conservation plan. These goals involve the protection, enhancement, and management of the following: migratory bird populations and habitats; wetlands; habitats and populations of endangered, threatened, and candidate species; fisheries and aquatic resources; and national wildlife refuges and national fish hatcheries.

Conservation management on private lands is extremely important to the future conservation of fish and wildlife resources. To achieve conservation priorities on private lands and in conjunction with public lands, the synergy of federal, state, tribal, and private organizations working together will ensure that the Service not only protects the more important areas, but also helps to reduce redundancy and overlap in the management efforts of various agencies and private organizations.

II. The Planning Process

OVERVIEW

The west Tennessee planning effort includes the preparation of four comprehensive conservation plans (CCPs) for five national wildlife refuges: Reelfoot and Lake Isom; Chickasaw; Lower Hatchie; and Hatchie. It also includes the cooperative, interagency West Tennessee Wildlife Resources Conservation Plan, which identifies resources and management goals for approximately 10,000 square miles of federal, state, and private lands in west Tennessee, with an emphasis on migratory birds. In addition to serving as a guide for resource management efforts in the western third of the state, the West Tennessee Wildlife Resources Conservation Plan provides the main biological foundation for the four national wildlife refuge CCPs.

In the Mississippi Alluvial Valley (in which four of the five west Tennessee national wildlife refuges are located), migratory bird habitat requirements and desired acreages were developed prior to the comprehensive conservation planning process (Ford and Wathen 2001; TWRA and USFWS 2002; Twedt et al. 1999). Given these prior MAV recommendations, it was clear going into the comprehensive planning effort that sufficient habitat to meet these habitat objectives could not be provided on the national wildlife refuges alone. Therefore, in order to achieve the habitat goals that had already been established, the west Tennessee planning effort looked beyond the respective national wildlife refuge boundaries and incorporated any public and private lands that might be available. This cooperative planning effort between the Service and the Tennessee Wildlife Resources Agency produced a broad overview of present and future resource management needs for west Tennessee, and incorporated over 6 million acres of land.

The final product of this west Tennessee planning effort will be a West Tennessee Master Plan that will incorporate the basic recommendations of the WTWR Conservation Plan within the context of the four refuge CCPs. The primary objective of the Master Plan is to provide a means of cooperatively protecting, restoring, and managing a sufficient amount and diversity of habitats to meet the requirements of migratory birds and resident wildlife that use federal, state, and private land habitats in the western third of the State of Tennessee.

The planning process began in January, 2000 with initial core group meetings in which the Service and TWRA began efforts to produce the WTWR Conservation Plan. The core group selected nine resource working groups, which then began the process of developing goals, objectives, and strategies for specific resource categories on federal, state, and private lands within the west Tennessee planning area (Figure 1).

Preplanning for the Reelfoot and Lake Isom draft comprehensive conservation plan and environmental assessment also began during early 2000. The identification of issues is a major factor in determining the management goals and objectives for comprehensive conservation plans. To ensure that future refuge management is responsive to all relevant issues and concerns, a series of meetings and interviews was conducted to guide the identification of issues for the planning effort.

In September 2000, the Reelfoot and Lake Isom CCP Technical Team (comprised of staff from Reelfoot National Wildlife Refuge and the West Tennessee National Wildlife Refuges Complex) began meeting to discuss the refuges' issues and management opportunities. On November 14, 2000, a public scoping meeting was held in Tiptonville, Tennessee. At the meeting, the public was given the opportunity to comment orally or in writing regarding their perceived issues and opportunities for management of the refuges. The scoping meeting was advertised locally and by

mailings, with additional comments received by mail, telephone, and e-mail. The planning staff of the West Tennessee National Wildlife Refuges Complex then developed a comprehensive list of issues to be considered in the development of management alternatives in the draft environmental assessment.

Coordination with federal, state, and local agencies, as well as nongovernmental organizations and the surrounding communities, is also essential to ensure support for the plan and the projects identified for the refuges. In April 2001, an initial meeting was held with the Reelfoot and Lake Isom Planning Review Group, in which refuge neighbors, organizations, educators, government agencies, and local officials were invited to attend and share their thoughts in a focus group meeting. The Reelfoot and Lake Isom Planning Review Group included representatives from the Tennessee Wildlife Resources Agency; Reelfoot State Park; Ducks Unlimited; Tennessee Ornithological Society; Friends of West Tennessee National Wildlife Refuges; Dyersburg State Community College; the University of Tennessee at Martin; and the Reelfoot Lake Tourism Council, as well as local landowners, businessmen, and county officials from Tennessee and Kentucky. This group provided oversight during the planning process, and solicited suggestions from local individuals and private interests. Draft versions of the comprehensive conservation plan were routed to the Planning Review Group members periodically for review, and their comments were considered in plan revisions.

The nine resource working groups began meeting in early 2000. In January, 2002, the WTWR Conservation Plan was completed and became available as the primary biological foundation for much of the Reelfoot and Lake Isom CCP planning process. Based on this biological foundation, as well as other relevant documents, the input received from the public, and the refuge staff's professional judgment, the Reelfoot and Lake Isom Technical Team evaluated the two refuges' issues and resource needs and developed various management alternatives which were then considered in the Draft Environmental Assessment (Section B). The alternatives address four different management scenarios, in which each relevant issue and concern is considered in the context of at least one of the alternatives. The environmental assessment constitutes the documentation and process by which the proposed action is selected.

Once the proposed action was selected, the Reelfoot and Lake Isom Technical Team developed a set of proposed goals, objectives, and strategies for accomplishing the preferred management scenario over the next 15 years. The proposed goals, objectives, and strategies are described in Chapter IV, Management Direction.

A second public meeting will be held to solicit public review and comments on this Draft Comprehensive Conservation Plan. A third public meeting will then be held to present the Service's Final Comprehensive Conservation Plan for the Reelfoot and Lake Isom National Wildlife Refuges.

ISSUES

The identification of issues provides the basis for initiating the development of management objectives and strategies. The identified issues play a role in determining the refuges' future conditions and will be considered in the long-term comprehensive conservation plan. The issues and concerns described in the following pages were generated by the public, the Planning Review Group, and Service staff. An initial list of approximately 21 issues was consolidated into a list of 18 issue categories concerning the Reelfoot and Lake Isom national wildlife refuges. The 18 issues were grouped according to five broad management categories: (1) fish and wildlife population issues; (2) habitat issues; (3) visitor services and environmental education issues; (4) refuge administration and operation issues; and (5) land protection and conservation issues. Appendix VII provides a summary of the comments received during the public scoping process.

Waterfowl Populations

Because the refuges' establishing purpose was specifically as an "inviolate sanctuary for migratory birds" (see the "Refuge Purpose" section in Chapter III), all operations and management are considered in light of their impact on migratory birds, of which waterfowl are the most numerous. The refuge staff monitors the refuges' waterfowl populations, and works to provide sufficient high quality habitat to fulfill the population objectives set for the Mississippi Alluvial Valley, as established in Ford and Wathen (2001) and the WTWR Conservation Plan (TWRA and USFWS 2002). A portion of the refuges is dedicated to providing seasonally flooded croplands, moist soil impoundments, and forested wetlands to meet the feeding, resting, and breeding needs of migratory and resident waterfowl (please refer to the following "Habitat Issues" section). In order to meet their objectives for waterfowl, the Reelfoot and Lake Isom refuges must maintain enough cropland and moist soil areas to meet the habitat needs of waterfowl and provide sufficient sanctuary areas for undisturbed resting and feeding.

Songbird Populations

Nearly every study examining the population trends of North America's Neotropical migratory birds has reported declines in at least some species (Askins et al. 1990). The Mississippi Alluvial Valley has been identified as experiencing some of the most widespread and pronounced declines (Hamel et al. 1994). Partners in Flight has developed conservation plans for the Mississippi Alluvial Valley (Twedt et al. 1998) and the East Gulf Coastal Plain (Woodrey et al. 1998) to address priority species and bird conservation issues. The Reelfoot and Lake Isom refuges continue to monitor migratory and resident songbirds and to address habitat issues that affect resident and Neotropical migrant populations, in keeping with the refuges' goals and establishing purposes.

Threatened and Endangered Species

A key function of the Reelfoot and Lake Isom national wildlife refuges is to enhance the survival of threatened and endangered species. Two federally listed threatened or endangered animals are known to use or populate lands within or in close proximity to the refuges: the bald eagle and the interior least tern. As many as 200 bald eagles are known to winter annually in the vicinity of Reelfoot and Lake Isom national wildlife refuges, and one known active nest is documented on Lake Isom. The refuges' habitat restoration and protection activities continue to provide suitable habitat for nesting eagles.

Interior least terns nest on Mississippi River sandbars in close proximity to Reelfoot National Wildlife Refuge, and are regularly observed feeding on refuge lands. The Reelfoot and Lake Isom refuges' protection of lands within approximately three miles of the Mississippi River provides protection to interior least tern feeding areas. This protection also includes the sandbars, which are used by least tern nesting colonies during the summer months.

Resident Species Populations

The two refuges' resident wildlife include game species such as white-tailed deer, wild turkey, squirrels, rabbits, and furbearers, as well as numerous species of nongame mammals, reptiles, and amphibians. The refuges monitor some resident wildlife populations through surveys such as the turkey survey and amphibian monitoring. Species groups that lend themselves to management (deer, turkey, etc.) are managed at levels consistent with habitat availability, refuge management

goals, and refuge purposes. Other species are observed and monitored in order to identify potential management issues. The benefits to resident species are one of the factors considered when opportunities arise for land acquisition within the refuges' current approved acquisition boundaries.

Shorebird Populations

Because of the abundance of agricultural land with water control capabilities, along with frequent inundation of fields by floodwaters, the Mississippi Alluvial Valley has significant potential for providing shorebird habitat (Elliott and McKnight 2000). Refuge waterfowl management activities may provide shorebird habitat, especially in conjunction with management of impoundments and moist soil units. The staff monitors shorebird use on the refuges and looks for opportunities to support the priorities of the WTWR Conservation Plan (TWRA and USFWS 2002) for migratory and resident shorebird populations.

HABITAT ISSUES

Waterfowl Habitat

Providing habitat for migratory birds, the most numerous of which are waterfowl, was the purpose for which the Reelfoot and Lake Isom refuges were established. Thus, the refuges' management priorities must be directed toward providing quality wetland areas that are attractive to migratory birds, including dabbling ducks, diving ducks, and geese. Each management unit provides a unique set of resources that are necessary for each group to complete its life cycle. A portion of the refuges is dedicated to providing seasonally flooded croplands, moist soil impoundments, and forested wetlands to meet the feeding, resting, and breeding needs of migratory and resident waterfowl. In order to meet their objectives for waterfowl, the refuges must maintain enough cropland and moist soil areas to meet waterfowl habitat needs, and provide sufficient sanctuary areas for undisturbed resting and feeding.

Songbird Habitat

As stated in the previous section concerning waterfowl habitat, the refuges' priorities include providing quality habitat for migratory birds, including Neotropical migrant songbirds. The refuges' land and forest management practices will continue to take into account the value of such practices to songbirds. The refuges will continue to monitor migratory and resident songbirds and to address habitat issues that affect resident and Neotropical migrant populations.

Forest Habitat Management

The refuges protect more than 7,294 acres of bottomland hardwood and bald cypress forest habitat. The refuges' bottomland hardwood forests provide invaluable habitat for a wide range of wildlife species and are critical to their preservation and perpetuation. Bottomland hardwood forests are important to migratory and wintering waterfowl, particularly mallards and wood ducks. The forested tracts provide crucial food resources such as hard mast, soft mast, and invertebrates for mallards during flood events in the fall and early spring. The refuges will complete their habitat and forest habitat management plans, and management decisions will be made for vegetation management and control based on resource goals and refuge purposes, with due consideration for all other environmental factors.

Cooperative Farming

Agricultural crops play an important role in the scheme of migratory bird management, as they provide a source of high-energy carbohydrates needed during periods of cold weather. Typically, the refuges supply corn and soybean crops, which are rotated with moist soil units or produced on the higher elevations to ensure a readily available source of food for wildlife, and to meet refuge objectives set forth in the WTWR Conservation Plan. The cropland operation on the Reelfoot and Lake Isom refuges includes approximately 1,560 acres, which are managed in a combination of agricultural crops and moist soil foods. This acreage varies from year to year, based on management needs. Under a cooperative farming agreement, this acreage is divided by a 75-to-25 percent farmer-to-refuge ratio, with the refuges' portion of the crops usually grown on the lower and wetter fields. These crops are left standing in the fields during harvest and provide supplemental forage for resident and migratory wildlife, specifically migratory waterfowl.

Another farming option being used on the refuges is force-account farming, in which refuge personnel and equipment are used to plant agricultural crops. This practice is a key component in the overall management program, as it ensures that agricultural crops will exist on at least a portion of the refuges. Force-account farming is more expensive than cooperative farming, in that the Service must bear all of the production costs, including personnel, equipment, seed, fertilizer, and chemicals. Alternatively, cooperative farming programs require the cooperative farmer to bear the cost of production and leave a designated share of crops in the field as payment for renting the property. Thus, force-account farming has the disadvantage of greater expense but the advantage of greater flexibility and retains one hundred percent of the production. Cooperative farming has little or no expense to the Service, but offers less flexibility and a substantial reduction in the total amount of agricultural products left in the field for use by wildlife.

Approximately 385 acres of the refuges' crop fields can be flooded for waterfowl use as part of the refuges' impoundment systems. This, coupled with subsequent acquisitions, sets the stage for the refuges to make substantial contributions to the migratory bird objectives of the Mississippi Flyway. The refuges' farming program will continue to address habitat issues that affect migratory bird populations.

Moist Soil Habitat

Moist soil habitats are an integral part of managing public wetlands for waterfowl, as these food resources are provided in large part only on state and federal lands. The Reelfoot and Lake Isom refuges and the associated river floodplains are capable of supplying moist soil foods such as barnyard grass, sprangletop, smartweeds, rice cut-grass, and a host of other beneficial herbaceous plants. As described previously, the refuges manage approximately 1,560 acres of a combination of agricultural crops and moist soil foods. This acreage varies from year to year, based on management needs. The refuges annually provide substantial acreages of these early successional moist soil habitats and play a key role in the migration patterns of midcontinental waterfowl and other migratory birds. The refuges' present and future will in large part be influenced by resource management practices that actively benefit waterfowl, including moist soil habitats. The management of the refuges' moist soil units will continue to address habitat issues that affect migratory bird populations.

VISITOR SERVICES AND ENVIRONMENTAL EDUCATION ISSUES

Hunting and Fishing Access and Opportunities

The National Wildlife Refuge System Improvement Act of 1997 states that hunting and fishing are two consumptive priority public uses on national wildlife refuges. In addition, hunting and fishing are integral parts of the lifestyle and culture of west Tennessee. Due to this fact and the limited amount of public lands, it is not surprising that there is considerable interest in expanding the refuges' hunting and fishing opportunities. Any additional hunting opportunities will be dependent on providing safe, quality experiences that are compatible with refuge purposes. However, the refuges' hunting opportunities could be expanded through additional land acquisitions from willing sellers within the current approved acquisition boundaries. The refuges will examine opportunities to increase and/or enhance hunting and fishing opportunities, in keeping with their other resource needs and establishing purposes.

Nonconsumptive Recreational Opportunities

The National Wildlife Refuge System Improvement Act of 1997 states that wildlife observation, wildlife photography, and environmental education and interpretation are four nonconsumptive priority public uses on national wildlife refuges. In accordance with this legislation, the refuges will seek to increase opportunities for these priority public uses. Currently, hunting and fishing are the major public uses on the Reelfoot and Lake Isom refuges. More exposure resulting from expanded nonconsumptive recreational uses and programs would increase public awareness and have a positive effect on other refuge programs. The refuges are located in Lake and Obion counties, Tennessee, and Fulton County, Kentucky (combined population 47,738) within six miles of Tiptonville, Tennessee (population 4,203), approximately 18 miles from Union City, Tennessee (population 10,770) and 107 miles from Memphis, Tennessee (population 648,882) (U.S. Census Bureau 2000). Better-developed visitor facilities would provide greatly enhanced wildlife-dependent environmental education, interpretation, and recreational opportunities to Lake and Obion counties, Tennessee, and Fulton County, Kentucky. The refuges will examine opportunities to increase and enhance nonconsumptive recreational opportunities on the refuges, in keeping with their other resource needs and establishing purposes.

Public Access

Reelfoot and Lake Isom are frequently visited national wildlife refuges with a high degree of public interest in the opportunities they offer for the enjoyment of natural resources. The National Wildlife Refuge System Improvement Act of 1997 requires the refuges to provide, when compatible with refuge purposes, opportunities for the "big six" wildlife-dependent types of public recreation. The "big six" are hunting, fishing, environmental education, interpretation, wildlife observation, and photography. Therefore, attention must be given to providing the appropriate amount and forms of visitor access on the refuges. Issues regarding the increasing or limiting of public access should be considered with respect to the refuges' overall resource management goals and purposes.

REFUGE ADMINISTRATION AND OPERATION ISSUES

Maintenance and Operations

Funding for national wildlife refuges is limited because the available funds must be prioritized and divided among the 545 individual refuges that comprise the National Wildlife Refuge System. Operating within a fixed budget requires the prioritizing of programs and projects that compete for funding and staffing. The Service's Refuge Operations Needs System (RONS) and Maintenance

Management System (MMS) are the processes used for the refuges to submit their budgetary requests. The Reelfoot and Lake Isom refuges' management priorities include managing aquatic and forest habitats; fish and wildlife populations; endangered species; cultural resources; public use; and law enforcement, as well as facilities maintenance. Consideration should be given to providing comprehensive maintenance of the refuges' facilities, within the constraints of available funding and management priorities. Management decisions would continue to address the refuges' priority operational needs, and budgetary requests would be made in keeping with the goals and purposes for which the refuges were established.

Law Enforcement

Large tracts of public lands may provide unique opportunities for public use and, unfortunately, in some cases, misuse; so the continual involvement of law enforcement personnel is necessary in order to protect the resources as well as the public. However, staff limitations preclude intensive law enforcement on refuge lands. As with other issues, refuge priorities must be established which compete for available funding and staffing. Enforcement issues should be considered and ways to improve law enforcement capabilities examined, in keeping with the refuges' goals and purposes.

LAND PROTECTION AND CONSERVATION ISSUES

Land Acquisition

The refuges' land acquisitions provide additional protection for land and resources as well as additional wildlife-dependent recreational opportunities for the public. Reelfoot National Wildlife Refuge has a current approved acquisition boundary of 18,015 acres. As of June 1, 2004, the Service had acquired a total of 10,428 acres within this approved acquisition boundary (Figure 6).

Lake Isom National Wildlife Refuge has a current approved acquisition boundary of 7,133 acres. As of June 1, 2004, the Service had acquired a total of 1,850 acres within this approved acquisition boundary (Figure 7).

Public perception of federal land acquisitions is often clouded by historical instances in which eminent domain was exercised and private lands were "taken" from unwilling landowners. It is the Service's policy to acquire land only from willing sellers, and every effort should be made to provide effective information to the public in order to promote full understanding of the refuge acquisition process. Management decisions must include acquisition priorities as well as future management of acquired tracts in light of the refuges' goals, objectives, and establishing purposes.

Water Level Management

Water level management has the potential to affect the resources on the refuges and their immediate vicinity. Numerous hydrological issues exist in regard to agricultural drainage, beaver flooding, and natural flooding induced by the Obion and Mississippi river systems and their immediate tributaries. Impacts from refuge water management can include flooding, altered drainage patterns, and sedimentation. (On a larger scale, water level management of Reelfoot Lake (most of which is not located on either refuge) involves the cooperation of several partners and has a lengthy history. A brief summary of the water level management of Reelfoot Lake and how it relates to this comprehensive conservation plan is described in Appendix VI.) The comprehensive planning process would attempt to address the individual water level issues on a case-by-case basis, while keeping management decisions in line with the refuges' management goals and purposes, as well as potential water level impacts on neighboring lands.

Figure 6. Approved acquisition boundary for Reelfoot National Wildlife Refuge

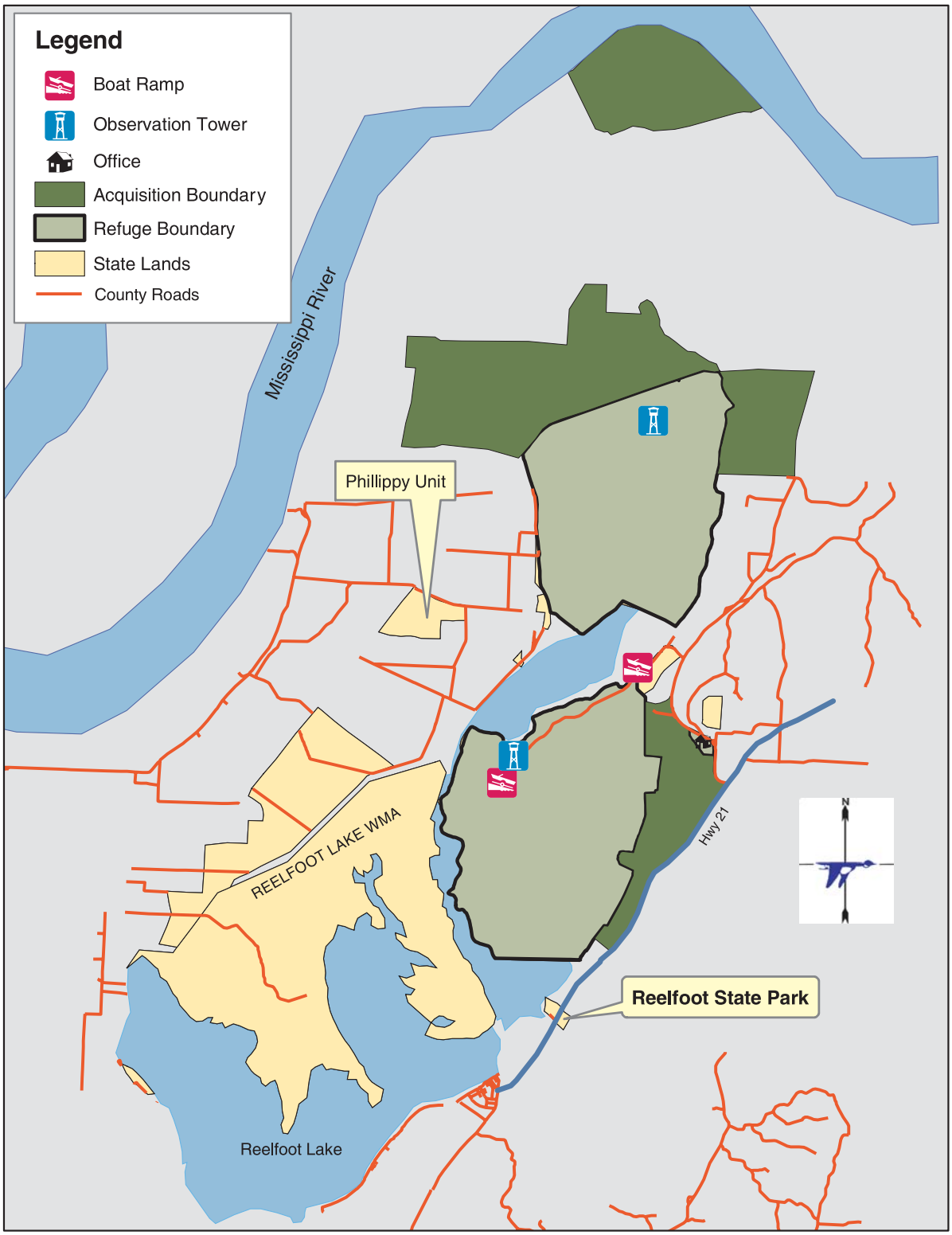
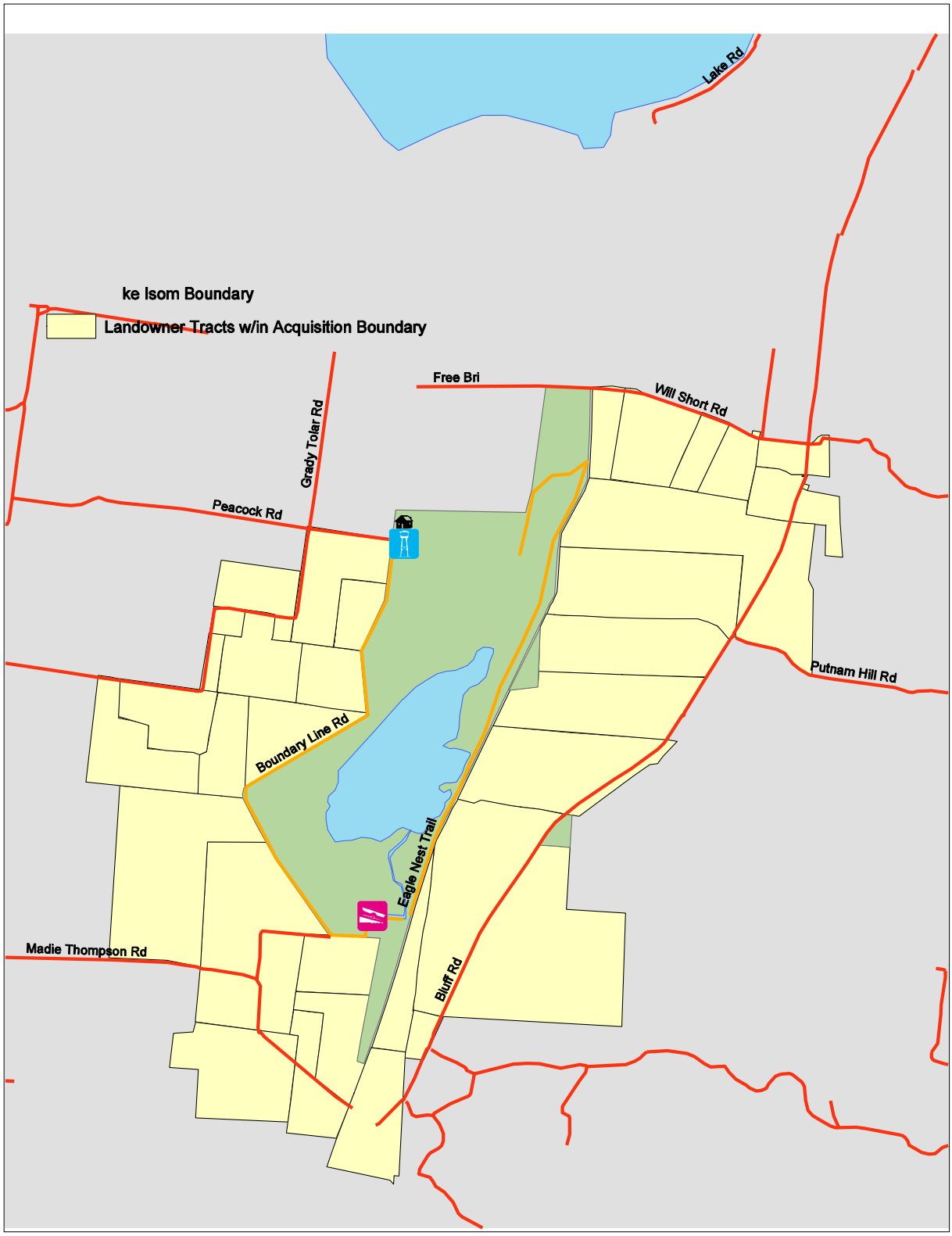


Figure 7. Approved acquisition boundary for Lake Isom National Wildlife Refuge



Protection of Unique Areas

Significant archaeological surveys were conducted on the Reelfoot and Lake Isom national wildlife refuges in 1979 (Dickson and Campbell 1979) and 1997 (Brown et al. 1998). Numerous other archaeological investigations have been conducted throughout the nearby portions of west Tennessee. These archaeological surveys document an area rich in prehistoric and historic cultural resources, dating back as far as 12,000 B.C. The results of the archaeological surveys conducted on the refuges, as well as past history, indicate that many more cultural resource sites are likely to exist on refuge lands. Refuge management should include efforts to identify and protect these unique areas, in keeping with the refuges' goals, objectives, and establishing purposes.

All of the above issues are further addressed in the "Summary of Management Alternatives" section of Chapter IV, Environmental Consequences, in the Draft Environmental Assessment (Section B). In that section, the issues are analyzed within the context of the four different management alternatives that were considered and evaluated during the planning process.

III. Refuge Description

LAND ACQUISITION

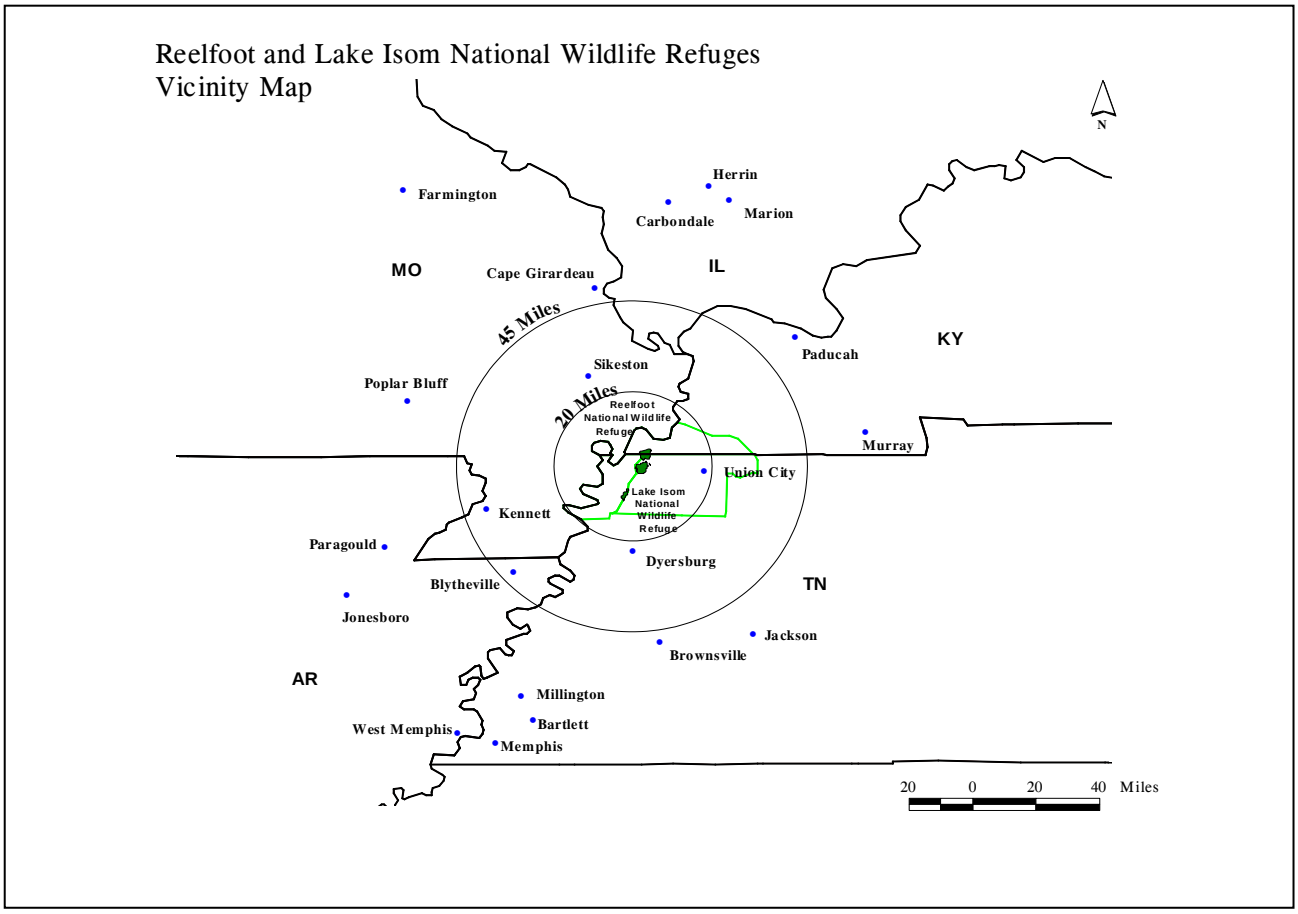
Reelfoot National Wildlife Refuge is located within four miles of the Mississippi River in rural northwest Tennessee, about 35 miles north of the city of Dyersburg and 15 miles southwest of Union City. It encompasses parts of Lake and Obion counties in Tennessee, and extends northward into Fulton County, Kentucky. Lake Isom National Wildlife Refuge is located in Lake County, Tennessee, about 15 miles south of Reelfoot Lake and five miles southeast of Tiptonville, Tennessee (Figure 8).

Reelfoot National Wildlife Refuge currently encompasses 10,428 acres (as of June 1, 2004). This acreage includes 7,847 acres managed by the Service under a 1941 lease agreement with the State of Tennessee, as well as 2,581 acres owned in fee title. In addition to lands within the original refuge boundary, an expansion to the acquisition boundary was approved in 1989; it included an additional 7,587 acres adjacent to the existing refuge boundary (U.S. Fish and Wildlife Service 1989a). If funding and opportunities becomes available, the Service proposes to acquire these lands through conservation easements, cooperative agreements, or fee title purchases from willing sellers. The proposed acquisitions, when complete, would increase the total size of the Reelfoot refuge to 18,015 acres. The majority of the refuge's approved acquisition boundary is located in Kentucky and adjoins the Mississippi River at its northernmost point. At full expansion, the refuge boundary would encompass the bulk of the remaining bottomland hardwood forest on or surrounding Reelfoot Lake. The refuge lies within the Mississippi Flyway and is part of a 20,000+ acre migratory bird zone identified in the WTWR Conservation Plan.

Lake Isom National Wildlife Refuge currently encompasses 1,850 acres (as of June 1, 2004). In addition to lands within the original refuge boundary, an expansion to the acquisition boundary was approved in 1989; it includes an additional 5,283 acres adjacent to the existing refuge boundary (U.S. Fish and Wildlife Service 1989a). If funding and opportunities become available, the Service proposes to acquire these lands through conservation easements, cooperative agreements, or fee title purchases from willing sellers. The proposed acquisitions, when complete, would increase the total size of the Lake Isom refuge to 7,133 acres. Most of the refuge's approved acquisition boundary is currently in agricultural production, although 788 acres of the approved acquisition boundary is upland woods along the Bluff Road. The Lake Isom refuge also lies within the Mississippi Flyway and is part of a 20,000+ acre migratory bird zone identified in the WTWR Conservation Plan.

The U.S. Fish and Wildlife Service acquires lands and waters in a manner consistent with legislation, other congressional guidelines, and executive orders for the conservation, management, and, where appropriate, restoration of ecosystems, fish, wildlife, plants, and related habitat, and to provide for compatible, wildlife-oriented public use for educational and recreational purposes. These lands include national wildlife refuges, national fish hatcheries, waterfowl production areas, and other areas. The Service acquires land and water interests including, but not limited to, fee title, easements, leases, and other interests. Donations of desired lands or interests are encouraged. Funding for acquisitions comes from receipts, such as Federal Duck Stamp sales, entrance fees to certain national wildlife refuges, import taxes on arms and ammunition, and appropriations under the Land and Water Conservation Fund Act (U.S. Fish and Wildlife Service 2001).

Figure 8. Vicinity map of Reelfoot and Lake Isom National Wildlife Refuges



It is anticipated that funding for future land acquisitions would be provided through the Migratory Bird Conservation Fund and the Land and Water Conservation Fund. The authorities for the use of these funds for land acquisition are the Migratory Bird Conservation Act (16 U.S.C. Sec. 715d) and the Refuge Recreation Act (16 U.S.C. Sec. 460k-1).

REFUGE PURPOSE

The Reelfoot and Lake Isom national wildlife refuges are administered under the National Wildlife Refuge System and thus are part of a larger national landscape conservation plan set forth by the Service. The mission of the National Wildlife Refuge System is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Improvement Act of 1997). There are currently 545 national wildlife refuges encompassing more than 100 million acres of lands managed by the U.S. Fish and Wildlife Service. The refuges are important components for the conservation and management of fish, wildlife, and plant resources within the National Wildlife Refuge System.

Reelfoot National Wildlife Refuge was established on August 28, 1941, under the authority of the Migratory Bird Conservation Act (16 U.S.C. Sec.715d). Subsequent lands for the refuge were acquired under the authority of the Refuge Recreation Act (16 U.S.C. Sec. 460k-1) and the Endangered Species Act of 1973 (16 U.S.C. Sec. 1534). The refuge was specifically authorized "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (Migratory Bird Conservation Act), and is "... 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 ..." (Refuge Recreation Act). Further, lands acquired under the Endangered Species Act have additional purposes, described as "... to conserve (A) fish or wildlife, ... or (B) plants, ... which are listed as endangered species or threatened species ... " (16 U.S.C. Sec. 1534, Endangered Species Act of 1973).

Lake Isom National Wildlife Refuge was established on August 12, 1938, by Executive Order 7953. Subsequent lands were acquired under the authority of the Migratory Bird Treaty Act (16 U.S.C. Sec. 715d). The refuge was specifically authorized "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7953), and also "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (Migratory Bird Conservation Act).

The Refuge Recreation Act of 1962 (16 U.S.C. 460(k)(1)) later declared national wildlife refuges to be "suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, and (3) the conservation of endangered species or threatened species ...."

In conjunction with their primary establishing purposes, these refuges will provide inviolate sanctuaries for migratory birds and preserve for the public benefit a representative portion of the bottomland hardwood forests of the Lower Mississippi Alluvial Valley. The refuges would also help support the priorities established by the Service's Lower Mississippi River Valley Ecosystem Team. These ecosystem priorities involve migratory bird populations and their habitats; wetlands; threatened and endangered species and their habitats; fisheries and aquatic resources; and national wildlife refuges and national fish hatcheries (U.S. Fish and Wildlife Service 2000b).

REFUGE ENVIRONMENT

TOPOGRAPHY AND CLIMATE

The Reelfoot and Lake Isom refuges are located in the Mississippi Alluvial Valley, within three and six miles, respectively, of the eastern shore of the Mississippi River. The Tennessee portion of the Mississippi Alluvial Valley is a subset of the Lower Mississippi River Ecosystem. The dominant land forms of the Lower Mississippi River Ecosystem are the alluvial plain of the Mississippi River, downstream of its confluence with the Ohio River, and the deltaic plain and associated marshes and swamps created by the meanderings of the Mississippi River and its tributaries.

The Mississippi Alluvial Valley is a 24-million-acre, relatively flat, weakly dissected alluvial plain, comprised of natural levees, basins and flats, point bar formations, terraces, tributary floodplains, and depressional wetlands. It is among the most heavily modified physiographic areas in the southeastern United States, but it still supports the largest forested floodplain in North America (Twedt et al. 1999). This portion of the Mississippi Alluvial Valley overlies the New Madrid fault line, with the potential for earthquakes.

The most significant recent geological event, which shaped the present-day landscape of the Reelfoot Lake area, was the New Madrid earthquakes. This series of earthquakes, which shook the area from December 1811 through February 1812, is reported as being the most significant to hit the continental

United States in recorded history. These earthquakes reportedly caused the Mississippi River to flow backwards when an area just south of the Reelfoot refuge, known as the Tiptonville Dome, was thrust violently upwards into the path of the river. Likewise, an area as much as 30 miles long and 10 miles wide, by some accounts, sank up to 50 feet, creating a sunken forest and forming the present-day Reelfoot Lake.

Over the history of Reelfoot Lake, altered hydrology and sedimentation have disrupted natural geomorphic processes. As a result of the construction of main line levees between the refuges and the Mississippi River, land and lake formation associated with Mississippi River meandering is no longer occurring, or is occurring on a very limited basis, restricting the formation of new oxbow lakes and sloughs.

Extensive drainage efforts that have occurred from the early twentieth century to the present day have resulted in significantly altered drainage patterns in the vicinity of both the Reelfoot and Lake Isom refuges. As recently as the early 1920s Lake Isom was a part of Reelfoot Lake, but construction of a ditch to drain Reelfoot Lake in 1921 effectively cut off the hydrological connection between Lake Isom and Reelfoot Lake. Actions to clear and settle the lands around Reelfoot Lake have seriously degraded the lake through accelerated siltation caused by farming the highly erodable soils around the lake and on the adjacent loess bluffs. In addition, ongoing sedimentation is gradually filling in many aquatic features on the refuge.

Both the Reelfoot and Lake Isom refuges have elevations ranging from 275 to 285 feet above mean sea level, with the highest elevations occurring along existing or old channels of tributaries. The soils of the refuges are of the Swamp-Bowdre-Sharkey Association. All the soils in this association were formed in sediments deposited by the Mississippi River. Differences in elevation account for most of the differences among the soils; however, nearly two-thirds of this association is level, dominantly swampy terrain. It is ponded for long periods, and the lowest positions along Reelfoot Lake support only water-tolerant plants such as bald cypress.

Fifteen soil series are found on Reelfoot and Lake Isom national wildlife refuges. Five major types, Bowdre, Convent, Iberia, Sharkey, and Tunica, represent approximately 80 percent of the soils on the refuges. The other types occur on a more localized basis. The Soil Survey of Lake County, Tennessee (Brown et al. 1969), the Soil Survey of Obion County, Tennessee (Brown et al. 1973), and the Soil Survey of Fulton County, Kentucky (Newton and Sims 1987), contain maps and descriptions of these soil types.

The climate of the refuges is characterized by fairly mild winters, hot summers, and abundant rainfall. There are wide and frequent changes in weather, both from day to day and from season to season. The average annual temperature at Union City is 59 degrees Fahrenheit. Extremes of 109 degrees and a negative 23 were recorded during the period 1931-60, but prolonged periods of very cold or very hot weather are unusual. The average date of the last freezing temperature in the spring is March 31. The average date of the first freezing temperature in the fall is October 28. The growing season averages 210 days. The average annual rainfall is approximately 49 inches, with extremes of 31 inches (1941) and 72 inches (1950) having been recorded. Winter and early spring are the rainiest times of the year; summer and early fall are the driest (Brown et al. 1973).

DEMOGRAPHY

The rural setting and sparse population of the refuge vicinity are characteristic of west Tennessee. The areas immediately surrounding the refuges are even less populated than most of west Tennessee, due to their locations adjacent to the Obion and Mississippi rivers and their floodplains.

According to estimates based on data from the U.S. Census Bureau (2000), Lake County, Tennessee, had a population of approximately 7,793 people in 2002, a decrease of 2.0 percent since the 2000 census. Obion County, Tennessee, had approximately 32,394 in 2002, a decrease of 0.2 percent since 2000; and Fulton County, Kentucky, had approximately 7,551 in 2002, a decrease of 2.6 percent since 2000. The total estimated population for 2002 in the three counties that encompass the two refuges was 47,738.

The per capita incomes of the states and counties recorded in 1999 are as follows: Tennessee, $19,393; Lake County, $10,794; Obion County, $17,409; Kentucky, $18,093; and Fulton County, $14,309. Agriculture and related service companies are the main economic bases in the three counties. Several small to medium manufacturing companies are also located in the counties; some of the major private employers include Goodyear Tires, Tyson Foods, Lenox Fireplace, Wal-Mart, Baptist Memorial Hospital, county and city schools, and the utility companies.

THREATENED AND ENDANGERED SPECIES

Part of the Service's mission is to protect, enhance, and manage habitats for threatened and endangered species, in keeping with the enforcement of the Endangered Species Act. Two federally listed species, the endangered interior least tern and the threatened bald eagle, are found on or near the refuges. The interior least tern is known to nest on Mississippi River sandbars within four miles of Reelfoot National Wildlife Refuge, and feed on refuge lands. As many as 200 bald eagles winter annually in the vicinity of Reelfoot Lake, with at least one known active nest documented on Lake Isom National Wildlife Refuge. No federally listed flora are known on the refuges. A Section 7 Intra-Service Biological Evaluation addressing those species is provided in Appendix V.

AVIAN SPECIES

Birds are important wildlife resources, with more than 250 species known to occur on Reelfoot National Wildlife Refuge (U.S. Fish and Wildlife Service 1989a). Appendix IV contains a list of the avian species known to occur on the refuges and their residence status. The bottomland hardwood forests serve as important habitat for breeding birds and migrants in the spring and fall, and migratory birds occur seasonally in substantial numbers. For migratory forest-breeding songbirds and shorebirds, the ecological and biological significance is transcontinental, with the refuges providing breeding and migration habitat for Gulf of Mexico migrants returning from their wintering grounds in Central and South America.

Recent studies indicate significant population declines in some species of Neotropical migrant birds (Askins et al. 1990), while current knowledge concerning management practices for most Neotropical migratory species is seriously lacking. The status of one of the most rapidly declining species, the cerulean warbler, prompted population monitoring on nearby Chickasaw National Wildlife Refuge during 1985-87 and 1991. Additional research began in 1992 and is ongoing to assess the habitats and responses of cerulean warblers in the Mississippi Alluvial Valley (Hamel et al. 1994). Neotropical migratory birds that regularly occur on the Reelfoot and Lake Isom refuges include the cerulean warbler, prothonotary warbler, and Swainson's warbler.

Approximately 32 species of shorebirds (TWRA and USFWS 2002) are commonly found in west Tennessee, with the highest populations occurring during migration periods that typically peak from August through October and from April to mid-May (Elliott and McKnight 2000). Shorebird species common to west Tennessee include the killdeer; pectoral sandpiper; solitary sandpiper; greater yellowlegs; lesser yellowlegs; common snipe; and American woodcock. Refuge lands that provide shorebird habitat include riverine mudbars; oxbows; flooded agricultural fields; the margins of

reservoirs; and managed impoundments. Presently, the Reelfoot and Lake Isom refuges manage approximately 245 acres of impoundments as shorebird habitat. Shorebird habitat is provided within the impoundments each spring (target 250 acres) and fall (target 60 acres).

The Lower Mississippi Valley serves as the primary wintering ground for midcontinental waterfowl populations that breed in the prairies and parklands of Canada and the United States. The Reelfoot and Lake Isom refuges and their adjacent lands are known to be an important wintering and stopover area for mallards using the Mississippi Flyway. Under optimum conditions, waterfowl population numbers in the vicinity of the two refuges may exceed 250,000. The value of Reelfoot and Lake Isom as waterfowl wintering areas is enhanced by their proximity to other refuges. The two refuges lie within 125 miles of numerous other national wildlife refuges, including Big Lake and Wapanocca to the west; White River, Chickasaw, Lower Hatchie, and Hatchie to the south; Tennessee to the east; and Crab Orchard and Mingo to the north. Other species of waterfowl known to use the areas include the black ducks; gadwall; pintail; green-winged teal; blue-winged teal; widgeon; wood duck; ring-necked duck; and hooded merganser. Wood ducks are year-round residents and depend on refuge habitats for nesting and brood-rearing.

The combined waterfowl objectives for the two refuges are 3.5 million goose-use days and 15.2 million duck-use days. These objectives are supported by the moist soil units, impoundments, flooded sloughs and brakes, as well as the entire refuge forest, much of which is subject to inundation during high river stages. These objectives are currently being evaluated in light of the refuge expansions and the North American Waterfowl Management Plan.

Wild turkeys are also present on the refuges, although spring flooding sometimes impacts nesting success. Flocks consisting of upwards of 50 turkeys are observed during high water periods, in which the birds congregate on higher ground. Mourning doves and bobwhite quail are common on open lands within and adjacent to the refuges. Common raptors include the red-tailed hawk, red-shouldered hawk, northern harrier, barred owl, and turkey and black vultures. Kestrels and broad-winged hawks are also present but occur less frequently.

MAMMALS

The diverse habitat types on the two refuges are very productive for a wide variety of game and nongame mammals, represented by seven taxonomic orders, including pouched mammals (opossums); insect-eaters (shrews and moles); bats; flesh-eaters (raccoon); gnawing mammals (squirrels and mice); rabbits; and even-toed hoofed mammals (white-tailed deer).

Mammalian game species hunted on the refuges include white-tailed deer, raccoon, gray and fox squirrels, coyote, and swamp and cottontail rabbits. Furbearers include raccoon, beaver, opossum, river otter, muskrat, nutria, striped skunk, coyote, bobcat, gray and red fox, and mink. Nongame species include shrews, moles, bats, and numerous rodents, such as mice, rats, chipmunks, and flying squirrels.

Providing a diversity of habitats on the refuges contributes to healthy populations of numerous mammalian species, as well as other resident animals. Habitat management practices that focus on providing habitat for migratory birds would also benefit many resident mammals. Forest thinning and regeneration cuts would provide browse for deer, and ultimately larger mast-bearing trees with a greater potential for cavities for squirrels and raccoons. Managing for a diversity of forest habitats would better meet the needs of all resident mammals that are dependent on forested habitats.

Appendix IV provides a list of the mammalian species known to occur on the refuges.

AMPHIBIANS AND REPTILES

A diverse group of amphibians is found on the Reelfoot and Lake Isom national wildlife refuges, including salamanders, toads, and frogs. Most are well adapted to the aquatic and terrestrial environments found on the refuges, with moisture being typically important for their survival. Numerous species of reptiles, including turtles, snakes, lizards, and skinks, are common as well.

Reptiles and amphibians are abundant and functionally important in most of the refuges' freshwater and terrestrial habitats, and are major components of the Lower Mississippi River ecosystem. Many species of herpetofauna are wide-ranging and may serve as key indicator species in evaluating the environmental health of an ecosystem.

A troubling indicator for the health of ecosystems worldwide is that many amphibian populations are declining. Loss and degradation of habitat are the main known causes of declines in reptile and amphibian populations in Tennessee, with the loss of wetlands and bottomland hardwood forests having the greatest negative impact on these species. Habitat fragmentation, hydrologic alterations, and excessive sedimentation are environmental problems common to west Tennessee which negatively affect populations. The refuges' land protection and management efforts serve these populations by protecting their existing habitats, as well as by restoring degraded habitats.

Comprehensive inventories are planned to establish baseline information on the occurrence and habitat use of amphibian and reptilian species by 2009. Specific knowledge of which species occur on the Reelfoot and Lake Isom refuges is fundamental to an understanding of the biological diversity of the area.

The reptiles and amphibians known to exist in west Tennessee and their status are listed in Appendix IV.

AQUATIC SPECIES

The dynamic nature of the flooding regimes between the Obion and Mississippi rivers and their associated wetland habitats on the refuges provide a constant and renewable fishery. When flooding occurs in the spring, these areas provide good nurseries for juvenile fish. The sloughs, rivers, and lakes within the refuges support a diversity of game fish, including largemouth bass; black crappie; white crappie; spotted bass; redear sunfish; bluegill; and channel catfish. Nongame species such as carp, buffalo, and drum are also present. Appendix IV provides a comprehensive listing of the fish likely to occur in the Mississippi River proper and its directly westward-flowing tributaries in western Tennessee, including the rivers on Reelfoot and Lake Isom national wildlife refuges (TWRA and USFWS 2001).

Although decades of hydrologic alteration and sedimentation have impacted the aquatic resources in the refuges' vicinity, land protection and habitat restoration result in positive benefits to aquatic habitats and species. The Service should emphasize projects that reduce the effects of channelization and poor land use practices through programs such as the Partners for Fish and Wildlife; the Wetlands Reserve Program; the Cropland Reserve Program; and Forest Legacy.

MUSSELS

A comprehensive mussel survey has not been completed for the refuges, and few published surveys are available on the mussels of the Mississippi River and its major tributaries in west Tennessee. However, a survey by A.E. Ortmann (1926) reported seven species of mussels from Reelfoot Lake

and 12 species from the Obion River. Pilsbry and Rhoads (1896, as cited in Ortmann 1926) listed 12 species of mussels from Reelfoot Lake. Don Manning (1989) later reported 33 species of mussels in the nearby Hatchie River. It is estimated that approximately 20 to 25 species of mussels likely exist in the vicinity of the Reelfoot and Lake Isom national wildlife refuges. Mussel species known to exist in the Obion and Forked Deer rivers of west Tennessee are listed in Appendix IV.

As stated in the above Aquatic Resources section, hydrologic alterations and sedimentation have impacted the area's aquatic resources, including mussels. Similarly, the refuges' land protection and habitat restoration efforts result in positive benefits to aquatic habitats and mussel species. The Service should emphasize projects that reduce the effects of channelization and poor land use practices. In addition, a comprehensive survey of mussel populations should be conducted on the waters of the refuges and surrounding vicinity, when funding and opportunities become available.

NOXIOUS AND INVASIVE SPECIES

Noxious and/or invasive species known to present problems on the refuges include a hybrid cocklebur, and hemp sesbania. The refuge vicinity has become home to a hybrid cocklebur that is resistant to flooding and wet soil conditions. This species is prolific and will outcompete native moist soil vegetation in moist soil units. Hemp sesbania also invades the moist soil units and will also outcompete the preferred moist soil plants.

The Reelfoot and Lake Isom refuges' Draft Habitat Management Plan includes plans and preferred methods for control and eradication of these nuisance and invasive species.

HABITATS

Reelfoot and Lake Isom national wildlife refuges provide a variety of habitat types for a diversity of wildlife species. The habitats on the refuges consist of approximately 98 acres of open administrative land; 1,560 acres of agriculture and moist soil open lands (the agricultural/moist soil breakdown varies from year to year); 2,168 acres of bald cypress/tupelo forest; 5,126 acres of mixed bottomland hardwood forest; 11 acres of upland forest; and 3,315 acres of open water. The total current deeded acreage being managed as Reelfoot National Wildlife Refuge is 10,428 acres (as of June 1, 2004). The total current deeded acreage being managed as Lake Isom National Wildlife Refuge is 1,850 acres (as of June 1, 2004). Figure 9 shows the existing habitat types on the two refuges.

The refuges' 5,126 acres of mixed bottomland hardwoods consist of black willow, eastern cottonwood, overcup oak, cherrybark oak, willow oak, water oak, Nuttall oak, sugarberry, bald cypress, sweet pecan, bitter pecan, sweetgum, and green ash. Forest management practices are used in these areas to maintain an optimal diversity of forest habitat for wildlife. Mast production in the bottomland hardwood habitats provides an important food source for a wide variety of wildlife, including migratory waterfowl, deer, squirrel, and turkey. During the winter and spring months, backwaters typically flood thousands of acres of bottomland hardwoods, providing valuable waterfowl habitat. The 11 acres of upland forest are dominated by southern red oak, sweetgum, yellow poplar, post oak, white oak, various hickories, and American beech.

There are approximately 1,560 acres of agriculture/moist soil open lands on the Reelfoot and Lake Isom refuges. In any given year, approximately 50 percent of these lands are managed for agricultural production and 50 percent are managed for moist soil, although the ratio varies from year to year due to river flooding and other factors. The croplands are managed under cooperative agreements with local farmers, who grow corn, soybeans, and winter wheat in rotation. The 25 percent refuge share is usually planted in corn, which is left in the field for waterfowl consumption.

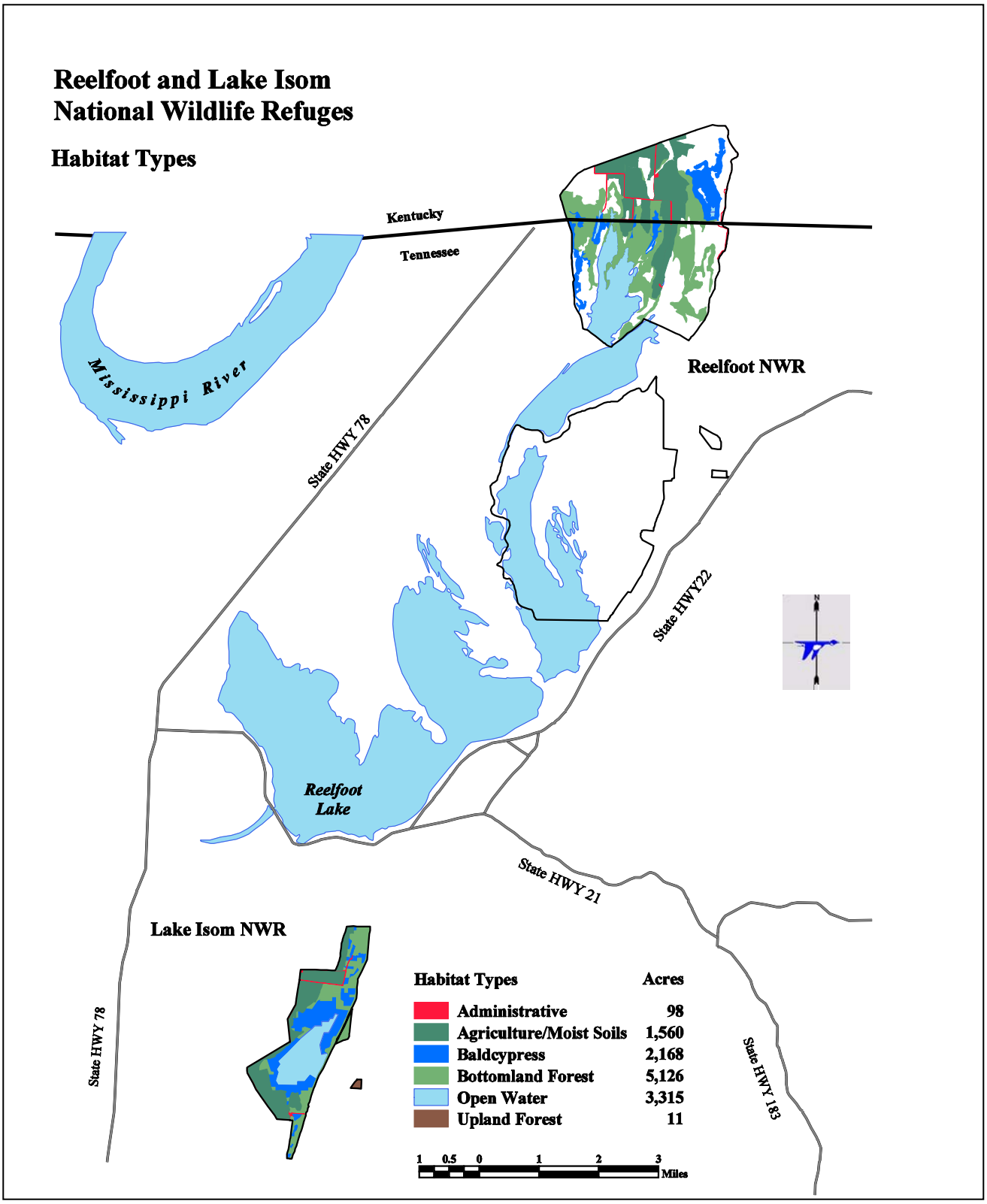
The refuges currently contain approximately 2,168 acres of wooded swamp habitat, which is dominated by bald cypress and swamp tupelo in the overstory, with buttonbush most abundant in the understory. In the 3,315 acres of open water habitat found on the refuges, dominant vegetation includes submerged aquatics such as elodea, curlyleaf pondweed, bladderwort, and coontail, as well as emergents such as American lotus, cowlily, duckweed, waterfern, and yellow pond-lily.

EDUCATION AND VISITOR SERVICES

Since the passage of the National Wildlife Refuge System Improvement Act of 1997, the refuges have adopted hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation as the six priority general public uses. These uses are management's primary focuses for recreation, and over time programs will be developed to increase visitor awareness and appreciation of the refuges' fish and wildlife resources.

Wildlife-dependent recreation activities currently available on the refuges include wildlife observation (by hiking, boating, or driving on established roads), wildlife photography, environmental education and interpretation, hunting, and fishing. Hunting and fishing have been the primary uses on the refuges since their inception, and encompass the majority of public use. The refuge staff also provides a diversity of interpretive and environmental education programs, including tours to observe concentrations of up to 200 bald eagles, as well as concentration of ducks and geese, which winter in the Reelfoot Lake area. Currently, the refuges' interpretive facilities include a visitor center with a 15-seat auditorium; three observation platforms (two of which are universally accessible); a boardwalk; and a 0.6-mile trail that is currently being constructed.

Figure 9. Existing habitat types on Reelfoot and Lake Isom National Wildlife Refuges



In fiscal year 2003, the refuges received about 293,724 visitors, although visitor use data is limited. The refuges are open during some of the state hunting seasons, specifically squirrel, raccoon, and archery deer, as well as a limited quota hunt for firearms deer and turkey. Fishing is permitted when the refuges are open, but all public access is closed on Reelfoot from November 15 to March 15 on the Long Point unit and from November 15 to January 31 on the waters of the Grassy Island unit. Lake Isom is closed to all public entry from November 15 to March 15. By law, national wildlife refuges are closed to public use activities unless those activities are expressly permitted; however, hunting, fishing, and wildlife observation and photography are permitted on most areas of the refuges.

Numerous other public lands within commuting distance offer wildlife-dependent recreation experiences. Three other national wildlife refuges, including Chickasaw (25,006 acres), Lower Hatchie (9,451 acres), and Hatchie (11,556 acres), are located within a two-hour drive of Reelfoot and Lake Isom.

Fishing opportunities are found at each national wildlife refuge in west Tennessee, with facilities including fishing piers, boat ramps, and bank fishing areas. Reelfoot and Hatchie offer universally accessible fishing areas. Big and small game hunting are offered on each west Tennessee national wildlife refuge.

The Tennessee Wildlife Resources Agency manages approximately 250,000 acres of state wildlife management areas and state wildlife refuges in Tennessee. All of these TWRA lands offer some fishing, hunting, and wildlife observation opportunities. Nearby state wildlife management areas include Anderson-Tully (12,000 acres); Moss Island (3,400 acres); and Tigrett (7,000 acres). The State of Tennessee allows the use of both modern and primitive weapons. During the 2003-4 season, the state offered in west Tennessee a total of 39 days of modern gun deer hunting; 53 days of muzzleloader deer hunting; and 105 days of archery deer hunting. Most of west Tennessee's wildlife management areas are also open to waterfowl and small game hunting.

REFUGE ADMINISTRATION

Refuge administration refers to the operation and maintenance of refuge programs and facilities, including new construction. The refuge staff currently consists of five permanent employees. The staff's efforts are primarily focused on protection and restoration of critical habitats, especially moist soil and agricultural habitats for waterfowl, as well as forest management and environmental education. The Draft Reelfoot and Lake Isom National Wildlife Refuges Habitat Management Plan provides an inventory of existing habitat resources and long term plans for management of these resources to maximize their value for a diversity of wildlife species. Of particular concern under management activities is providing quality habitats for migratory birds.

The staff also coordinates extensively with landowners, conservation organizations, local agencies, and civic groups, attending meetings and providing presentations as needed to local groups. The staff's current public information efforts concentrate on keeping the public informed regarding public use opportunities and refuge activities.

The staff maintains three administrative sites, with one each in the Grassy Island unit, the Long Point unit, and the Lake Isom area. The Grassy Island unit includes the headquarters/visitor use complex, an enclosed maintenance shop, and an oil storage facility. The Long Point unit includes a maintenance shop and two pole sheds. The Lake Isom area includes an enclosed compound and a maintenance shop.

The Reelfoot and Lake Isom refuges are accessible through several state- and county-maintained roads (Figures 10 and 11). Reelfoot can be accessed via Tennessee State Highway 157 or Kentucky State Highway 311, with the Walnut Log Road (in Tennessee) and State Highway 1282 (in Kentucky) as the main refuge arteries. Lake Isom is accessible from Tennessee State Highway 22, via Greasy Lane, or from Tennessee State Highway 78 indirectly via Isom Lake Road.

Another refuge facility is a boat ramp on Grassy Island Drive. It is located on Bayou DuChien, which is connected by a dug channel with Reelfoot Lake.

In addition to the refuges' normal road maintenance activities, the 1998 Transportation Equity Act for the 21st Century (TEA-21) provides funding for National Wildlife Refuge System roads under the Federal Lands Highway program. The Reelfoot and Lake Isom refuge staffs are coordinating with Federal Highway Administration officials to assess refuge roads for possible enhancements or improvements with TEA-21 funding. Congress requires that the projects must be compatible with comprehensive management plans and must minimize impacts on refuge operations. The Federal Highway Administration is available to assist the Service in planning, design, and contract administration. One such project was completed in 2003 when the Visitor Center and Grassy Island roads and associated parking areas were rehabilitated. Projects proposed for work (2005-2010) under the TEA-21 grant funding process include the rehabilitation of Slough Road; Interior Refuge Road; Goose Pen Road; West Banding Site Road; West Boathouse Road; the Long Point Auto Tour Road and its associated parking areas; Lake Isom Boundary Line Road; Lake Isom Access Road; and the Lake Isom Public Access Road. In addition, the refuge staffs are working with the county to secure possible additional TEA-21 funding for other county and state roads that pass through the two refuges.

ARCHAEOLOGICAL OR HISTORIC RESOURCES

During the early historic period, the portion of western Tennessee that now includes the Reelfoot and Lake Isom refuges was a hunting territory claimed by the Chickasaw Indians of northern Mississippi, as well as certain Sioux peoples of the lower Midwest (Cotterhill 1954). Initial European explorations included visits by the Spanish explorer De Soto in 1540 and the French explorer La Salle, who made contact with the Chickasaw Indians in the vicinity of current Fort Pillow State Park in 1682 (Anderson 1995). After the American Revolution, the lands of northwestern Tennessee were ceded to the new United States government, which made peace with the Chickasaw residents in 1786. In 1818, the Chickasaw Nation ceded all claim to lands in Tennessee, and, in 1837, all remaining Chickasaw east of the Mississippi were removed to the West.

Archaeological investigations on refuge lands consist of two significant surveys conducted on project-specific areas on the Reelfoot and Lake Isom refuges. A survey of project-specific areas by Dickson and Campbell (1979) encountered a total of ten archaeological and historic sites. Eight of these were prehistoric sites and two were historic. Another survey by Brown et al. (1998) encountered a total of 25 cultural occurrences in the vicinity of proposed construction sites for the Reelfoot Lake spillway and a Lake Isom project area. Evidence of Woodland and Mississippian occupation was found as a result of these surveys.

The surveys recommended that certain sites be tested and evaluated for their eligibility for inclusion on the National Register of Historic Places. The locations of all discovered cultural resources were mapped, and it was determined that certain site areas should be avoided by all heavy earthmoving equipment.

Numerous other archaeological investigations have been conducted in nearby portions of west Tennessee, including Mainfort (1994), in which archaeological investigations were made within the nearby Obion River drainage. Numerous other smaller archaeological resource studies have been conducted in west Tennessee in conjunction with various federal development projects. These reports document an area rich in prehistoric and historic cultural resources, dating back as far as 12,000 B.C.

Prior to refuge ownership, earthquakes, levee and road construction, and agricultural activities may have adversely impacted archaeological deposits associated with many sites on the refuges. However, it is likely that numerous other undisturbed sites exist on the refuges. The surveys recommended that the Service develop a cultural resource management plan for both refuges to assist in future project management. In addition, oral history interviews and documentary research could provide a wealth of information regarding the refuges and their surrounding vicinity.

LAND PROTECTION AND CONSERVATION

Reelfoot National Wildlife Refuge currently encompasses 10,428 acres (as of June 1, 2004). This acreage includes 7,847 acres managed by the Service under a 1941 lease agreement with the State of Tennessee (Appendix VIII), as well as 2,581 acres owned by the Service in fee title. The total size of the refuge's approved acquisition boundary is 18,015 acres; of this, 7,587 acres remain in private ownership and may be acquired if funding and willing sellers become available.

The approved acquisition boundary for Lake Isom National Wildlife Refuge totals 7,133 acres. To date (as of June 1, 2004), the Service has acquired 1,850 acres for the Lake Isom refuge, leaving a balance of 5,283 acres in private ownership within the approved acquisition boundary. The land protection goals set for both refuges would support strategic growth in areas where there is greatest concern, mainly lands identified for migratory waterfowl and songbirds.

All tracts acquired by the Service are removed from the local real estate rolls because federal government agencies are not required to pay state or local taxes. However, the Service makes annual payments to Lake, Obion, and Fulton counties in lieu of real estate taxes, as required by the Refuge Revenue Sharing Act (Public Law 95-469). Payments for acquired land are computed on whichever of the following formulas yields the greatest result: (1) three-fourths of one percent of the fair market value of the lands acquired in fee title; (2) 25 percent of the net refuge receipts collected; or (3) 75 cents per acre of the lands acquired in fee title within the county.

Of the 133,759 acres in Fulton County, Kentucky, in 1997, approximately 93,677 consisted of crop lands. There are approximately 162 farms in the county, with an average size of 578 acres. Of the 104,319 acres in Lake County, Tennessee, in 1997, approximately 89,635 consisted of crop lands. There are approximately 80 farms in the county, with an average size of 1,120 acres. Of the 348,798 acres in Obion County, Tennessee, in 1997, approximately 242,251 consisted of crop lands. There are approximately 705 farms in the county, with an average size of 344 acres. The remaining lands in all three counties consist primarily of forested lands and open lands associated with residential and commercial developments and transportation systems.

The lands immediately adjacent to the refuges are privately owned and managed as farmlands and hunting clubs. The surrounding farmlands are cultivated primarily for soybeans, cotton, wheat, corn, and milo. Farm commodity prices, in general, have decreased since the mid-1980s, and more dramatically since the passage of the 1996 Farm Bill. Poor farm production, droughts, and low commodity prices in recent years have encouraged many producers to sell their farms or enroll them in some kind of conservation program.

Private lands enrolled in conservation programs contribute significantly to wildlife conservation. As of 2004, Fulton County claimed 2,662.9 acres in the Conservation Reserve Program (Joan Jackson, pers. comm., Fulton County Farm Service Agency, Hickman, Kentucky) and 1,901 acres in the Wetlands Reserve Program (Jackie Franklin, pers. comm., Natural Resources Conservation Service, Fulton, Kentucky). Lake County claimed 110 acres in the CRP (Ann Perkins, pers. comm., Lake County Farm Service Agency, Tiptonville, Tennessee) and 4,930 acres in the WRP (Mike Williams, pers. comm., Natural Resources Conservation Service, Dyersburg, Tennessee). Obion County claimed 10,042.5 acres in the CRP (Sally Cherry, pers. comm., Obion County Farm Service Agency, Union City, Tennessee) and 224 acres in the WRP (Jim Needham, Natural Resources Conservation Service, Union City, Tennessee). The Fish and Wildlife Service has an active partnership with several agencies and organizations to enroll private lands in these programs. Private land enrollment in conservation programs would continue to be encouraged to augment the Service's program and mission requirements.

A study of contaminants occurring on 26 national wildlife refuges in the Lower Mississippi River Ecosystem was conducted by North Carolina State University (Shea et al. 2001). Samples of water, sediment, and fish were collected, and sampling devices that accumulate persistent organic chemicals were employed. Organochlorine pesticides (OCPs) (including DDTs, toxaphene, mirex, endrin, dieldrin, and numerous other pesticides) were detected at every refuge. However, on the Reelfoot and Lake Isom refuges, the total levels of DDT and toxaphene were well below published levels for the protection of fish or wildlife in both predator and benthic fish species.

Mixtures of multiple pesticides were often detected in the Lower Mississippi River Ecosystem refuges, and their detection frequency was clearly associated with their use and persistence. Total polychlorinated biphenyls (PCBs) values in sampled predator and benthic fish and in sampled sediment and water were well below published levels for the protection of fish. Total polycyclic aromatic hydrocarbons (PAHs) in sediment and water samples were low throughout the region, except near oil and gas production facilities, which do not occur on or near the Reelfoot and Lake Isom refuges. Mercury levels in sediment and predator and benthic fish samples were well below threshold levels for fish-eating mammals and birds. Current use pesticides (CUPs) (including the herbicides 2,4-D, atrazine, and numerous others; and the insecticides diazinon, malathion, and numerous others) were detected at every refuge, but at only one-half the frequency as they were at nearby off-refuge areas. On Reelfoot National Wildlife Refuge, water samples indicated the presence of four CUPs. On nearby lands outside the Reelfoot refuge, three CUPs were found at levels that exceeded aquatic life criteria—that is, they may endanger aquatic life.

On Lake Isom National Wildlife Refuge, water samples indicated the presence of six CUPs. On nearby lands outside the Lake Isom refuge, three CUPs were found at levels that exceeded aquatic life criteria. According to the Shea study, hazards associated with CUPs are uncertain due to limitations of sampling techniques. Additional data are probably necessary to perform a quantitative risk assessment (Shea et al. 2001). In summary, the tests at both the Reelfoot and Lake Isom refuges indicated no likely hazard in regard to OCPs, PCBs, or PAHs, but further testing is needed to accurately determine the possible risks associated with current-use pesticides.

REFUGE-RELATED PROBLEMS

Prior to agricultural development, almost all of the area that surrounds Reelfoot Lake was covered with bottomland hardwood floodplain forests. Scattered openings dotted the forested landscape and were primarily created by fire, winds, beaver, Native Americans, or large flood events and river changes by the Mississippi River and its tributaries. These openings were generally comprised of

early successional and shrub/scrub wetlands that created excellent waterfowl and other wetland wildlife habitat.

The advent of agriculture brought cotton production, which was well developed in the area by the 1830s. Cotton was a profitable commodity and production doubled every five years until 1860. Continual cotton production began to deplete the soil, and farming practices abused the landscape. Soybeans eventually became a major cash crop by the end of World War II and were less susceptible to flooding, due to their short growing season. Additionally, extensive flood control efforts such as channelization were well underway during this period and contributed greatly to the increase of farmable lands. From 1947 until the late 1970s, land was still being cleared for farming operations.

Of 24 million acres of forested wetlands originally in the Mississippi Alluvial Valley, only about five million acres remained forested by 1978 (MacDonald et al. 1979). Today, over 80 percent of the MAV lands are in agricultural production (Twedt et al. 1999). The remaining forested lands are typically isolated patches surrounded by agriculture. More than 35,000 forest patches exist in the Mississippi Alluvial Valley; of these, the average size is less than 100 acres, and less than one percent are greater than 10,000 acres.

Agricultural practices in the vicinity of the Reelfoot and Lake Isom national wildlife refuges have resulted in large-scale clearing and fragmentation of bottomland hardwood forests, which equates to significant losses and degradation of valuable wildlife habitat. Actions to clear, settle, and farm the lands around Reelfoot Lake have seriously degraded the lake through accelerated siltation of the highly erodable soils. The bluffs east of the lake consist of extremely erosive loessial soils, which are carried into the lake by its major tributaries in huge quantities. This silt deposition problem has been causing a sedimentation problem to the lake for numerous years and efforts to solve it are not new.

Massive navigation and flood-control works have also severely impacted the natural hydrological processes of the rivers within and adjacent to the refuges. As a result, the physical and biological interaction between the rivers and floodplain has been impeded, and much of the system's natural functions have been hindered significantly. Natural scouring and flushing out of the lake bed by river floodwaters have been eliminated by the separation of the lake from the Mississippi River by mainline levees. As a result, Reelfoot Lake continues to silt in and become shallower, significantly reducing the quality and quantity of its aquatic habitats.

Lake Isom is adjacent to Running Reelfoot Bayou, approximately four miles south of Reelfoot Lake. As recently as the early 1920s, Lake Isom was connected to Running Reelfoot Bayou, but construction of a ditch to drain Reelfoot Lake in 1921 effectively cut off the hydrological connection between Lake Isom and Running Reelfoot Bayou, and ultimately with Reelfoot Lake, which is upstream of Reelfoot Bayou. The impacts of river controls on Lake Isom have been similar to those experienced by Reelfoot Lake, in the form of limited natural flushing and scouring and increased sedimentation. Similarly, Lake Isom has for years experienced the same loss of aquatic habitat quantity and quality, as the lake is gradually being filled in by excessive silt.

WATER LEVEL MANAGEMENT OF REELFOOT LAKE

In 1929, the State of Tennessee enacted a law that authorized the construction of a spillway for Reelfoot Lake and established a uniform and constant lake level at 282.2 feet above mean sea level (msl). In 1941, a lease and cooperative agreement between the State of Tennessee and the Service established Reelfoot National Wildlife Refuge. The refuge's current boundary includes approximately 3,278 acres of aquatic habitat that is part of 18,000-acre Reelfoot Lake. The 1941 lease agreement also gave the Service the responsibility to regulate the water level of Reelfoot Lake by operating the

spillway and manipulating the water levels by as much as three feet above or below the elevation of 282.2 feet msl (U.S. Fish and Wildlife Service 1989b). The Reelfoot Lake watershed consists of approximately 153,000 acres in west Tennessee and southwest Kentucky, and has three major tributaries: Reelfoot Creek, Indian Creek, and Bayou du Chien (Running Slough). The lake's major outlet is Running Reelfoot Bayou (also called the Spillway Ditch), which is controlled via the Reelfoot Lake spillway and gate structures at the south end of Reelfoot Lake.

As described in the preceding section, problems relating to the refuge and the lake are numerous, as a result of reduced hydrology, erosive soils, and high levels of sedimentation. In addition, various parties surrounding the lake, including sportsmen, farmers, and business owners, have conflicting interests and different ideologies about how Reelfoot Lake should be managed. Thus, water level management at Reelfoot Lake has been a source of conflict among various user groups for many years. Natural resource professionals recognize the hydrological and water chemistry problems and have been searching for a solution that would benefit all involved.

As a result, a fifty-year management plan for Reelfoot Lake and its surrounding watershed was prepared in conjunction with Joint Senate Resolution 235 of the 1986 Tennessee General Assembly. The resolution, recognizing the urgency to resolve the immediate needs and long-term management problems of Reelfoot Lake, directed that a proposed comprehensive plan be prepared by January 6, 1987. Water level management at Reelfoot Lake then became the subject of a three-year study that resulted in the release of a final environmental impact statement (EIS). The first draft was prepared and circulated for public comments in December, 1986, with the final version released in July, 1989 (U.S. Fish and Wildlife Service 1989b). The plan emphasizes the depth of consideration needed for long-term programs such as watershed and water level management of Reelfoot Lake.

The preferred alternative identified in the EIS proposes dynamic water level fluctuations between 280.0 and 284.0 feet msl, with periodic major drawdowns. Any change in this water level management would require modification of appropriate cooperative agreements and resolution, and/or implementation of mitigation measures to protect and preserve archeological sites, private agricultural lands, recreation areas, sewage systems, bottomland forests, fishery resources and sport fishing, and related tourism.

An interim water management plan, in effect since 1991, set the parameters for high lake levels up to 283.2 feet msl during the nongrowing season (November 15 – April 15) and 282.7 feet msl during the remainder of the year. Seasonal variations in the stages of the Mississippi River; incoming flow from the tributaries that feed the lake; the lake's evaporation/transpiration rates; and other environmental factors influence the lake level and subsequently the operation of the water control structure.

This interim plan is in effect by the Service and will remain so until all prerequisites, including mitigation measures, are in place for the preferred alternative as stated in the 1989 EIS. Although the Service has the responsibility to operate and maintain the control structure and water level of Reelfoot Lake, this issue is more complex and broader in scope than the management of wildlife habitat on the refuges. It is also a separate issue, subject to guidelines and policies that are separate and distinct from the management of the refuges, and therefore was not addressed in detail during the development of this comprehensive conservation plan.

CONSERVATION PRIORITIES

The conservation priorities identified for the Reelfoot and Lake Isom national wildlife refuges include continued emphasis on habitat for migratory waterfowl and bottomland hardwood forests, and an increased emphasis on habitat for migratory songbirds.

The importance of the Lower Mississippi Valley as the primary wintering ground for midcontinental waterfowl populations serves to reinforce the value of the Reelfoot and Lake Isom refuges for migrating waterfowl. The refuges and adjacent lands are known to be an important wintering and stopover area for mallards using the Mississippi Flyway. The value of the refuges as a waterfowl wintering area is enhanced by their proximity to other refuges. The refuges were authorized by the Migratory Bird Conservation Act of 1929 "... for use as an inviolate sanctuary or for other management purposes, for migratory birds." Management of impoundments, agricultural lands, moist soil units, and bottomland hardwood forests would be carried out with an emphasis on providing habitat for migrating waterfowl.

The vast amount of clearing and forest fragmentation in the Mississippi Alluvial Valley underscores the importance of the Reelfoot and Lake Isom refuges as some of the larger blocks of bottomland hardwood forests remaining in west Tennessee. A priority is placed on protection and maintenance of the refuges' bottomland hardwood forests. On both refuges, the forest management staff is working to develop a forest structure that provides a diversity of habitats for numerous species of wildlife.

Significant declines in populations of many Neotropical migratory songbirds serve to emphasize the importance of forest habitats for species that migrate through the Lower Mississippi Valley. Management efforts to enhance existing forests for songbirds would continue to be a priority on both refuges. The refuges' focal species include the swallow-tailed kite, cerulean warbler, and Swainson's warbler.

Focal wildlife species would continue to be managed in support of the goals and objectives developed for the Lower Mississippi River Ecosystem (U.S. Fish and Wildlife Service 2000b). The resource goals and objectives developed cooperatively with the State of Tennessee (TWRA and USFWS 2002) would continue to be a priority in the future planning and management of refuge lands. The Service would continue to work with partners and landowners to achieve common goals and form conservation partnerships. One such partnership involves the Natural Resources Conservation Service. Landowner participation in the Wetlands Reserve Program and the Cropland Reserve Program would assist the Fish and Wildlife Service in meeting its wildlife objectives through land restoration in the vicinity of the Reelfoot and Lake Isom refuges.

WILDERNESS REVIEW

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which

1. generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
2. has outstanding opportunities for solitude or primitive and unconfined types of recreation;
3. has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;
4. does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and
5. may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within the Reelfoot and Lake Isom national wildlife refuges were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. No lands in the refuges were found to meet these criteria. Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this plan.

IV. Management Direction

INTRODUCTION

The Service endeavors to manage fish and wildlife and their habitats, while considering the needs of the complete spectrum of natural resources in the decision-making process. But first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the National Wildlife Refuge System Improvement Act is for the Service to maintain the ecological health, diversity, and integrity of national wildlife refuges. The refuges in the Lower Mississippi Valley include managed bottomland hardwood forests and moist soil areas, and are vital links in the overall function of the ecosystem. To offset the historic and continuing loss of these habitats within the ecosystem, the Reelfoot and Lake Isom national wildlife refuges and other public lands provide the biological "safety net" for migratory nongame birds and waterfowl, threatened and endangered species, and resident species.

REFUGE VISION

The wildlife and biological communities found on the refuges form the basis for the future management of refuge lands. The following vision statement, developed collaboratively by the planning team with input from the refuge staff and the public, describes the desired future conditions and management emphasis for Reelfoot and Lake Isom national wildlife refuges:

> *In accordance with the purposes for which the refuges were established and with a continued emphasis on wintering waterfowl and other migratory birds; to provide habitat for fish and wildlife; to protect, restore, enhance, and manage outstanding examples of the bottomland hardwood forest that once covered most of the Mississippi Alluvial Valley; and to promote the enjoyment of these unique biological systems for present and future generations.*

REFUGE GOALS

The following nine goals were developed in keeping with the vision for the refuges and the purposes for which they were established:

Goal 1 – Waterfowl: Provide a complex of managed wintering and migration habitats for waterfowl that support the population goals and objectives established in the North American Waterfowl Management Plan, the Lower Mississippi Valley Joint Venture Plan, and the West Tennessee Wildlife Resources Conservation Plan.

Goal 2 – Endangered and Threatened Species: Protect, manage, and enhance refuge habitats in a manner that will sustain or increase species' populations.

Goal 3 – Migratory Land Birds: Provide a complex of habitats that meet the breeding, migration, and wintering needs of the species of management concern as identified in the goals and objectives of the Partners in Flight Plan and the West Tennessee Wildlife Resources Conservation Plan.

Goal 4 – Shorebirds and Waterbirds: Provide a complex of managed habitats for shorebirds and waterbirds during critical periods throughout the year to increase bird use on the refuges and develop a traditional use site.

Goal 5 – Aquatic Resources: Maintain or improve aquatic habitat quantity, quality, and diversity to sustain or increase population levels of aquatic resources on the refuges in accordance with the West Tennessee Wildlife Resources Conservation Plan and other Service aquatic resource plans.

Goal 6 – Resident Wildlife: Provide a complex of habitats suitable for a wide range of resident (endemic) wildlife species, including mammalian, avian, amphibian, and reptilian species, while achieving habitat management objectives and biological integrity with other native flora and fauna.

Goal 7 – Public Use: Enhance public use of the refuges through development of an appropriate and compatible program of wildlife-dependent recreation and education/interpretation that is consistent with the National Wildlife Refuge System Improvement Act of 1997 and that will promote an understanding of the Lower Mississippi River Valley ecosystem.

Goal 8 – Administration and Operation: Ensure that present and future operational, administrative, and personnel objectives are achieved in order that goals and objectives for refuge habitats, fish and wildlife populations, land conservation, and visitor services will be achieved.

Goal 9 – Land Protection and Conservation: Conserve natural and cultural resources through partnerships, protection, and land acquisition.

COMPREHENSIVE CONSERVATION PLAN – SUMMARY STATEMENT

This proposed management plan was derived from Alternative D of the Draft Environmental Assessment (Section B). The refuges would be managed using an ecosystem management approach that preserves the environmental health and diversity of natural resources on the refuges. At the same time, opportunities would be examined to allow greater access for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

During the planning process, oral and written comments received conveyed both a desire for increased public access and recreation and a desire to preserve the diverse flora and fauna of the refuges. The decisions to allow or prohibit certain uses were dependent upon the compatibility of those uses (whether the proposed uses would have an adverse effect on the natural resources of the refuges), the establishing purposes for the refuges, and the professional judgment of the refuge staff and planning team.

This management plan outlines how wildlife and habitats would be managed and enhanced by the refuges over the next 15 years. The goals, objectives, and strategies acknowledge that the refuges are a portion of the much larger Lower Mississippi River Ecosystem. The actions considered and taken in implementing this plan would affect the remaining Lower Mississippi River Ecosystem, natural areas that surround the refuges, and nearby municipalities and landowners.

Crucial elements of this plan include managing wintering and migration habitats for wintering waterfowl and other migratory birds. Management of moist soil units, croplands, and bottomland hardwood forests, as well as acquisition and management of additional lands, would ensure that the refuges support the population goals and objectives established in numerous regional plans, including the North American Waterfowl Management Plan; the Lower Mississippi River Joint Venture Plan; and the West Tennessee Wildlife Resources (WTWR) Conservation Plan. Waterfowl impoundments, including moist soil units and flooded fields, would be managed to provide seasonal habitat for migratory shorebirds in support of the WTWR Conservation Plan and the Shorebird Management Manual.

Protection and management of refuge forests would support target populations of migratory land birds and support population goals and objectives established in the Partners in Flight Plan and the WTWR Conservation Plan. Refuge land acquisitions and cooperative efforts with other agencies and nongovernmental organizations would work to assemble a 20,000-acre block of contiguous bottomland hardwood forest within the Upper Tennessee Bird Conservation Area boundary.

Active forest management would maximize the ability of the refuges' forest lands to benefit all resident and migratory species. Protection of aquatic resources would promote self-sustaining fish populations and aquatic habitats necessary for resting, foraging, and breeding habitats for resident and migratory wetland-dependent wildlife species. Inventory and monitoring of threatened and endangered species would continue, and resource protection and management would contribute to their recovery.

The refuges' environmental education and outreach program would be enhanced to showcase the Lower Mississippi River Ecosystem, and a wide range of partnering opportunities would be actively pursued and fostered to share in the protection of natural and cultural resources. Public use facilities, including a new visitor center, boat ramps, observation platforms, kiosks, and trails would be developed to enhance public access and appropriate and compatible wildlife-dependent recreation.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies presented below are the Service's response to the issues and concerns expressed by the planning team, and by the public at open meetings and in written comments. All issues discussed during the public scoping process are listed in Appendix VII. The Service's responses to relevant comments received during the public review of this Draft Comprehensive Conservation Plan will be addressed in the Final CCP. Following each goal is a list of objectives, and under each objective is a listing of strategies. Chapter V, Plan Implementation, shows the support projects for the goals in priority order.

The goals developed in this plan reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997 and the mission of the National Wildlife Refuge System. The objectives and strategies in this plan are designed to contribute to the population goals and objectives established in regionally, nationally, and internationally significant management plans, including the North American Waterfowl Management Plan; Lower Mississippi Valley Joint Venture Plan; Partners In Flight Plan; Shorebird Management Manual; Lower Mississippi River Ecosystem Plan; WTWR Conservation Plan; and other plans relevant to the Lower Mississippi River Valley.

With adequate staffing and funding as outlined in Chapter V Plan Implementation, the Service intends to accomplish these goals, objectives, and strategies during the next 15 years.

GOAL 1 – WATERFOWL

Provide a complex of managed wintering and migration habitats for waterfowl that support the population goals and objectives established in the North American Waterfowl Management Plan, the Lower Mississippi Valley Joint Venture Plan, and the WTWR Conservation Plan.

Objective 1.1: Through the management of existing refuge lands and resources, as well as acquisition from willing sellers and development and management of additional lands identified in the current approved acquisition boundary, provide migration and wintering habitats to support 13 million duck-use days and 2.5 million goose-use days on Reelfoot National Wildlife Refuge, as well as 2.5

million duck-use days and 1 million goose-use days on Lake Isom National Wildlife Refuge annually, based on a 110-day wintering period, in addition to year-round habitat for resident wood ducks.

Guidelines for minimum duck-use days were predicted by the use of a series of step-down plans, starting with population objectives developed in the North American Waterfowl Management Plan. These values were stepped down to the Lower Mississippi Valley Joint Venture, which in turn determined minimum foraging requirements that needed to be met to support the established goals of the North American Waterfowl Management Plan; and these foraging requirements were then allocated to each state within the Joint Venture. Within each state, coordination meetings were held to allocate the needed habitat requirements among public and private lands. Taking into account sanctuary and foraging requirements, public land managers determined what potential existed on various managed lands to meet the state objectives. For the Reelfoot and Lake Isom refuges, these potential objectives were adjusted based on multi-species duck life history requirements, goose life history requirements, and refuge purposes and capabilities.

Strategy 1.1.1: Maintain the current core waterfowl management area (12,278 acres) as an inviolate sanctuary for waterfowl and other migratory birds where few if any disturbance factors are allowed during the critical winter period (November to March).

Strategy 1.1.2: Manage 1,560 acres of moist soil/agricultural areas through water manipulation, as well as mechanical and chemical treatments, to provide quality moist soil habitat and high-energy food resources for waterfowl.

Strategy 1.1.3: Manage refuge forests to increase the red oak component on suitable sites in the red oak and potential red oak management units to 60 percent of the basal area.

Strategy 1.1.4: Continue reforestation efforts and establish red oak and other mast species on newly acquired lands that are not scheduled for water management development.

Strategy 1.1.5: In cooperation with private, state, and federal partners, establish a contiguous block of forest within the approved acquisition boundary that contains 20,684 acres and connects to other conservation lands under the designated 20,000-acre MAV Bird Conservation Area.

GOAL 2 – ENDANGERED AND THREATENED SPECIES

Protect, manage, and enhance refuge habitats in a manner that will sustain or increase species populations.

Objective 2.1: Enhance, restore, protect, and manage imperiled species' habitat using all appropriate conservation tools, including habitat management on 12,278 acres of existing refuge lands.

Part of the Service's mission is to protect, enhance, and manage habitat for threatened and endangered species, in compliance with the Endangered Species Act. Refuge resource management emphasizes the protection of threatened and endangered species and efforts to protect and manage these habitats will be conducted.

Strategy 2.1.1: Provide habitat to support the recovery of the threatened bald eagle through approved land acquisitions and resource management actions.

Strategy 2.1.2: Provide feeding sites on refuge lands for interior least terns and cooperate with other resource agencies in minimizing disturbance to interior least tern nesting colonies on Mississippi River sandbars.

Strategy 2.1.3: Enhance, restore, protect, and manage imperiled species' habitat using all available conservation tools, including habitat management on existing lands (federal, state, and private), conservation easements, partnership agreements, conservation agreements, and land acquisition from willing sellers.

GOAL 3 – MIGRATORY LAND BIRDS

Provide a complex of habitats which meet the breeding, migration, and wintering needs of the species of management concern as identified in the goals and objectives of the PIF plan and the WTWR Conservation Plan.

Objective 3.1: Through acquisition and management of up to 25,148 acres of refuge lands, provide sufficient habitat to support species of management concern, and work with partners toward the assemblage of a 20,000-acre block of forested land in west Tennessee and southwest Kentucky within 15 years of the approval of this plan.

To support the establishment of sustainable populations of interior-nesting migratory songbirds, Partners in Flight and their cooperating partners have mapped blocks of forest that could provide appropriate habitat. The MAV Migratory Bird Conservation Plan has identified 101 areas that, with varying amounts of reforestation, could become contiguous forest patches of 10,000, 20,000, or 100,000 acres. Resource professionals believe that forest patches in these categories are the minimum sizes suitable to support breeding populations of various Neotropical songbirds. According to the Partners in Flight research, a typical 100,000-acre block contains 84,000 acres of core habitat capable of supporting the species most dependent upon large forest blocks, including swallow-tailed kites, red-shouldered hawks, broad-winged hawks, pileated woodpeckers, and Cooper's hawks (Mueller et al. 1999). In some cases, even larger forest patches may be needed to support breeding Neotropical songbird populations, where the shape and/or isolation of a particular forest patch may dictate the need for even larger forest acreage. These large forest blocks also are expected to support other less area-sensitive, forest-nesting migrants as well. Figure 5 shows the Upper Tennessee Bird Conservation Area, as designated by Partners in Flight.

Strategy 3.1.1: In cooperation with private, local, state, and federal partners, establish a contiguous block of forest within the approved acquisition boundary that contains 8,742 acres and connects to other conservation lands under the designated 20,000-acre block.

Strategy 3.1.2: Develop and maintain a diversity of bottomland forest structure through sound silvicultural management.

Strategy 3.1.3: Manage upland forests to provide quality habitat for migratory birds.

GOAL 4 – SHOREBIRDS AND WATERBIRDS

Provide a complex of managed habitats for shorebirds and waterbirds during critical periods throughout the year to increase bird use on the refuges and develop a traditional use site.

Objective 4.1: Provide a minimum of 100 acres of shorebird habitat during spring migration, 30 acres during fall migration, and a minimum of 20 acres of waterbird habitat during summer in managed impounded wetlands on the Reelfoot and Lake Isom national wildlife refuges.

Shorebirds annually migrate through the Lower Mississippi River Valley (LMRV) from the southernmost parts of South America to the northernmost parts of North America. Foraging habitat (mudflats and shallow water areas) objectives were recommended for fall migrating shorebirds by the U.S. Shorebird Working Group and a smaller group of shorebird experts working in the LMRV (Elliott et al. 2001). These ecosystem objectives were then stepped down to private and public lands.

Foraging habitat is not considered limiting during the spring migration, when river stages are typically falling and mudflats are common throughout the LMRV, but fall habitats can be critical due to the lack of available sheet water along the Mississippi Flyway. However, the WTWR Conservation Plan identified zero acres of fall shorebird habitat for Reelfoot National Wildlife Refuge. To compensate for this absence of habitat, management activities aimed at waterfowl commonly provide fall foraging opportunities for shorebirds. The refuge staff recognized this opportunity to provide habitat; thus, management schemes have been implemented to furnish additional acreage during the critical fall shorebird migration period.

Strategy 4.1.1A: Manage a minimum of 100 acres of shallowly flooded mudflat habitats with less than 25 percent vegetative cover and varying water levels, up to 8 inches, to support shorebirds during spring migration on Reelfoot National Wildlife Refuge (March to early June).

Strategy 4.1.1B: Manage a minimum of 100 acres of shallowly flooded mudflat habitats with less than 25 percent vegetative cover and varying water levels, up to 8 inches, to support shorebirds during spring migration on Lake Isom National Wildlife Refuge (March to early June).

Strategy 4.1.2A: Provide a minimum of 30 acres of shallowly flooded mudflat habitats with less than 25 percent vegetative cover and varying water levels, up to 8 inches, during fall migration on Reelfoot National Wildlife Refuge (late June to October).

Strategy 4.1.2B: Provide a minimum of 30 acres of shallowly flooded mudflat habitats with less than 25 percent vegetative cover and varying water levels, up to 8 inches, during fall migration on Lake Isom National Wildlife Refuge (late June to October).

GOAL 5 – AQUATIC RESOURCES

Maintain or improve aquatic habitat quantity, quality, and diversity to sustain or increase population levels of aquatic resources on the refuges in accordance with the WTWR Conservation Plan and other Service aquatic resource plans.

Objective 5.1: Conserve, restore, and manage up to 3,315 acres of open water wetlands (lakes, sloughs, side channels, etc.) and 7,294 acres of seasonally flooded bottomland hardwood forest to provide resting, foraging, and breeding habitats for resident and migratory wetland-dependent wildlife species, including native fish and invertebrates; and cooperate with Tennessee Wildlife Resources Agency in meeting the terms of the 1941 lease agreement.

As part of the lease agreement with the State of Tennessee, the Service has assumed management responsibilities for the waters of Reelfoot Lake. This 18,000-acre lake is dependent upon local runoff from three major watersheds (Reelfoot Creek, Indian Creek, and Bayou du Chien) and several smaller watersheds, which primarily flow through agricultural lands encompassing approximately

153,000 acres in west Tennessee and southwest Kentucky. While most of these watersheds are intermittent in nature, Reelfoot Creek and Running Bayou typically flow year-round. With limited influence from the ground water associated with the Mississippi River, the lake is dependent on runoff to maintain water levels. Reelfoot Lake's water level management was the subject of a 3-year study resulting in the release of a final environmental impact statement during July, 1989 (U.S. Fish and Wildlife Service 1989b).

Strategy 5.1.1: Implement the August 28, 1941, 75-year lease and cooperative agreement under which the Service assumed certain responsibilities for maintenance and improvement of Reelfoot Lake.

Strategy 5.1.2: Improve water quality and reduce sedimentation by constructing a settling basin to catch suspended solids.

Strategy 5.1.3: Promote the enhancement and protection of riparian corridors.

Strategy 5.1.4: Manage for sustainable harvest of recreational fish species.

Strategy 5.1.5: Manage the waters of Lake Isom, through the utilization of the spillway structure, for maximum aquatic productivity.

GOAL 6 – RESIDENT WILDLIFE

Provide a complex of habitats suitable for a wide range of resident (endemic) wildlife species, including mammalian, avian, amphibian, and reptilian species, while achieving habitat management objectives and biological integrity with other native flora and fauna.

Objective 6.1: Conserve, restore, and manage up to 12,278 acres of refuge lands to support resident wildlife species and population levels identified in the WTWR Conservation Plan.

In keeping with the refuges' management objectives and establishing purposes, sound biological principles are used in the assessment of, and when feasible, management for resident species. In some resident species groups, little specifically targeted resource management is performed other than monitoring, protection, and awareness of any species of special concern that may exist on the refuges. However, management for priority habitat conditions often results in good management for a host of resident species. Resident game species lend themselves to active management in the form of hunt management, check station information collection, and biological assessment of harvested individuals. Targeted management efforts directed at resident species focus on maintaining viable populations, rather than favoring certain species, age classes, or sexes.

Strategy 6.1.1: Manage resident wildlife populations to achieve habitat management objectives and biological integrity with other priority species and species groups.

GOAL 7 – PUBLIC USE

Enhance public use of the refuges through development of an appropriate and compatible program of wildlife-dependent recreation and education/interpretation that is consistent with the National Wildlife Refuge System Improvement Act of 1997, benefiting visitors and promoting an understanding of the Lower Mississippi River Valley ecosystem.

The National Wildlife Refuge System Improvement Act of 1997 identifies six high priority, wildlife-dependent public use activities for national wildlife refuges: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Fundamental to the provision of these uses are viable and diverse fish and wildlife populations and the habitats upon which they depend. These priority uses, along with all other proposed uses, must be compatible with the refuges' establishing purposes and the mission of the National Wildlife Refuge System, and will receive enhanced consideration over other general public uses.

If determined appropriate, recreation fees and concessions are tools available to assist in managing these uses. The refuges will only permit other uses when it has been determined that they are legally mandated, provide benefits to the Service, occur due to special circumstances, or facilitate one of the priority wildlife-dependent recreational uses. See 605 FW 1, General Guidance, and 603 FW1, Appropriate Refuge Uses.

Objective 7.1: Manage up to 12,278 acres of refuge lands to provide compatible opportunities for wildlife-dependent public use activities, including the six designated as high priority for national wildlife refuges: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Strategy 7.1.1: Provide appropriate and compatible fishing opportunities at Reelfoot and Lake Isom national wildlife refuges, consistent with sound biological principles, by maintaining existing access and facilities, and by evaluating refuge resources for possible additional fishing opportunities.

Strategy 7.1.2: Provide appropriate and compatible hunting opportunities at Reelfoot and Lake Isom national wildlife refuges by maintaining existing access and facilities and by evaluating refuge resources for possible additional hunting opportunities and access.

Strategy 7.1.3: Provide quality, appropriate and compatible wildlife observation and photography opportunities at Reelfoot and Lake Isom national wildlife refuges by maintaining existing access and facilities and by evaluating refuge resources for additional opportunities and facilities.

Strategy 7.1.4: Provide quality, appropriate, and compatible environmental education and interpretation programs at Reelfoot and Lake Isom national wildlife refuges by maintaining existing programs and facilities and by evaluating opportunities for additional programs and resources.

Strategy 7.1.5: Develop an effective program of public outreach and awareness that provides an understanding and appreciation of the refuges and the Lower Mississippi River Ecosystem, the refuges' ecology, and the human influence on ecosystems of west Tennessee.

Strategy 7.1.6: Examine existing methods of orienting visitors to the refuges, and develop more effective methods and facilities to accomplish refuge information dissemination and visitor orientation.

Strategy 7.1.7: Evaluate and improve existing partnerships, and pursue opportunities for refuge support groups and other partnerships, including an enhanced volunteer program.

GOAL 8 – ADMINISTRATION AND OPERATION

Ensure that present and future operational, administrative, and personnel objectives are achieved in order that goals and objectives for refuge habitats, fish and wildlife populations, land conservation, and visitor services will be achieved.

The administrative and operational functions associated with a refuge include a wide array of activities that are critical to the mission of the National Wildlife Refuge System and the purpose of each refuge. These functions include staffing, training, budgeting, planning, refuge access, law enforcement, facilities management, community relations, partnering, and maintenance. Refuges must have appropriate staff, facilities, equipment, and funding in order to accomplish their overall goals and objectives.

Office space is needed at the Reelfoot and Lake Isom national wildlife refuges for staff in six existing positions, including a refuge manager, a refuge operations specialist, a park ranger, a Student Career Experience Program (SCEP) student, and two equipment operators. In addition, seven new positions are proposed, including a secretary/clerk, three equipment operators, a biologist, a maintenance worker, and a law enforcement officer. Extra space is also needed for occasional refuge workers, including other law enforcement personnel, interns, and volunteers. The current office space consists of three offices within a small (2,720 square feet) office/visitor center. Existing maintenance facilities at three locations on the two refuges include an enclosed maintenance shop, two smaller enclosed storage/maintenance shops, three pole sheds, and an oil storage facility.

Objective 8.1: Provide adequate facilities, personnel, training, and equipment necessary to accomplish a comprehensive refuge management program, as proposed in this plan, by 2009.

Strategy 8.1.1: Develop more appropriate maintenance facilities and a larger office/visitor center, to ensure safe and efficient refuge operations, by 2007.

Strategy 8.1.2: Develop staff resources, including personnel, equipment, and training, adequate to accomplish a comprehensive refuge management program, as proposed in this plan.

Strategy 8.1.3: Maintain highly trained and effective law enforcement personnel to ensure trust resource protection, visitor safety, and enforcement of all refuge-related acts and regulations.

GOAL 9 – LAND PROTECTION AND CONSERVATION

Conserve natural and cultural resources through partnerships, protection, and land acquisition.

To further conserve and protect natural and cultural resources on and in the vicinity of the refuges, the refuge staff would seek to develop and enhance partnerships with state and county natural resource agencies, conservation organizations, and neighboring landowners. Among critical issues to be addressed are water quality, erosion and sedimentation, and cultural resource protection. With the enactment of the Antiquities Act of 1906, the federal government recognized the importance of cultural resources to the national identity and sought to protect archaeological sites and historic structures on those lands owned, managed, or controlled by the United States. The Service would work toward improving resource protection through offering technical advice, evaluating potential land acquisition opportunities from willing sellers, and identifying and protecting cultural and historic resources on refuge lands.

Objective 9.1: Through land acquisitions from willing sellers, technical assistance with private landowners, and protection of cultural resources, protect the remaining 35,234 acres within the refuges' approved acquisition boundary, as well as neighboring lands which have potential to significantly impact the refuges' natural and cultural resources.

Strategy 9.1.1: By 2008, work with the realty specialist to update the address and contact lists for all inholders and make inquiries concerning their willingness to sell identified properties.

Strategy 9.1.2: Work with partner conservation organizations such as The Nature Conservancy, The Conservation Fund, Trust for Public Land, and others to acquire land for the refuges.

Strategy 9.1.3: Acquire the remainder of the lands within the 35,234-acre approved acquisition boundary as funding and willing sellers become available.

Strategy 9.1.4: Work with private landowners through the Partners for Wildlife program to improve wildlife habitat and reduce sedimentation and contaminants problems that affect the refuges.

Strategy 9.1.5: Protect cultural and historic resources from disturbance or inadvertent damage that could occur as a result of refuge activities.

Strategy 9.1.6: By 2008, assess the feasibility of conducting a refuge-wide archaeological survey.

V. Plan Implementation

BACKGROUND

Refuge lands are managed under the National Wildlife Refuge System Improvement Act of 1997, the Fish and Wildlife Manual, sound biological principles, and current research. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges, which, unlike other public lands, are dedicated primarily to the conservation of the Nation's fish and wildlife resources. Recreational values are accommodated where they are appropriate and compatible with the Congressional mandate for protecting wildlife first. Priority projects emphasize the protection and enhancement of fish and wildlife species first and foremost, but consideration is given to balancing the needs and demands for recreation and environmental education.

To accomplish the purpose, vision, goals, and objectives contained in this plan for the Reelfoot and Lake Isom national wildlife refuges, this chapter identifies the proposed projects, a cost summary for those proposed projects, staffing and funding needs, step-down management plans, partnership opportunities, a monitoring and evaluation plan, and a plan for review and revision of the plan.

PROPOSED PROJECTS

The following proposed projects describe the basic needs that have been identified by Service staff, the public, and planning team members for the management of fish and wildlife populations, habitats, visitor services and environmental education, refuge administration and operation, and land protection and conservation on the two refuges over the next 15 years.

For the purposes of achieving the goals and objectives developed for the refuges, the plan has grouped management strategies into specific projects. This plan describes 11 potential projects for development and management. Some of these projects include several different components, such as pieces of heavy construction equipment or staff positions, which would be needed to accomplish a particular project. Private lands have also been identified for potential acquisition from willing sellers or possible enrollment in conservation programs offered by the Service or other partnering agencies.

A cost summary of projects proposed for the refuges is provided in Table 1. These figures would be specifically updated and adjusted annually. There are no estimates of potential land purchases, because land values vary with the time of the sale and market value at the time of purchase. There are no assurances that these projects will be either fully or partially funded. However, with the help and cooperation of conservation partners, the Service would use this plan to focus attention on funding the management, operation, and maintenance needs of the refuges.

The following proposed projects are categorized under four management categories: Fish and Wildlife Populations and Habitat Management; Visitor Services and Environmental Education; Refuge Administration and Operation; and Land Protection and Conservation. Each project description includes first-year costs, recurring annual costs (if any), and linkages of the proposed project to the specific goals and objectives developed during the course of the comprehensive planning process.

PROJECT DESCRIPTIONS

PROJECT CATEGORY 1: FISH AND WILDLIFE POPULATIONS AND HABITAT MANAGEMENT

Project 1: Wetland Restoration and Enhancement of Farming Operation.
Interagency partnership restoration efforts on Reelfoot Lake have included managing water levels to improve water quality and enhance fisheries habitat. Though a valuable undertaking, this process has impacted the Reelfoot refuge's ability to manage its farming program to meet migratory waterfowl management responsibilities. This project would enable the conversion of much of the currently farmed acreage (which is often saturated during the growing season and unable to be planted) so that it can be managed more effectively as moist soil impoundments. This project will benefit many of the 400,000 wintering waterfowl that use the Reelfoot Lake area, which is visited by a half-million people each year.

Project 1A: Equipment to Expand Force-account Farming Operation. This project calls for the purchase of a tractor, disk, drill, boom sprayer, and planter to enable the refuge staff to conduct farming operations necessary for the conversion of approximately 200 acres of farmed ground into moist soil units, as well as subsequent management of these lands. In addition, this equipment will enable the refuge staff to perform force-account farming, rather than rely on private area farmers, and will greatly reduce the amount of chemicals used to grow crops needed as wildlife foods. The estimated first-year cost is $227,000, with a recurring annual cost of $10,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, and 7.1).

Project 1B: Equipment Operator Position (1 full-time equivalent, FTE). This project calls for providing an equipment operator to convert approximately 200 acres of farmed ground to moist soil units, as well as the subsequent management and force-account farming of these lands, as described in Project 1A. The estimated first-year cost is $65,000, with a recurring annual cost of $57,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, and 7.1).

Project 1C: Equipment Operator Position (1 FTE). Provide an equipment operator to convert approximately 200 acres of farmland to moist soil units and the continued management of several hundred acres of farmland on the Reelfoot refuge. Justifications for this project are the same as described for Project 1A above. The estimated first-year cost is $65,000, with a recurring annual cost of $57,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, and 7.1).

Project 2: Reelfoot Lake Channel Maintenance.
Reelfoot Lake is managed in part under a cooperative agreement with the Tennessee Wildlife Resources Agency, under which the Service assumes management obligations for mitigating impacts from accelerated sediment deposition in the lake. This project includes the maintenance of a series of circulatory channels and ditches within the lake to improve flows of silt-laden waters through the lake.

Project 2A: Equipment Operator Position (1 FTE). This project calls for the hiring of an equipment operator to operate the newly acquired aquatic excavator. Frequent operation of this excavator is required to accomplish removal of drift and debris from the circulatory channels; the cost of operation exceeds current staffing and funding levels. The estimated first-year cost is $101,000, with a recurring annual cost of $76,000. (Linkages: Objectives 1.1, 2.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 2B: Maintenance Worker Position (1 FTE). This project calls for the hiring of a maintenance worker to provide necessary support for safe operations of the aquatic excavator within the waters of Reelfoot Lake. Current staffing levels do not allow adequate support for the completion of circulatory channel maintenance. The estimated first-year cost is $88,000, with a recurring annual cost of $59,000. (Linkages: Objectives 1.1, 2.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 3: Water Delivery and Management.
Water delivery and management are critical for the effectiveness of the Reelfoot and Lake Isom refuges in providing a mosaic of bottomland hardwood and aquatic habitats. Various types of water control structures, including gates, stop-log structures, gated pipes, culverts, and wells, are strategically placed to provide water delivery and management capability. Many of these structures are old and in need of replacement.

Project 3A: Replace Radial Arm Gate on Reelfoot Lake Spillway. This project calls for replacement of the deteriorated radial arm gate, which is essential in providing water management and flood control capabilities on Reelfoot Lake. This structure, originally built in the late 1940s, has been repaired several times. It is currently deteriorated to the point that repairs are not feasible and failure of the structure is probable. This structure is essential in maintaining water levels on the 18,000-acre Reelfoot Lake, providing recreational opportunities for more than 500,000 visitors annually, as well as providing wintering habitat for up to 400,000 waterfowl and up to 200 wintering bald eagles. The estimated first-year cost is $122,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 3B: Replace Three Pumping Stations and Water Delivery Systems. This project calls for the replacement of three pumping stations and water delivery systems to provide water for optimum plant growth, food availability, and water depths for migratory bird management. There are five moist soil units, totaling 187 acres, on the Long Point Unit of Reelfoot National Wildlife Refuge. These areas are capable of growing natural foods and providing habitat for up to 150,000 ducks and geese, as well as for thousands of shorebirds and wading birds. However, current water management is completely dependent upon rainfall (timing and amounts) to provide optimum conditions for waterfowl and other species. The estimated first-year cost is $322,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 3C: Rehabilitate Levees and Replace Water Control Structures. This project calls for renovation of the Lake Isom refuge's existing moist soil units through repair of existing levees, replacement of water control structures, and improvement of the refuge's moist soil management abilities by installing a well and water delivery system. Five units totaling 100 acres, located on the north end of Lake Isom National Wildlife Refuge, have the capability of growing moist soil foods, providing flooded crops and/or retaining water in the winter for waterfowl. The refuge needs a pumping station and water delivery system to provide optimum plant growth, food availability, and water depths for wintering waterfowl using these impoundments. The levees are in disrepair and need renovation and gravel to provide year-round access for optimal management. The 2.5-mile road system will be graveled to provide access for water and wildlife management, farming, and visitor use. Waterfowl populations will increase by over a third and maintenance and safety liability will be eliminated. The estimated first-year cost is $231,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 3D: Replace Lake Isom Water Control Structure. This project calls for replacement of the Lake Isom water control structure. This 1,000-foot levee and 48-inch-wide stop log structure were constructed in 1947. This structure provides very limited water management capabilities for the 600-acre Lake Isom and surrounding 300-acre wetland that serves as an inviolate sanctuary for more than

50,000 wintering migratory birds. Lake Isom is used by more than 16,000 visitors annually for fishing and wildlife (waterfowl, eagle) viewing. The existing structure consists of a solid concrete, open-top structure and an 8-foot-deep channel, with no safety features. A replacement structure with catwalk and handrails is needed to ensure safe and effective water level management for this critical migratory bird habitat and to provide safe public enjoyment of these resources. The estimated first-year cost is $673,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 4: Rehabilitation of Moist Soil Impoundment System.
Lake Isom National Wildlife Refuge, established in 1938 (the oldest refuge in Tennessee), provides important wintering waterfowl habitat, annually hosting 50,000 ducks. A dozen threatened bald eagles also make their home here. This area is presently being cultivated as farmland, providing only limited wildlife habitat benefits for ducks and other wetland-dependent wildlife on the refuge. The soil and elevations in this area would create excellent "moist soil" or natural wetland habitat.

Project 4A: Creation of 200 Acres of Moist Soil Impoundments. This project calls for the creation of five moist soil units on the Lake Isom refuge, totaling 200 acres. This project will enable the construction of 2.5 miles of levees, installation of approximately 15 water control structures, and installation of a pump/water delivery system. The new area will easily double the number of waterfowl using the area and provide new and expanded areas for migrating shorebirds, wading birds, and other species that benefit from wetlands such as bald eagles. The estimated first-year cost is $221,000, with a recurring annual cost of $8,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 4B: Rehabilitation of Existing Moist Soil Unit Levee and Water Control Structure. This project calls for rehabilitation of the 950-foot West Boathouse levee and water control structure, to provide optimal management capabilities. The existing levee is in need of renovation and gravel to provide adequate access during the winter months to facilitate management activities. The improvement of the levee and access route will enhance the refuge's ability to provide habitat for wintering waterfowl and to expand management capabilities for migrating shorebirds. Renovations include expanding the levee to provide increased wetland acres. The estimated first-year cost is $50,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5: Replacement or Acquisition of Equipment Needed for Habitat Management.
Numerous types of equipment are required to effectively accomplish various projects on the Reelfoot and Lake Isom national wildlife refuges, including construction, maintenance, operations, and renovation. Projects include moist soil impoundment rehabilitation and construction to benefit a combined total of more than 200,000 wintering waterfowl annually; maintenance of numerous water control structures; and refuge road and facility maintenance and repair, to ensure safe access for over 250,000 visitors to the two refuges annually.

Project 5A: Replace Front End Loader. This project calls for replacement of the 20-year-old front end loader used to load fill materials and gravel for a variety of habitat restoration projects to benefit up to 200,000 wintering waterfowl, as well as for maintaining refuge roads and visitor use facilities to provide safe access for over 250,000 visitors annually. Breakdowns of the loader that is now in service are frequent, and replacement parts are becoming expensive and increasingly more difficult to acquire. The estimated first-year cost is $150,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5B: Replace John Deere Farm Tractor. This project calls for replacement of the 16-year-old John Deere 4640 farm tractor, which is essential for maintenance activities on more than 200 acres of

moist soil habitat. This tractor is used to set back succession on moist soil units, providing food and habitat for up to 200,000 wintering waterfowl and several thousand migrating shorebirds annually. The current tractor is functional; however, the costs incurred to maintain it outweigh the benefits derived from it. The estimated first-year cost is $132,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5C: Replace Dump Truck. This project calls for replacement of the 22-year-old dump truck which is needed for refuge construction, maintenance and renovation projects. Projects include moist soil impoundment rehabilitation and construction to benefit more than 200,000 wintering waterfowl annually, and refuge road maintenance and repair to ensure safe access for over 250,000 visitors annually. The truck is used to transport fill materials and gravel to various locations on the refuges to complete these projects. This vehicle exceeds replacement standards due to its age, and significant repairs are currently needed to continue safe operation. The estimated first-year cost is $90,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5D: Replace John Deere Backhoe. This project calls for replacement of the 23-year-old John Deere 302A backhoe, essential for maintaining water control structures, drainage culverts, and ditches associated with more than 17 miles of public use roads, moist soil habitat, and habitat restoration projects benefiting more than 200,000 wintering waterfowl. The current backhoe has been modified several times to meet changing safety requirements, but it meets only the minimum safety standards. Repair and maintenance costs associated with this machine are excessive. The estimated first-year cost is $125,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5E: Replace Caterpillar D4H Dozer. This project calls for replacement of the 1984 Caterpillar D4H Dozer. This crawler-tractor is critical for completing management activities on nearly 300 acres of moist soil habitat to benefit up to 200,000 wintering waterfowl and several thousand migrating shorebirds on the refuges. The dozer has been used extensively since its acquisition, and has suffered a significant structural failure in the main drive frame. The dozer has had transmission problems, requiring two overhauls, and currently the tracks and rollers are in need of replacement. Because of its age and past history, it is more economical to replace the dozer than to repair it. The estimated first-year cost is $185,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5F: Replace Polaris 6X6 ATV. This project calls for replacement of the 2000 model Polaris ATV (all-terrain vehicle) used to transport materials and supplies to remote portions of the Refuge for wildlife monitoring and habitat enhancement projects. This vehicle is essential for transporting materials through swampy environments efficiently. Scheduled replacement is in 2010. The estimated first-year cost is $8,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5G: Replace 13-foot Disk Harrow. This project calls for replacement of the 13-foot disk harrow used to maintain moist soil habitat for migrating and wintering waterfowl and shorebirds, preparation of farm fields for reforestation efforts, and renovation of impoundment levees. Scheduled replacement is in 2007. The estimated first-year cost is $16,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 5H: Replace 1993 Chevrolet Pickup Truck. This project calls for replacement of the 11-year-old Chevrolet service pickup truck used by the refuges' maintenance staff to provide support for habitat restoration and manipulation projects, construction, and road maintenance projects benefiting more than 200,000 wintering waterfowl and more than 250,000 refuge visitors. This vehicle is

essential to facilitate timely and efficient completion of these projects. The vehicle exceeds replacement standards, and its repair and maintenance costs are excessive. The estimated first-year cost is $25,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

PROJECT CATEGORY 2: VISITOR SERVICES AND ENVIRONMENTAL EDUCATION

Project 6: Provide Increased Visitor Services on Two Refuges.
The mosaic of diverse habitats found on the Reelfoot and Lake Isom national wildlife refuges are valuable to more than 235 bird species, including populations of up to 200,000 ducks and an important bald eagle population. Approximately two million people live within two hours of the Reelfoot and Lake Isom refuges, and the greater Reelfoot Lake area supports up to one half-million visitors each year.

Project 6A: Equipment Operator Position (1 FTE). This project calls for providing an equipment operator on Lake Isom National Wildlife Refuge, where there is currently no on-site staff. This project would provide an equipment operator to maintain public roads, manage habitats, and improve public recreational opportunities. The only staff support for this refuge comes from nearby Reelfoot National Wildlife Refuge, which already has tremendous responsibilities under a lease agreement with the State of Tennessee to maintain the water levels of Reelfoot Lake, as well as wildlife and habitat management responsibilities. The estimated first-year cost is $65,000, with a recurring annual cost of $54,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 6B: Construct Visitor Center. This project calls for the construction of a new visitor center of approximately 5,000 square feet at Reelfoot National Wildlife Refuge. Facilities will include a renovated exhibit area with interactive audio-visual exhibits, and an equipped auditorium with capacity for up to 200 students. To meet the growing needs of the refuge's environmental education programs, an environmental classroom with laboratory facilities to accommodate a 50-student class is needed. Partnerships with local communities, school districts, and area universities will be strengthened, and the refuge will be able to further its environmental education and interpretation goals. The building will incorporate the unified design approach being developed by National Wildlife Refuge System and Engineering staffs. The refuge has outgrown its current facility, with annual visitation now approaching 250,000. The estimated first-year cost is $2,727,000, with a recurring annual cost of $15,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7: Rehabilitation of Roads and Parking Areas.
The roads on the two refuges provide access for more than 266,000 visitors annually, as well as providing essential access by refuge staff and contractors to conduct habitat management activities benefiting more than 200,000 wintering waterfowl, numerous species of migrating songbirds and shorebirds, as well as resident wildlife species.

Project 7A: Replace 1986 Caterpillar Motor Grader. This project calls for replacement of the 1986 Caterpillar 130G motor grader. This motor grader is essential in maintaining all refuge public use roads. Access to the refuges by over 250,000 visitors is dependent upon replacement of this grader. Scheduled replacement is in 2005. The estimated first-year cost is $155,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7B: Replace 15-foot Batwing Mower. This project calls for replacement of the batwing mower essential for controlling vegetation along refuge public use roads, manipulating moist soil vegetation, and exposing waste grains for wintering waterfowl. Scheduled replacement is in 2009. The estimated first-year cost is $18,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 7C: Replace Hustler Riding Mower. This project calls for replacement of the Hustler riding mower used to maintain refuge grounds and enhance the backyard habitat demonstration area. Scheduled replacement is in 2012. The estimated first-year cost is $20,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 6.1, 7.1, and 8.1).

Project 7D: Rehabilitate Interior Refuge Road. This project calls for rehabilitation of the 1.83-mile Interior Refuge Road, which provides public access from Observation Tower Road and Goose Pen Road. The road provides access for more than 60,000 visitors annually. It also provides essential access by refuge staff and contractors to conduct habitat management activities benefiting more than 200,000 wintering waterfowl, numerous species of migrating songbirds and shorebirds, as well as resident wildlife species. The road is in generally poor condition, reducing access during wet conditions. Rehabilitation will ensure safe access for the visiting public, as well as year-round access for wildlife monitoring and habitat management activities. This road is currently rated as being in good condition by the Federal Highway Administration (Route # 102). The estimated first-year cost is $327,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7E: Rehabilitate Goose Pen Road. This project calls for rehabilitation of 1.49-mile Goose Pen Road, a two-lane road that provides public access for wildlife-dependent uses on the refuge. The road surface is graveled and generally in fair condition. The roadway is subject to moderate rutting and wash-boarding, requiring frequent maintenance to ensure safe visitor access. This road provides access for more than 60,000 visitors annually. It also provides essential access for refuge farming activities, which serve to provide winter food for up to 200,000 wintering waterfowl. This road is also essential for access to the refuge's primary wood duck banding site. Over 300 birds are banded here annually, providing hands-on experience for more than 20 college interns annually. This road is currently in good condition as rated by the Federal Highway Administration (Route # 101). The estimated first-year cost is $238,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7F: Rehabilitate West Banding Site Road. This project calls for rehabilitation of the 0.64-mile West Banding Site Road to ensure adequate access for refuge management activities and the visiting public. This road provides access to the west banding site, which is essential for meeting refuge banding quotas, as well as providing public access for up to 50,000 visitors for wildlife-dependent recreation. This road is currently in fair condition as rated by the Federal Highway Administration (Route # 103). Access year-round is essential for refuge staff to conduct habitat management, population monitoring, and law enforcement activities to benefit up to 200,000 wintering waterfowl. The estimated first-year cost is $157,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7G: Rehabilitate West Boathouse Road. This project calls for rehabilitation of the 0.58-mile West Boathouse Road to ensure adequate access for refuge management activities and the visiting public. This road provides access to the West Boathouse boat ramp, which is essential in accessing the northern end of Reelfoot Lake to conduct waterfowl management and monitoring activities and law enforcement activities, as well as providing public access for up to 50,000 visitors for wildlife-dependent recreation. This road is currently rated as being in poor condition by the Federal Highway

Administration (Route # 104). Access year-round is essential for refuge staff to conduct habitat management and law enforcement activities to benefit up to 200,000 wintering waterfowl. The estimated first-year cost is $200,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7H: Rehabilitate Long Point Auto Tour Route and Parking Areas. This project calls for rehabilitation of the 0.93-mile Long Point Road, a two-lane road that provides public access to the northern unit of Reelfoot National Wildlife Refuge. This road provides year-round public access for a growing number of visitors to the Long Point Unit and is the location of a scenic tour route, providing access to an observation tower and parking areas. Its current use exceeds 100,000 visitors annually. This road is also important for law enforcement, search and rescue, and fire management, in addition to other habitat management. Due to recent wet and cold weather, damage to the existing road bed is excessive. The road bed needs to be reshaped, with additional base material placed, and the road needs resurfacing to accommodate the increasing use. From the observation tower that this road serves, visitors may at times observe 150,000 wintering waterfowl. The estimated first-year cost is $537,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7I: Rehabilitate Lake Isom Boundary Line Road. This project calls for the replacement of gravel on approximately 3.92 miles of the Lake Isom Boundary Line Road. This road serves as the main access to the refuge's public use facilities, and is essential for access to various portions of the refuge for maintenance and habitat enhancement projects. Its current visitor use is over 16,000 annually. The road currently suffers from inadequate base material and poor drainage structures. Over-topping of the road by local runoff is frequent during heavy rains, causing significant washouts and limiting public access. The Federal Highway Administration classifies this road (Route # 010) as being in fair (1.01 miles) to poor (2.91 miles) condition. The estimated first-year cost is $574,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7J: Renovate Road on South End of Lake Isom. This project calls for rehabilitation of 0.35 miles of the access road on the south end of Lake Isom, evaluated by the Federal Highway Administration (Route # 101) as being in poor condition. Rehabilitation of this road will provide safe visitor access to the refuge’s boat ramp, as well as wildlife viewing and bank fishing opportunities. This road provides access to the water control structure, and is essential for completing water level manipulations and monitoring on the refuge to benefit more than 50,000 wintering waterfowl. Access to the refuge boat ramp is also essential for conducting adequate law enforcement, wildlife monitoring, and habitat management activities. The estimated first-year cost is $74,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7K: Renovate Public Access Road on South End of Lake Isom. This project calls for the rehabilitation of 0.5 miles of a public use access road on the south end of Lake Isom. This road has been evaluated by the Federal Highway Administration (Route # 100) as being in poor condition. This road provides public access for the 16,000 visitors to the 600-acre lake for wildlife observation and bank fishing opportunities, as well as critical access to the lake by refuge staff to complete habitat renovation and management projects for the more than 50,000 waterfowl wintering on the refuge. Renovations will also provide expanded educational/recreational opportunities on the refuge. The estimated first-year cost is $106,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 7L: Rehabilitate Slough Road. This project calls for the rehabilitation of Slough Road. This 2.75-mile public road provides seasonal access for more than 16,000 annual visitors for a variety of wildlife-dependent activities. The current dirt and gravel surface is in poor condition and rutted

because of inadequate base materials and undermined by burrowing animals. As a result, the road is accessible only by four-wheel drive vehicles. Inadequate crowning and lack of associated drainage structures results in severe ponding on the road during wet periods. Renovation of the road will enhance visitor use opportunities on the refuge, as well as improve access for refuge staff performing habitat management and wildlife monitoring activities to benefit more than 200,000 wintering waterfowl. The road's condition is rated as poor by the Federal Highway Administration (Route # 100). The estimated first-year cost is $1,240,000 with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

PROJECT CATEGORY 3: REFUGE ADMINISTRATION AND OPERATION

Project 8: Enhance Administrative Capability on Two Refuges.
In 1995, the administrative office of the West Tennessee National Wildlife Refuges Complex was moved from Reelfoot National Wildlife Refuge to a more centrally located office 45 miles south in Dyersburg, Tennessee, to better serve all of the station's growing responsibilities. Additional administrative support at the refuge will result in improved wildlife and habitat management, more and better public use opportunities, and greater partnership and volunteer opportunities at the Reelfoot and Lake Isom refuges. The end result will be more effective overall operation of the Reelfoot and Lake Isom national wildlife refuges, with their expanding management programs and 266,000 visitors per year.

Project 8A: Secretary/Clerk Position (1 FTE). This project would provide a secretary/clerk to improve the effectiveness of administrative operations for the Reelfoot and Lake Isom refuges. Currently, an off-site administrative assistant must help the Reelfoot and Lake Isom refuge manager to address visitor inquiries, correspondence, personnel actions, and travel vouchers, as well as process time and attendance information. This existing administrative assistant is also responsible for several other refuges, and is able to provide only limited support to the Reelfoot and Lake Isom refuges. As a result, the refuge manager is often unable to focus needed attention on larger, more complex habitat and public use management issues. The estimated first-year cost is $65,000, with a recurring annual cost of $49,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 8B: Maintenance Worker Position for Lake Isom NWR (1 FTE). Lake Isom National Wildlife Refuge, the oldest national wildlife refuge in Tennessee (established 1938), does not have on-site staff to care for its wildlife and public amenities. This project will provide for a much-needed maintenance worker to repair the equipment required to properly maintain roads, water control structures, and other facilities. Lake Isom National Wildlife Refuge is valuable for more than 235 species of birds, including 50,000 ducks and an important bald eagle population. The refuge lies within the greater Reelfoot Lake area, which is visited by a half-million people annually. Maintenance of equipment, roads, and other property and facilities is necessary to meet public expectations for a safe, enjoyable refuge visit. The estimated first-year cost is $65,000, with a recurring annual cost of $54,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 8C: Replace Long Point Residence on Reelfoot NWR. The Long Point Residence is critical in maintaining a Service "presence" on a remote portion of the Reelfoot refuge. Providing adequate housing for refuge employees ensures adequate protection of refuge facilities and equipment, as well as protection of the refuge's trust resources. The current residence at Long Point was constructed in 1935 and has numerous deficiencies. Its electrical system has been randomly repaired over the years and does not meet current code. The roof has been damaged and is in need of replacement. Inadequate insulation, deteriorating windows, and insufficient heating and cooling systems need to be upgraded to provide comfort as well as efficient living conditions. Interior amenities including floor coverings, light fixtures, wallboard, plumbing fixtures, and appliances need to be upgraded. The

estimated first-year cost is $220,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 8D: Replace Ford Windstar Van. This project calls for replacement of the Ford Windstar van, which is essential for efficiently transporting staff to various training sessions and meetings. The van is used by refuge outreach staff to conduct tours, talks, and presentations regarding the Refuge System, as well as refuge programs. Scheduled replacement is in 2007. The estimated first-year cost is $25,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 8E: Replace Lake Isom Residence. This project calls for replacement of the Lake Isom residence, which is currently 67 years old. This residence serves as the refuge's staff quarters for the purpose of providing security to the refuge during non-working hours. However, its utilities and living conditions are substandard, and its current remote location provides only a minimal security benefit to the refuge. The refuge would be better served with a residence located adjacent to the main entrance. This replacement location would provide for and ensure after-hours security for the refuge's equipment storage compound and provide a visitor contact point for the more than 16,000 annual visitors. The estimated first-year cost is $209,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 8F: Replace 1995 Ford Explorer. This project calls for replacement of the worn-out 1995 Ford Explorer. The vehicle is used to commute to all field stations in the Complex and is regularly used by the Project Leader to attend meetings, conduct official travel, and perform law enforcement. The vehicle has high mileage and has become unreliable. Repairs are frequent and costly. Replacing this vehicle will provide the Project Leader with reliable transportation and will facilitate critical resource planning and management. The estimated first-year cost is $31,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 9: Replace Maintenance Equipment and Facility.
Refuge maintenance equipment is essential in maintaining habitats for more than 200,000 wintering waterfowl and a host of other migratory birds, as well as providing safe access for more than 266,000 visitors to the two refuges.

Project 9A: Replace Storage Facility at Long Point Unit. This project calls for replacement of the inadequate storage facility on the Long Point Unit of Reelfoot National Wildlife Refuge. The current building is in poor shape, provides minimal protection from the weather for refuge equipment and vehicles, and provides no security to prevent tampering or theft. Replacement of this building will provide a secure, weather-tight storage space for refuge equipment, and greatly increase the useful life of the equipment. The estimated first-year cost is $118,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 9B: Replace Winch Truck. This project calls for replacement of the 20-year old winch truck. This special purpose truck is used to haul trailers and equipment among the four west Tennessee national wildlife refuges, encompassing more than 45,000 acres. Together, these refuges provide habitat for approximately 500,000 wintering waterfowl, as well as recreational and educational opportunities for nearly 400,000 visitors annually. The truck is equipped with a PTO-driven winch, which is used to load inoperable machinery and vehicles for transport, as well as to remove vehicles and equipment that frequently get stuck in the refuges' wetland environments. Maintenance costs are rapidly increasing as this piece of equipment ages. The estimated first-year cost is $82,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, and 8.1).

Project 9C: Replace 1993 Dodge Dakota Pickup Truck. This project calls for replacement of the 11-year-old Dodge pickup truck, which is essential in transporting small equipment and personnel to remote portions of the refuge to complete habitat management activities, conduct population monitoring, and maintain public use facilities, benefiting more than 200,000 wintering waterfowl and 266,000 visitors annually. This vehicle exceeds current vehicle replacement standards. The estimated first-year cost is $25,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 9D: Replace 2001 Chevrolet Pickup Truck. This project calls for replacement of the 2001 four-wheel-drive Chevrolet pickup used by refuge maintenance staff to provide support for various maintenance and construction projects. Scheduled replacement is in 2008. The estimated first-year cost is $25,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

PROJECT CATEGORY 4: LAND PROTECTION AND CONSERVATION

Project 10: Law Enforcement.
The 45,000 acres of refuge lands within the West Tennessee National Wildlife Refuges Complex are in need of additional law enforcement capabilities to properly protect wildlife, habitats, and the increasing numbers of visitors. Approximately one million people currently live within 100 miles of the four refuges, and expansion of recreational uses has overwhelmed the present staff, with known violations going unenforced. Improved safety for 400,000 annual visitors and improved wildlife protection would be made possible by this project. As many as 500,000 ducks and numerous other wildlife species, including a growing population of bald eagles, depend on the refuges' habitats, which represent some of the largest protected areas in the State of Tennessee.

Project 10A: Replace Radio System. This project calls replacement of the refuges' current low-band radio system in order to meet new Service guidelines. The current radio system is inadequate and unreliable. The new high-band system would increase management efficiency over a 70-mile radius. It would allow law enforcement personnel to be in continual contact with other law enforcement agencies and would also give other agencies the ability to contact Service personnel. This system would prove very beneficial in search and rescue operations. This is a complex-wide project. The total cost is $255,000, with a recurring annual cost of $5,000, to be shared among the four refuges in the complex. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, and 9.1).

Project 10B: Full-time Law Enforcement Position (1 FTE) and Equipment. This project calls for the funding of a full-time law enforcement position for the West Tennessee National Wildlife Refuges Complex. The refuges' law enforcement program would also be improved in safety and efficiency through the purchase of needed equipment, including a safe, a shotgun, a vehicle, three public address/siren/director-strobe systems, and three mobile radios. This is a complex-wide project. The total cost is $129,000, with a recurring annual cost of $65,000, to be shared among the four refuges in the complex. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1 and 9.1).

Project 10C: Airboat for Enforcement on Reelfoot NWR. This project would improve law enforcement operations and improve habitat monitoring capability by providing an airboat for Reelfoot National Wildlife Refuge. Due to Reelfoot Lake water management decisions that are beyond the control of the refuge, the lake's lower water levels and continuing siltation have made access to large portions of the refuge difficult or impossible by conventional motor boat. This situation has hampered law enforcement operations to protect wildlife and visitor safety. An airboat will allow access to additional areas of the refuge, restore important habitat monitoring capabilities, and facilitate protection of wildlife from potential violators. Search and rescue operations for lost or injured visitors will also

improve. The estimated first-year cost is $35,000, with a recurring annual cost of $4,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1 and 9.1).

Project 10D: Replace 1998 Dodge Four-Wheel-Drive Pickup Truck. This project calls for replacement of the 1998 Dodge four-wheel drive pickup truck, which serves as the primary law enforcement vehicle for the Reelfoot and Lake Isom national wildlife refuges. Scheduled replacement is in 2005. The estimated first-year cost is $25,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1 and 9.1).

Project 11: Landscape Conservation Planning.
National, regional, and state conservation objectives for waterfowl, shorebirds, and forest-breeding birds are being stepped down to guide the formulation of objectives for the refuge focus area. Hence, there is a need to integrate science-based monitoring and inventory data with restoration and habitat management efforts on the two refuges and their surrounding landscapes. In west Tennessee, the planning effort includes five national wildlife refuges and is being expanded to include state and private lands that provide habitat for migratory birds. In the Mississippi Alluvial Valley, migratory bird habitat requirements have been developed. This information is being expanded to include areas in west Tennessee outside the MAV. Given these recommendations, it is clear that sufficient habitat cannot be provided on the national wildlife refuges alone. Therefore, if we are to achieve the habitat goals that have been established, we must look beyond the respective refuge boundaries and incorporate into the comprehensive conservation plan any public or private lands that may be available. The primary objective of this plan is to provide a means of cooperatively protecting, restoring, and managing a sufficient amount and diversity of habitat to meet the requirements of migratory birds and resident wildlife that use west Tennessee habitats.

Project 11A: Comprehensive Conservation Planning. This project calls for the comprehensive conservation planning effort to be completed by 2006. This is a complex-wide project. The initial cost is $105,000, with a recurring annual cost of $100,000, to be shared among the four refuges in the complex. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1 and 9.1).

Project 11B: Biologist Position (1 FTE) to Develop CCP and Improve Biological Program. This project calls for funding a biologist position to lead extensive long-range planning efforts for the Reelfoot and Lake Isom refuges, including the completion of their legally mandated comprehensive conservation plans. This position will also survey, monitor, and evaluate habitats and wildlife, and the public use programs that impact them. No biological staff is available currently to help with planning efforts or conduct research, inventorying, and monitoring. A quarter-million visitors come to the two refuges each year to see the 200,000 ducks and other wildlife that inhabit the refuges. All of the national wildlife refuges in west Tennessee, including Reelfoot and Lake Isom, are involved in a unique cross-agency, landscape-level comprehension planning effort. The estimated first-year cost is $74,000, with a recurring annual cost of $65,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1 and 9.1).

STAFFING AND FUNDING

Currently, a staff of five permanent positions has been approved for the two refuges. To complete the extensive wildlife habitat management and restoration projects and conduct the necessary inventorying, monitoring, and mapping activities, more staff is needed. Figure 10 shows the proposed staffing plan for the Reelfoot and Lake Isom national wildlife refuges and the West Tennessee National Wildlife Refuges Complex. The proposed staffing increases, with adequate funding, would enable the refuges to achieve their plan objectives and strategies within the next 15 years. The initial project costs (including salaries and benefits) would total $10.8 million, with annual recurring costs of

$0.7 million (Table 1). The rate at which these refuges realize their full potential to contribute locally, regionally, and nationally to wildlife conservation and wildlife-dependent recreation and environmental education is contingent upon receiving adequate staffing and funding.

STEP-DOWN MANAGEMENT PLANS

This comprehensive conservation plan is a broad-scale strategic plan that guides the future direction of the refuges. In order for these strategies and projects to be implemented, detailed step-down management plans need to be prepared or updated.

Step-down plans are individual and specific plans that guide the management of particular resources found on the refuges. These step-down plans outline proposed actions as well as the benefits and potential impacts of the proposed actions. Some step-down plans would be revised as a result of the planning process, while others would be more fully developed to better address refuge management needs. For support in preparing and implementing the step-down plans, the refuge staff develops partnerships with local agencies and organizations, which provide comments and input during the development of the plans.

The Service prepares step-down plans in accordance with the provisions of the National Environmental Policy Act of 1969. The Act requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

The step-down plans that are currently being prepared or updated for the Reelfoot and Lake Isom refuges are listed below.

Habitat Management Plan (new plan), draft completion 2004: This plan will describe the overall desired future habitat conditions needed to fulfill the refuges' purposes, goals, and objectives. Procedures, techniques, and timetables for achieving desired future conditions will be developed into a comprehensive plan for management of refuge habitats. (This plan incorporates components of step-down plans formerly written for Forest Management, Moist Soils Management, and Cropland Management).

Wildlife Inventory Plan (update), final plan completed 2002: This plan describes inventory and monitoring techniques and time frames. Numerous species, including waterfowl, songbirds, Neotropical migrants, bald eagles, white-tailed deer, wild turkey, amphibians, and other key resident species, are inventoried and their population trends are monitored. These data are essential to guide the management of the refuges' wildlife habitats.

Sport Fishing Plan (update), draft completion 2004: This plan will address specific aspects of the refuges' fishing programs. It will define season structures, areas open to fishing, legal methods of fishing, universal accessibility, facilities needed, and refuge-specific regulations.

Hunt Management Plan (update), draft completion 2004: This plan will address specific aspects of the refuges' hunting programs. It will define species to be hunted, season structures, areas open to hunting, legal hunting methods, all-terrain vehicle use, universal accessibility, facilities needed, and refuge-specific hunting regulations.

Visitor Services and Education Plan (update), final plan completed 2002: This plan describes the refuges' wildlife-dependent recreation, environmental education, and interpretation. Specific items or issues that will be addressed include facility needs, access, and partnerships and outreach opportunities. (The Sport Fishing Plan and Hunt Management Plans are referenced in this plan.)

Step-down plans currently being prepared or updated for the West Tennessee National Wildlife Refuges Complex (including Reelfoot, Lake Isom, Lower Hatchie, and Chickasaw) include:

Beaver Control Management Plan (update), draft completion 2004: This plan includes a description of beaver control methods and an explanation of the necessity to control excess beaver populations in order to protect refuge habitats and the species that are dependent upon those habitats.

Safety/Hazcom/Pollution Prevention Plan (update), final plan completed 2001: This plan identifies specific hazards in the workplaces of the West Tennessee National Wildlife Refuges Complex, and defines the staff responsibilities and procedures for providing and maintaining a safe work environment. The plan also provides guidance for staff in responding to various types of emergencies and dangerous occurrences.

Fire Management Plan (update), final plan completed 2001: This plan describes the use of prescribed fire on refuges in the West Tennessee National Wildlife Refuges Complex, as well as a contingency plan in the case of wildfire activity on or in the vicinity of the refuges. Safety considerations for fire fighting personnel are also addressed in this plan.

Law Enforcement Plan (update), draft to be completed 2005: This plan describes the basic framework and policy for law enforcement on refuge lands in the West Tennessee National Wildlife Refuges Complex, and the implementation thereof, in cooperation with other local law enforcement entities.

PARTNERSHIP OPPORTUNITIES

A major objective of this comprehensive conservation plan is to establish or enhance partnerships with local volunteers, landowners, private organizations, and state and federal natural resource agencies. At regional and state levels, partnerships already exist with organizations such as the Tennessee Wildlife Resources Agency, Tennessee Department of Environment and Conservation, Tennessee State Parks, Natural Resources Conservation Service, and Ducks Unlimited. In the vicinity of the refuges, other opportunities exist to establish partnerships with elementary and secondary schools, private landowners, and community organizations.

The refuges' volunteer program and other partnerships generated will be dependent to a large degree upon the number of staff positions provided at the refuges. As staff and resources are committed to the refuges, opportunities to expand the volunteer program and develop new partnerships would be enhanced.

MONITORING AND EVALUATION

Adaptive management is a flexible approach to long-term management of resources that is directed over time by the results of ongoing monitoring activities and other acquired information. More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

In order to apply adaptive management, specific inventory, survey, and monitoring methods would be adopted for the refuges which best assess the effects of ongoing refuge management. Based on the results of these inventories, surveys, and monitoring efforts, habitat management strategies would be systematically evaluated to determine the management effects on wildlife populations. This information would then be used to refine management and determine how effectively the refuge

objectives are being accomplished. Evaluations would include appropriate staff and partner participation. If monitoring and evaluation indicate undesirable effects for targeted or nontargeted species and/or communities, then alterations to the management projects would be made. If appropriate, the refuges' comprehensive conservation plan would be revised.

Specific monitoring and evaluation activities would be described in the step-down management plans.

PLAN REVIEW AND REVISION

This comprehensive conservation plan will be reviewed annually to determine the need for revision. A revision will be made whenever important changes occur or pertinent information becomes available, such as a change in ecological conditions or a major refuge expansion. The final plan will be supported by detailed step-down management plans that direct on-the-ground management activities designed to accomplish specific strategies in support of the refuges' goals and objectives. Revisions to the comprehensive conservation plan and the step-down management plans will be subject to public review and NEPA compliance.

Figure 10. Proposed staffing plan for west Tennessee national wildlife refuges

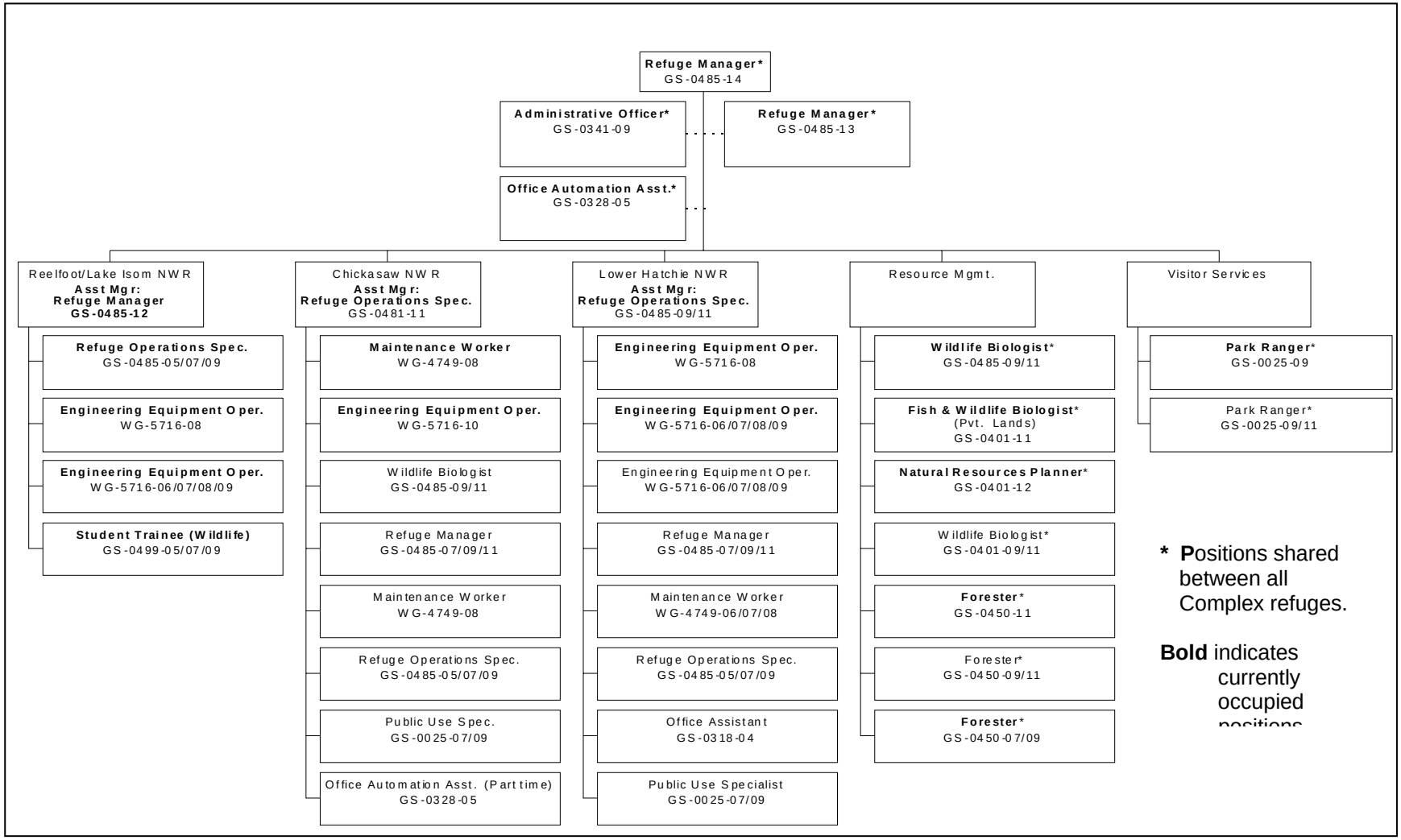


Table 1. Cost summary of proposed projects.

Projects	Initial* Project Cost	Recurring** Base Cost
Project Category 1: Fish and Wildlife Populations and Habitat Management		
Project 1. Wetland Restoration and Enhancement of Farming Operation		
1A. Equipment to Expand Force Account Farming	$227,000	$10,000
1B. Equipment Operator Position (1 FTE)***	$65,000	$57,000
1C. Equipment Operator Position (1 FTE)***	$65,000	$57,000
Project 2. Reelfoot Lake Channel Maintenance		
2A. Equipment Operator Position (1FTE)***	$101,000	$76,000
2B. Maintenance Worker Position (1 FTE)***	$88,000	$59,000
Project 3. Water Delivery and Management		
3A. Replace Radial Arm Gate on Reelfoot Lake Spillway	$122,000	-----
3B. Replace Three Pumping Stations and Water Delivery System	$322,000	-----
3C. Rehabilitate Levees and Replace Water Control Structures	$231,000	----
3D. Replace Lake Isom Water Control Structure	$673,000	-----
Project 4. Rehabilitation of Moist Soil Impoundment System		
4A. Creation of 200 Acres of Moist Soil Impoundments	$221,000	$8,000
4B. Rehabilitation of Existing Moist Soil Unit Levee and Water Control Structure	$50,000	-----
Project 5. Replacement or Acquisition of Equipment Needed for Habitat Management		
5A. Replace Front End Loader	$150,000	-----
5B. Replace John Deere Farm Tractor	$132,000	-----
5C. Replace Dump Truck	$90,000	-----
5D. Replace John Deere Backhoe	$125,000	-----
5E. Replace Caterpillar D4H Dozer	$185,000	-----
5F. Replace Polaris 6X6 ATV	$8,000	-----
5G. Replace 13-Foot Disk Harrow	$16,000	-----
5H. Replace 1993 Chevrolet Pickup Truck	$25,000	-----
Project Category 2: Visitor Services and Environmental Education		
Project 6. Provide Increased Visitor Services on Two Refuges		
6A. Equipment Operator Position (1 FTE)***	$65,000	$54,000
6B. Construct New Visitor Center	$2,727,000	$15,000
Project 7. Rehabilitation of Roads and Parking Areas		
7A. Replace 1986 Motor Grader	$155,000	-----
7B. Replace 15-Foot Batwing Mower	$18,000	-----
7C. Replace Hustler Riding Mower	$20,000	-----
7D. Rehabilitate Interior Refuge Road	$327,000****	-----
7E. Rehabilitate Goose Pen Road	$238,000****	-----

Projects	Initial* Project Cost	Recurring** Base Cost
7F. Rehabilitate West Banding Site Road	$157,000****	-----
7G. Rehabilitate West Boathouse Road	$200,000****	-----
7H. Rehabilitate Long Point Auto Tour Route and Parking Areas	$537,000****	-----
7I. Rehabilitate Lake Isom Boundary Line Road	$574,000****	-----
7J. Renovate Road on South End of Lake Isom	$74,000****	-----
7K. Renovate Public Access Road on South End of Lake Isom	$106,000****	-----
7L. Rehabilitate Slough Road	$1,240,000****	
Project Category 3: Refuge Administration and Operation		
Project 8. Enhance Administrative Capability on Two Refuges		
8A. Secretary/Clerk Position (1 FTE)***	$65,000	$49,000
8B. Maintenance Worker Position for Lake Isom (1 FTE)***	$65,000	$54,000
8C. Replace Long Point Residence	$220,000	-----
8D. Replace Ford Windstar Van	$25,000	-----
8E. Replace Lake Isom Residence	$209,000	-----
8F. Replace 1995 Ford Explorer	$31,000	-----
Project 9. Replace Maintenance Equipment and Facility		
9A. Replace Long Point Storage Facility	$118,000	-----
9B. Replace Winch Truck	$82,000	-----
9C. Replace 1993 Dodge Dakota Pickup Truck	$25,000	-----
9D. Replace 2001 Chevrolet Pickup Truck	$25,000	-----
Project Category 4: Land Protection and Conservation		
Project 10. Law Enforcement		
10A. Replace Radio System	$255,000	$5,000
10B. Full-Time Law Enforcement Position and Equipment (1 FTE)***	$129,000	$65,000
10C. Airboat for Law Enforcement	$35,000	$4,000
10D. Replace 1998 Dodge Pickup Truck	$25,000	-----
Project 11. Landscape Conservation Planning		
11A. Comprehensive Conservation Planning	$105,000	$100,000
11B. Biologist Position to Develop CCP and Improve Biological Program (1 FTE)***	$74,000	$65,000
Grand Total	**$10,822,000**	**$678,000**

* The Initial Project Cost is the projected sum for getting the project started the first year.
** The Recurring Base Cost is the amount that would be incurred each year thereafter to continue the project.
*** A total of eight new FTE positions are included in the proposed projects under this draft plan.
**** All or part of funds would come from TEA-21 Refuge Roads funds.

I. Background

INTRODUCTION

This Draft Environmental Assessment for the Reelfoot and Lake Isom national wildlife refuges was prepared in compliance with the National Environmental Policy Act of 1969 (NEPA). It discusses the purpose and need for the refuges' comprehensive conservation plan and provides an analysis of the impacts that could be expected from each of the management proposals outlined in the plan. This analysis assists the U.S. Fish and Wildlife Service in determining if it will need to prepare an Environmental Impact Statement or a Finding of No Significant Impact for the refuges.

PURPOSE AND NEED FOR ACTION

The purpose of the proposed plan is to specify a management direction and long-term management guidance for refuge managers at the Reelfoot and Lake Isom national wildlife refuges. This management direction will be described in detail through a set of goals, objectives, and strategies in a comprehensive conservation plan. Comprehensive conservation plans are revised every 15 years or sooner.

Management of these refuges is now guided by refuge objectives that are over 19 years old, and implemented by specific step-down management plans. This action is needed to address current management issues, provide long-term management direction for the refuges, and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a comprehensive conservation plan for all national wildlife refuges.

The purposes for the refuges were established by Congress through the Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d) for "... use as an inviolate sanctuary or for other management purposes, for migratory birds." The Fish and Wildlife Act of 1956 established additional refuge purposes to be "... for the development, advancement, management, conservation, and protection of fish and wildlife resources" (16 U.S.C. 742f(a)(4)), and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition or servitude ..." (16 U.S.C. 742 (b)(1)). Later, the Refuge Recreation Act of 1962 (16 U.S.C. 460K-1) identified additional purposes for which the refuges were suitable, including "... (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..."

This Draft Environmental Assessment was prepared using guidelines established under the NEPA. The NEPA requires the Service to examine the effects of its proposed actions on the natural and human environment. In the following sections, we describe four alternatives for future refuge management, the environmental consequences of each alternative, and our preferred management direction. Each alternative was designed as a reasonable mix of fish and wildlife habitat prescriptions and wildlife-dependent recreational opportunities, with the preferred alternative recommended based on its environmental consequences and it ability to achieve the refuges' establishing purposes.

The Draft Comprehensive Conservation Plan (Section A), which is ultimately derived from this Draft Environmental Assessment, will set the management direction for the refuges for the next 15 years. As stated above, the refuges are currently guided by step-down management plans based on 19-

year-old objectives. This draft environmental assessment presents four management alternatives for the future of the refuges. The preferred alternative was tentatively selected based on its ability to meet the identified goals. These goals may be considered as the primary need for action. The goals for the refuges were developed by the planning team and encompass all aspects of refuge management, including fish and wildlife population management; habitat management; visitor services and environmental education; refuge administration and operation; and land protection and conservation. Each of the four management alternatives described in this environmental assessment will, in part, strive to achieve the following goals:

- **Fish and Wildlife Populations Management:** Contribute to the population goals and objectives established in regionally, nationally, and internationally significant and relevant management plans, including the North American Waterfowl Management Plan; Lower Mississippi River Joint Venture Plan; Partners in Flight; Shorebird Management Manual; Lower Mississippi River Ecosystem Plan; West Tennessee Wildlife Resources Conservation Plan; and other plans relevant to west Tennessee and the Lower Mississippi River Valley.

- **Habitat Management:** Restore, enhance, and manage the various habitats found on the refuges in order to maintain the natural diversity, abundance, and ecological function of communities characteristic of Lower Mississippi Valley bottomland hardwoods and associated habitat types, with an emphasis on critical habitat needs for wintering waterfowl and other migratory birds.

- **Visitor Services and Environmental Education:** Develop an appropriate and compatible program of wildlife-dependent recreation and education/interpretation that is consistent with the National Wildlife Refuge System Improvement Act of 1997 and that will benefit refuge visitors while promoting an understanding of the Lower Mississippi River Valley ecosystem.

- **Refuge Administration and Operation:** Develop and implement a comprehensive refuge management program to ensure that present and future operational, administrative, and personnel objectives will be achieved.

- **Land Protection and Conservation:** Provide for the protection and management of natural resources, including cultural resources, within or in proximity to the refuges.

DECISION FRAMEWORK

The Regional Director of the U.S. Fish and Wildlife Service, Southeast Region, will need to make two decisions based on this Draft Environmental Assessment: (1) selection of an alternative, and (2) determination if the selected alternative is a major federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement. The planning team has recommended Alternative D to the Regional Director. The Draft Comprehensive Conservation Plan (Section A) was developed for implementation based on this recommendation.

PLANNING STUDY AREA

This Draft Environmental Assessment considers four management alternatives for the Reelfoot and Lake Isom national wildlife refuges (described in Chapter II, Alternatives), with consideration also given to lands within the refuges' approved acquisition boundaries (Figures 6 and 7), as well as other lands immediately adjacent to and directly affected by the management of the refuges. This proposed plan also takes into account the proposed management actions for three other west

Tennessee national wildlife refuges—Chickasaw, Lower Hatchie, and Hatchie—as well as landscape-level planning objectives developed by an interagency team in the production of the West Tennessee Wildlife Resources Conservation Plan (TWRA and USFWS 2002) (Figure 2).

Reelfoot National Wildlife Refuge is located in rural northwestern Tennessee, in Lake and Obion counties, Tennessee, and Fulton County, Kentucky. It lies about 8 miles northeast of the town of Tiptonville and within four miles of the Mississippi River (Figure 8). The refuge currently covers a total of 10,428 acres (as of June 1, 2004), and has an approved acquisition boundary that includes an additional 7,587 acres of land, for a potential total of 18,015 acres.

Lake Isom National Wildlife Refuge is located 1.5 miles south of Reelfoot Lake, approximately 5 miles southeast of the town of Tiptonville. It currently covers a total of 1,850 acres (as of June 1, 2004) and has an approved acquisition boundary that includes an additional 5,283 acres of land, for a potential total of 7,133 acres.

SCOPING OF THE ISSUES

The Service included the involvement of the public in its developed of this draft plan. Once the planning team was assembled, a wide variety of people from the general public, other federal, state, and local government agencies, nongovernmental organizations, educational institutions, and private businesses were contacted and involved.

The planning process began in January 2000, when a core group composed of Service employees, representatives from the Tennessee Wildlife Resources Agency, and Partners in Flight met to discuss the scope of the planning effort and the issues that would likely affect the future of the refuges. The team met several times during the year to conduct a cooperative biological review with the State of Tennessee and other partners (see Chapter I, Background, in the Draft Comprehensive Conservation Plan, Section A). In November 2000, a public scoping meeting was held to solicit comments and suggestions from the general public on the management issues concerning the refuges. Additional public comments were received through focus group meetings, personal contacts, and by mailed and web page responses. Chapter II, The Planning Process (Section A) provides more details on the scoping of issues.

ISSUES AND CONCERNS

A wide range of issues, concerns, and opportunities were addressed during the planning process. Numerous discussions among citizens, focus group participants, resource specialists, and the refuge planning staff brought to light several recurring themes. In general, conservation management themes centered primarily on public access; consumptive and nonconsumptive recreational opportunities and facilities; and wildlife management techniques. Alternatives were formulated to address the following issues, which were raised during internal and public scoping:

- More and improved public access, including better roads and trails.
- Development of additional recreational use facilities, including nature trails and boardwalks.
- More hunting and fishing opportunities.
- More nonconsumptive recreational opportunities, including environmental education, wildlife observation, and photography.
- More land acquisition.
- Develop Lake Isom's water management capabilities.
- More food plots and stockings to promote the refuges' wildlife populations.

A complete listing and further discussion of these issues and concerns can be found in Chapter II, The Planning Process, of the Draft Comprehensive Conservation Plan (Section A).

II. Alternatives

FORMULATION OF ALTERNATIVES

Four management alternatives were developed by the planning team. They are based on the issues, concerns, and opportunities that were identified by the Service and the public during the public scoping process. Management alternatives are different approaches or combinations of management actions designed to achieve the refuges' purposes and vision; the goals of the National Wildlife Refuge System; and the mission of the U.S. Fish and Wildlife Service. They describe the desired resource conditions and visitor experiences for specific geographic areas or specific resource types, wherever they occur on the refuges.

The four alternatives were developed with the assumption that new private resources are possible from volunteers, grant funds, etc., along with the possibility of modest funding increases for the refuge program and/or staff. Such increases should be supported by legitimate needs and purposes on the refuges, and would be subject to available funding.

In this Draft Environmental Assessment, the specific impacts of implementing each alternative are examined in five broad issue categories. Each category is listed below, followed by the types of questions that were considered during the development of the alternatives.

- **Fish and Wildlife Populations Management:** Can we meet the target waterfowl population objectives established for the Reelfoot and Lake Isom national wildlife refuges? Will the proposed management alternative support the establishing purposes of the refuges? Will the proposed management scenario benefit natural biodiversity and protect threatened and endangered species that inhabit the refuges? How do we deal with wildlife populations, such as beaver, which negatively affect the refuges' vegetation and habitat management capabilities?

- **Habitat Management:** What level of habitat restoration and maintenance is appropriate given funding constraints and desired future conditions? Will the management alternative provide the proper balance of moist soil and cropland to meet the habitat needs for targeted waterfowl populations? Does the forest management plan provide a balanced approach from a standpoint of wildlife management and natural biodiversity? Does the current mix of habitat types meet the needs of all wildlife species using the refuges? Will land acquisitions continue within the refuges' approved acquisition boundaries?

- **Visitor Services and Environmental Education:** What is the appropriate level of recreational activities on refuge lands? Do the refuges adequately meet the mandate to provide quality wildlife-dependent recreation? What are the appropriate nonwildlife-dependent recreational activities on refuge lands? Will the quality of environmental education, both on-site and through outreach, be improved in the future?

- **Refuge Administration and Operation:** Is available funding being used effectively to accomplish refuge priorities? What other sources of income exist and what can refuge managers do to acquire additional funding? What areas of the refuges are in need of additional maintenance? How can law enforcement efforts on the refuges be improved within budget constraints? What additional staff positions would most effectively serve to advance the goals and purposes of the refuges?

- **Land Protection and Conservation:** What opportunities exist for new partnerships and how can existing partnerships be improved and expanded? What aspects of surrounding land uses threaten the integrity of ecological processes on the refuges? What can the refuges do to control or reduce negative impacts to cultural and natural resources found on or in the vicinity of the refuges?

DESCRIPTION OF ALTERNATIVES

The following describes the general features of each refuge management alternative.

ALTERNATIVE A: NO ACTION (CURRENT MANAGEMENT)

Under this alternative, the refuges' current management and public outreach practices would be continued with no changes. The refuge staff would continue to restore and maintain bottomland hardwood forests and moist soil habitat on existing lands, and no additional moist soil units would be developed. The existing cropland habitat units would be maintained. Under current management, new lands would continue to be acquired within the refuges' approved acquisition boundaries, as willing sellers and funding become available.

Control of exotic plants or nuisance wildlife populations, including beaver, would be continued at current levels to protect trust resources. Seasons and access for hunting and fishing would continue as they currently exist, including the seasonal closure of waterfowl sanctuaries. No new visitor education facilities would be built. Only limited improvements would be made to the refuges' existing environmental education exhibits and interpretive materials.

Please refer to Chapter III, Refuge Description, in the Draft Comprehensive Conservation Plan (Section A) for additional details about the refuges' current management.

ALTERNATIVE B: PUBLIC USE EMPHASIS

This alternative would emphasize recreational uses and environmental education while maintaining a low-maintenance approach to managing habitats. Additional staff and resources would be dedicated to allow for more public use activities in all areas of the refuges. Bottomland hardwood forests and moist soil habitat would be maintained on existing refuge lands, but no additional moist soil units would be developed. The cropland acreage would be reduced to accommodate increased public use programs.

New lands would continue to be acquired within the refuges' approved acquisition boundaries, as willing sellers and funding become available. Priority lands for acquisition under this alternative would be those lands that provide the greatest potential for additional public use opportunities.

Control of exotic plants and nuisance wildlife populations would be kept to a minimal and reactive level. Beaver control would be conducted only where necessary to protect the properties of adjoining landowners. However, the deer herd would be controlled through public hunting, which would be expanded under this alternative. Hunting and fishing seasons and regulations would be examined to provide fewer restrictions and more opportunities.

Secondary recreational uses would be considered for compatibility on Refuge lands. The environmental education program could see a visitor education facility, exhibits, and interpretive

materials. Additional staff and/or volunteers would be added in an effort to increase on-site public contacts, including enhanced environmental education and interpretation programs on the refuges.

ALTERNATIVE C: HABITAT MANAGEMENT EMPHASIS

Alternative C emphasizes the active and intensive management of existing fish, wildlife, and plant habitats. Additional staff and resources would be dedicated to allow for more habitat management activities in all areas of the refuges, such as tree plantings in converted bottomland forests and prescribed burning. Integrated biological controls and harvest methods would be used to control exotic plant or nuisance wildlife species. The biological research and monitoring program would also receive more attention.

The refuge staff would continue to restore and maintain existing bottomland hardwood forest and moist soil units, and additional moist soil units would be developed on existing and newly acquired lands. Cropland habitats would be managed by cooperative and force-account farming, and additional units would be developed on newly acquired lands.

New lands would continue to be acquired within the refuges' approved acquisition boundaries, as willing sellers and funding become available. Under this alternative, the priority lands for acquisition in this alternative would be those that provide the greatest potential for additional habitat protection or restoration opportunities.

In contrast to the expanding habitat work, new recreational opportunities for visitors would not be pursued. Environmental education and outreach programs would remain at the year 2004 level or below. Hunting and fishing seasons and access would continue, but with the possibility of more seasonal closures to protect sensitive wildlife resources. The environmental education program could see a new visitor facility but only minimal improvements in existing exhibits and interpretive materials. A slight increase in public awareness of the refuges is expected due to land protection efforts.

ALTERNATIVE D: BALANCED PUBLIC USE AND HABITAT MANAGEMENT (PROPOSED ACTION)

The preferred alternative would promote more active management of the refuges' existing fish, wildlife, and plant habitats, as well as improved recreational experiences for visitors. The refuge staff would continue to restore and maintain existing bottomland hardwood forest and moist soil units, and develop additional moist soil units on existing and newly acquired lands. Cropland habitats would be managed by cooperative and force-account farming, and additional units would be developed on newly acquired lands. Integrated biological controls and harvest methods would be used to more intensively manage wildlife populations and to control exotic plant or nuisance wildlife species.

New lands would continue to be acquired within the refuges' approved acquisition boundaries, as willing sellers and funding become available. The priority lands for acquisition in this alternative would be those that provide potential for additional habitat protection or restoration opportunities, as well as possible public use opportunities.

Hunting and fishing seasons and regulations would be examined to provide compatible access and opportunities. Seasonal closures of waterfowl sanctuaries would continue. The environmental education program would see a new visitor education facility as funding becomes available. Some improvements in existing exhibits and interpretive materials would also occur. New public outreach strategies would result in greater public understanding and advocacy for refuge resources. Enhanced

programs would provide more opportunities for public use, including environmental education and interpretation, wildlife observation, and photography.

COMPARISON OF ALTERNATIVES

Table 2 on the following pages provides a side-by-side comparison of the four alternatives. The intent is to make the differences between alternatives readily apparent. Each alternative, if implemented, will accomplish the refuges' vision and purposes to some degree, while addressing the issues and concerns in different ways. In some cases there may be no difference or only a slight difference between alternatives. However, it should be clear that each alternative offers a different management approach to addressing the issues and concerns.

Table 2. Comparison of management alternatives for Reelfoot and Lake Isom National Wildlife Refuges.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Fish and Wildlife Populations Management				
Threatened and Endangered Species (T&E Species)	Monitoring of bald eagles and interior least tern.	Monitoring of bald eagles and interior least tern. Develop interpretive materials to supplement T&E species management.	Increase closures if needed to eliminate disturbance of bald eagles.	Same as Alternatives B and C combined.
Nuisance Wildlife and Invasive Species Control	Control beaver populations to minimize loss of trust, threatened, endangered, and resident species. Mechanical and chemical control of noxious and/or invasive plants.	Control beaver populations to minimize loss of trust, threatened, and endangered species. Reactive control only. Public education of nuisance wildlife and invasive species control.	Control beaver populations to benefit and increase trust, threatened, endangered, and resident species. Mechanical and chemical control of noxious and/or invasive plants.	Same as Alternative A. Increase public awareness of nuisance wildlife and invasive species control.
Neotropical Migratory Songbirds	Continue long-term monitoring of existing populations and habitat.	Increase interpretive and education efforts to promote nongame bird conservation activities while providing public use access.	Develop management plans/guidelines for priority species and manage habitat essential to maintaining viable populations.	Develop management plans/guidelines for priority species and manage habitat essential to maintaining viable populations. Increase interpretive and education efforts to promote nongame bird conservation activities.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Migratory Waterfowl and Shorebirds	Limited access and maximum protection. Manage populations for Mississippi Alluvial Valley (MAV) target goals through habitat management. Seasonal closures of sanctuaries.	Enforce minimum legal protection and reduce closures to public access. Enhance public viewing opportunities.	Enhance water management capability, farming, and monitoring for target MAV population goals. Seasonal closures of sanctuaries.	Enhance habitat and water management capability, farming, and monitoring for target MAV population goals. Enhance public viewing opportunities while enforcing limited access and maximum protection. Seasonal closures of sanctuaries.
Resident Wildlife	Monitor, protect, and control for healthy population levels.	Maximize public access and hunting opportunities. More public education about resident species.	Increase levels of monitoring to accomplish optimum population goals.	Increase levels of monitoring to accomplish optimum population goals. More public education about resident species.
Fisheries	Monitor and protect at current levels.	Increased public access and fishing opportunities.	Increase level of monitoring. Expand protection areas near sensitive wildlife habitats.	Increase level of monitoring. Increase public fishing opportunities.
Habitat Management				
Forests	Conduct forest management practices to achieve habitat management goals and objectives. Intensive restoration (tree planting) and natural regeneration of selected open land.	No active management. Develop interpretive and education programs regarding bottomland hardwood forests in the MAV.	Conduct forest management practices to achieve habitat management goals and objectives. Intensive restoration (tree planting) and natural regeneration of selected and newly acquired open land.	Same as Alternative A. Develop interpretive and education programs regarding bottomland hardwood forests in the MAV.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Moist Soil Units	Develop no additional units. Manage existing units using natural and artificial flooding.	Develop no additional units. Manage existing units at current levels and develop public access opportunities to showcase wildlife benefits of moist soil management.	Renovate existing units and water control structures. Develop new units and water control structures on existing and newly acquired lands. Continue using natural and artificial flooding.	Renovate existing units and water control structures. Develop new units and water control structures on existing and newly acquired lands. Continue using natural and artificial flooding. Develop public access opportunities to showcase wildlife benefits of moist soil management.
Croplands	Maintain existing units using cooperative farming management at current levels.	Reduce croplands and shift management emphasis to support increased public use activities.	Maintain and expand existing units using cooperative and force-account farming management. Develop additional units on newly acquired lands.	Maintain and expand existing units using Refuge force-account farming management. Develop additional units on newly acquired lands. Increase public access opportunities.
Aquatic Resources	Monitor and protect at current levels.	Monitor and protect at current levels and provide public with information about refuge aquatic resources.	Enhance habitat through active habitat management and restoration projects.	Same as Alternatives B and C combined.
Visitor Services and Environmental Education				
Fishing	Maintain refuge facilities that support sport fishing at current levels. Continue seasonal closures during waterfowl hunting season.	Develop and increase facilities and access to refuge waters to support sport and commercial fishing.	Increase monitoring of fisheries and provide seasonal closures near sensitive aquatic habitat.	Increase monitoring of fisheries and improve existing facilities that support sport fishing access.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Hunting	Maintain existing facilities and open areas (identified in hunt brochures) at current levels.	Examine seasons and regulations for maximum opportunities and access.	Monitor hunter impacts and use and consider increased closures to protect waterfowl and T&E species habitats and populations.	Examine seasons and regulations for compatible ways to expand hunting opportunities and access, and to enhance refuge hunting experience. Monitor consumptive use through improved data collection and increased monitoring.
Wildlife Observation and Photography	Maintain existing trails, brochures, and tours at current levels. Add kiosks and observation platforms near existing facilities.	Develop self-guided trails, brochures, and signs for wildlife observation and photography. Add kiosks and observation platforms. Open refuges to increased access year-round.	Examine appropriateness of existing trails and tours in light of optimum resource management goals. Some reductions in opportunities due to additional seasonal closures.	If appropriate, increase facilities and guided tours. Add kiosks and observation platforms.
Environmental Education (EE) and Interpretation	Maintain existing visitor education facilities and interpretive materials that educate visitors about refuge programs.	Increase EE activities, interpretive materials, facilities, and staff and provide year-round experiences. Add new visitor education facility.	Possible new visitor education facility. Examine appropriateness of trails and access in light of optimum resource management goals.	Same as Alternatives B and C combined.
Outreach and Awareness	Continue partnering with the state. Maintain existing techniques and partnerships to promote public awareness of fish and wildlife conservation and federal and state programs.	Continue partnering with the state. Develop new signs, brochures, partnerships, and techniques to expand public awareness of fish and wildlife conservation and federal and state programs.	Continue partnering with the state. Examine appropriate level of level of public information sharing, in keeping with optimum resource management goals.	Same as Alternative B.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Refuge Administration and Operation				
Maintenance	Maintain current level of facilities maintenance, based on budget limitations.	Increase maintenance efforts for public use facilities while reducing maintenance efforts for habitat management facilities.	Increase maintenance efforts for habitat management facilities while reducing maintenance efforts for public use facilities.	Increase maintenance of public use and habitat management facilities.
Law Enforcement (LE)	Maintain current staff levels to support existing refuge programs.	Increase law enforcement capability as needed to monitor increased public use.	Decrease LE for reduced public use opportunities. Possible increase in resource law enforcement capability as needed to monitor newly acquired lands.	Increase law enforcement capability to monitor increased public use and newly acquired lands and associated wildlife resources.
Staff	Maintain current staff to support existing refuge programs.	Increase staff to facilitate larger public use program.	Increase staff for habitat management on newly acquired lands while reducing staff for public use programs.	Increase staff as needed to facilitate larger public use program and for habitat management on newly acquired lands.
Operations	Maintain current operations capability to support existing refuge programs.	Increase operations capabilities for public use programs while reducing capabilities for habitat management programs.	Increase operations capabilities for habitat management programs while reducing capabilities for public use programs.	Explore possibilities for increased operations capability for both public use and habitat management programs.
Land Protection and Conservation				
Land Acquisitions *	Land acquisitions within the refuges' approved acquisition boundaries would continue as willing sellers and funding become available.	Same as Alternative A, but with priority on acquiring lands with greatest potential for public use.	Same as Alternative A, but with priority on acquiring lands with greatest potential for habitat protection or restoration.	Same as Alternative A, with priority on lands that can provide both public use and habitat protection/restoration potential.
Technical Assistance	Provide current level of technical assistance to landowners, agencies, and individuals.	Decrease emphasis on lands outside refuges as more emphasis is placed on public use of refuge lands.	Explore new techniques and programs for assisting landowners and partners. Increase in staffing.	Same as Alternative C.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Resource Protection	Provide current levels of awareness and protection to cultural and natural resources.	Focus on protection of cultural and natural resources on existing refuge lands. More efforts at public education regarding resource protection.	As public use is reduced, increase protection for cultural and natural resources on existing and newly acquired lands.	Increase levels of awareness of cultural and natural resources on existing and newly acquired lands. Maintain protection at current levels

* Note: As of May 1, 2004, Reelfoot National Wildlife Refuge included a total of 10,428 acres. The refuge's approved acquisition boundary includes an additional 7,587 acres. Acquisition of the entire approved acquisition area could increase the Reelfoot refuge to a total of 18,015 acres. As of May 1, 2004, Lake Isom National Wildlife Refuge included a total of 1,850 acres. The refuge's approved acquisition boundary includes an additional 5,283 acres. Acquisition of the entire approved acquisition area could increase the Lake Isom refuge to a total of 7,133 acres.

III. Affected Environment

Please refer to Chapter III of the Draft Comprehensive Conservation Plan (Section A) for a description of the affected environment.

IV. Environmental Consequences

EFFECTS COMMON TO ALL ALTERNATIVES

The specific environmental and social impacts of implementing each alternative are evaluated in five broad issue categories: fish and wildlife populations management; habitat management; visitor services and environmental education; refuge administration and operation; and land protection and conservation. However, a few potential effects would be the same under each alternative; these are summarized below.

FISH, WILDLIFE, AND HABITAT

Each alternative would protect habitat types important to migratory birds, mammals, reptiles, amphibians, fish, and invertebrates, including threatened and endangered species. Alternative B would provide the least amount of habitat protection and management emphasis, while Alternatives C and D would provide the most protection and management. Implementation of any of the four alternatives would benefit and not likely adversely affect endangered or threatened species or habitats.

Overall foraging habitat for waterfowl and shorebirds should improve under all alternatives, because of improvements to moist soil and cropland habitats. Benefits to refuge waterfowl and shorebirds may be less as a result of less protection and increased public access in Alternative B.

At least one active bald eagle nest has been documented on the refuges. All four alternatives would ensure minimal disturbances to bald eagles and any eagle nests that may occur on refuge lands. Alternative B might result in a slight increase in disturbance to bald eagles, while Alternative C would provide a greater level of protection from disturbance to bald eagles.

Deer health surveys indicate that deer populations on the refuges are currently at carrying capacity. Under all alternatives, forest and cropland management actions would result in stable or increasing deer populations, as habitat management actions increase the carrying capacity of refuge lands. Increased access and public use under Alternative B could impact deer movement and population levels, as more hunting opportunities are provided. All the alternatives include deer population control through a hunt program.

All alternatives provide additional protection to wetlands beyond the protection afforded by existing wetland regulations. Under all alternatives, the riparian areas would be protected and would provide travel corridors between the refuges and private lands adjacent to the refuges. Subject to landowner control, wildlife corridors would be restored by private landowners who enroll their lands in private lands conservation programs.

Under all four alternatives, refuge visitation for priority public uses would be expected to build over time as lands are acquired and operational funds are provided. The number of visitors would depend on the season and would grow as the land base increases and more public use programs are provided. Wildlife-dependent recreation described under Alternatives A, B, and D would support the greatest increase in economic activity. Economic benefits would result from increased visitation to the refuges and would directly improve the value of goods and services to local communities such as Tiptonville and Union City.

All four alternatives would decrease gross property tax revenues as additional lands are acquired; however, there would be an increase in refuge revenue-sharing payments, as well as increases to the local economy resulting from refuge visitations. The Refuge Revenue Sharing Act requires the Fish and Wildlife Service to make payments to local taxing authorities to offset the loss in tax revenue when land is purchased for a refuge.

Recent trends demonstrate a decline in federal farm subsidies for crop production (U.S. Department of Agriculture Economic Research Service 2001). Crop prices nationwide have declined as well. As a result, real estate trends demonstrate a marked increase in farm land sales. There is a positive benefit (including tax relief to heirs) for farmers in the Lower Mississippi Valley to restore conditions of marginal farm lands and forest lands located in flood-prone areas for wildlife, and to enroll properties in conservation easements. All four alternatives advocate the Service acquiring lands in Lake and Obion counties, Tennessee, and in Fulton County, Kentucky, to enlarge the refuges, thereby reducing the available acreage that could be developed. Lands adjacent to the refuges may increase in value, largely due to the value of those properties to private hunting clubs.

Under any of the four alternatives, there would be no significant detrimental impacts to floodplains, prime and unique farmlands, or state-owned conservation areas. Neither minority and low-income populations nor Indian trust resources would be impacted under any of the four alternatives.

AIR AND WATER QUALITY

Because of extensive reforestation, subsequent increases in biomass, and decreases in agricultural activities, air quality should improve from current levels under all alternatives. Habitat management involving prescribed burning may occur according to an approved Fire Management Plan, currently being developed as part of the comprehensive conservation planning process. Smoke management practices will be implemented during all burning events.

All alternatives would positively impact soil formation processes on lands the refuges acquire. Some disturbances to surface soils and topography would occur at those locations selected for administrative, maintenance, and visitor facilities, as well as in areas targeted for wildlife management practices. Each alternative would protect the natural hydrology of the affected areas. Each alternative would prevent substantial agricultural acreage from being developed if the Service acquired properties or provided assistance to landowners and local conservation partners. Each alternative would maintain groundwater recharge areas and natural catchments to hold and absorb surface waters, thereby minimizing flooding. Refuge management activities and visitor use should not negatively affect water quality. All alternatives would positively impact water quality in individual streams. Other positive impacts include runoff prevention, sediment retention, and minimizing nonpoint source pollution. Land acquisition in erosion-prone areas would improve water quality in the vicinity of the refuges.

CULTURAL RESOURCES

The U.S. Fish and Wildlife Service is responsible for managing archaeological and historic sites found on its lands. All four management alternatives afford land protection and low levels of development, thereby producing little negative effect on the cultural and historic environment. Potentially negative actions could include logging and constructing new trails, roads, or facilities. In most cases, these management actions would require review by the Service's Regional Archaeologist and consultation with the Tennessee Historic Preservation Office, as mandated by Section 106 of the National Historic Preservation Act. Cultural resources surveys on the refuges have been limited and indicate that other cultural sites likely exist. Determining whether a particular action within an alternative has the

potential to affect cultural or archaeological resources is an ongoing process that would occur with the planning stages of every project. The Service's policy is to preserve these resources in the public trust, avoiding impacts whenever possible.

WILDERNESS AREAS

There are no designated wilderness areas within the refuges.

ENVIRONMENTAL JUSTICE

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

None of the management alternatives described in this Draft Environmental Assessment would disproportionately place any adverse environmental, economic, social, or health impacts on minority or low-income populations. Implementation of any action alternative that includes public use and environmental education would actually provide a benefit to citizens living in the vicinity of the refuges.

CLIMATE CHANGE IMPACTS

The U.S. Department of the Interior issued an order in January 2001 requiring its federal land management agencies to consider the potential impacts of climate change as part of their long-range planning efforts.

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

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

Preserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in the Draft Comprehensive Conservation Plan would preserve or restore land and water, and would thus enhance carbon sequestration. This in turn would contribute positively to efforts to mitigate human-induced global climate changes.

SUMMARY OF EFFECTS BY ALTERNATIVE

This section summarizes the environmental consequences of each refuge management alternative. Table 3 provides a side-by-side comparison of the likely outcomes for the specific issues and is organized by broad issue categories.

ALTERNATIVE A: NO ACTION (CURRENT MANAGEMENT)

Under this alternative, the current management and public outreach practices would be continued with little or no significant improvements to the refuges' overall programs in all five broad use categories (fish and wildlife populations management; habitat management; visitor services and environmental education; refuge administration and operation; and land protection and conservation) (see Table 3). Maintenance and enhancement of bottomland hardwood forests and moist soil habitat would continue at present levels. No additional moist soil units would be developed. Maintenance of existing cropland habitats would continue to provide an important source of food for wildlife. Ongoing monitoring efforts would continue to address habitat quality and wildlife distribution and population levels. Land acquisitions from willing sellers within the refuges' approved acquisition boundaries would continue at the current level.

Hunting and fishing seasons and regulations, as well as seasonal closures, would continue to be used to limit disturbance for waterfowl and other wildlife species. Improvements to existing exhibits and interpretive materials would be used to inform and educate visitors about fish and wildlife management issues. No new visitor education facility would be built.

ALTERNATIVE B: PUBLIC USE EMPHASIS

This alternative would result in greater levels of public recreational uses and environmental education while maintaining only a minimal level of habitat management. Public use opportunities would increase as staff time and resources are shifted to emphasize public use programs. An enhanced environmental education program, including a possible new visitor facility, would provide more facilities and programs with higher quality environmental education and interpretation opportunities for refuge visitors. The refuges' current management would be examined for possible additional hunting and fishing opportunities and access, as well as possible reductions in seasonal closures.

The refuges' bottomland hardwood forests and moist soil habitats would be less intensively managed as staff and resources are shifted to public use programs. Additional staff and resources would be dedicated to allow for more public use activities in all areas of the refuges. Law enforcement and monitoring of visitor activities would be increased. No new moist soil units would be developed, thus limiting the potential for additional waterfowl habitat. Cropland management would be reduced, resulting in less wildlife food production and potentially limiting the refuges' ability to attract and hold targeted waterfowl populations during the winter months. Lands within the refuges' approved acquisition boundaries would be acquired as willing sellers and funding become available, providing expansions to existing refuge lands and additional public use opportunities.

Beaver populations would be controlled only on a reactive basis and may result in increased populations and potential damage to bottomland hardwood forests and waterfowl habitat. More liberal hunting and fishing seasons and regulations, and other compatible public uses, would produce additional public use opportunities. However, this increase in public use could also negatively affect waterfowl populations and other trust species.

ALTERNATIVE C: HABITAT MANAGEMENT EMPHASIS

Alternative C emphasizes the active and intensive management of existing fish, wildlife and plant habitats. Habitat enhancements such as silvicultural treatments, tree plantings, and prescribed burning would enhance the quality of the refuges' habitats and benefit wildlife populations. Proactive control of nuisance wildlife species and the integration of biological controls and harvest methods would ensure more effective and balanced management of wildlife populations and habitat. An increased biological research and monitoring program would enhance understanding of refuge resources and benefit future management efforts.

Continued maintenance of bottomland hardwood forest and moist soil units, and development of additional moist soil units, would provide additional waterfowl habitat. Additional cropland farming units and more intensive management by cooperative and force-account farming would significantly increase the refuges' capability to attract and hold targeted waterfowl populations during the winter months. Land acquisitions, if willing sellers and funding become available, would increase the refuges' capability to protect natural resources.

Public use opportunities would decrease, as new recreational opportunities for visitors would not be pursued under this alternative. Environmental education and outreach programs would remain at the year 2004 level or below. A new visitor education facility could be constructed, but only minor improvements would occur in existing environmental education exhibits and interpretive materials. Hunting and fishing seasons and access would continue, but the possibility of more seasonal closures to protect sensitive wildlife resources might reduce consumptive public use opportunities. A slight increase in public awareness of the refuges is expected due to land protection efforts.

ALTERNATIVE D: BALANCED PUBLIC USE AND HABITAT MANAGEMENT (PROPOSED ACTION)

The preferred alternative would promote more active management of the refuges' existing fish, wildlife, and plant habitats as well as provide higher quality recreational experiences for visitors. Continued maintenance and enhancement of bottomland hardwood forest and moist soil units, along with development of additional moist soil units, would provide additional waterfowl habitat. Additional cropland farming units and more intensive management by cooperative and force-account farming would significantly increase the refuges' capability to attract targeted waterfowl populations during the winter months. Monitoring efforts for habitat quality and wildlife distribution and population levels would be enhanced. Land acquisitions, if willing sellers and funding become available, would increase the refuges' capability to protect resources and provide additional public use opportunities.

Hunting and fishing seasons and access, as well as seasonal closures, would be used to limit disturbances to waterfowl and other wildlife species. A possible new visitor education facility and improvements for existing exhibits and interpretive materials would be used to inform and educate visitors. Public outreach strategies would be examined to provide greater public understanding and advocacy for refuge resources. Enhanced public use programs and facilities would provide more opportunities for high quality public uses, including environmental education and interpretation, wildlife observation, and photography.

CUMULATIVE EFFECTS OF THE PROPOSED ACTION

There would no significant cumulative impacts on the environment. Cumulative impacts are actions that may be generated by various entities, including other federal or state agencies, local agencies, nongovernmental organizations, and private landowners, as each of these groups undertakes actions

related to land uses. The current size, condition, and configuration of the refuges' forests are due to previous commercial harvesting impacts, water development projects, and agricultural activities. Cumulatively, these actions have resulted in a lack of sufficient protected native bottomland hardwood forests and forest structures and conditions needed to support increases in forest-breeding birds or the protection and recovery of threatened and endangered species.

The forest wetland environment is heavily influenced by agriculture and water development activities, resulting in diminished quality of the waters, soils, and air. These actions are cumulative and occur throughout the Lower Mississippi Valley. Pollution sources in the Lower Mississippi Valley include animal waste; agricultural chemicals; construction; logging; hazardous materials spills; sand and gravel extractions; junkyards; landfills; litter; and debris. These pollution sources are generated by human populations and are cumulative over time. Threats to the refuges' fish and wildlife resources would primarily be from outside their boundaries through increased habitat fragmentation, nutrient loading, and erosion.

UNAVOIDABLE ADVERSE EFFECTS OF THE PROPOSED ACTION

Unavoidable adverse impacts are projected based on changes in the levels of management activities described in the Service's proposed action. The effects on the quality of the human environment are not likely to be highly controversial or involve highly uncertain, unique, or unknown environmental risks to the human environment. If implemented, Alternative D would not lead to a violation of federal, state, or local laws imposed for the protection of the environment.

Some forest management practices, construction of visitor facilities, and increased visitation may affect local air and water quality, natural vegetation, and soil compaction. Increased visitation would also mean additional disturbances to both resident and migratory wildlife. Increased visitation for wildlife-dependent recreational and environmental education programs may generate public safety issues; more visitors occupying a limited amount of space. Additional hunting could result in increased conflicts, with some user groups opposing such activity. Wildlife harvests through hunting and trapping would reduce the number of certain species, enabling other species of management concern to increase or recover. Such management actions are necessary in order for the Service to carry out its wildlife resource protection mandates. Although some unavoidable adverse impacts are expected, the benefits to wildlife and habitats outweigh these impacts.

In terms of financial impacts, the residential or industrial development potential of acquired lands would be precluded, which could result in impacts to the local economy. Also, the local governments would not receive the fiscal benefits of increased property tax receipts. However, this type of impact is expected to be minor. Additionally, the Service is committed to working with willing sellers. It can be assumed that property owners who give up their development rights, by willingly selling their lands, do not expect the development potential of their lands to increase greatly, or are simply more interested in land conservation than in any monetary gains. Further, the Service makes in-lieu tax payments to the counties.

Other positive financial effects include spending associated with refuge visitation. In a recent study entitled, *Banking On Nature 2002: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*, economists found that in 2002, more than 35.5 million visits to national wildlife refuges fueled more than $809 million in the sales of recreation equipment, food, lodging, transportation, and other expenditures. That figure is more than double the $401.1 million generated in 1995, the last time the study was conducted (U.S. Fish and Wildlife Service 2003b).

SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE PROPOSED ACTION

Short- and long-term effects describe the relationship between short-term uses of the human environment and maintenance of long-term productivity of the environment.

Short-term economic effects would occur as a result of land purchases. There would be short-term impacts on tax collections for the year in which a property is acquired. In the long term, however, land protection would reduce municipal service costs, while providing an increased quality of life, essential habitat for wildlife, and outdoor recreation. Any loss in local taxes would be at least partially offset by the annual refuge revenue-sharing payments, as well as by the economic benefits associated with refuge visitation as stated previously.

In the long run, the local economy would be positively impacted by increased spending on environmental programs. The programs would attract visitors and impact tourism and recreation in the region. In the long term, the adverse impacts would be mitigated or offset by the positive impacts from increased open space and quality habitat for plants and animals.

All long-term impacts on biological resources are expected to be beneficial. Sites attracting threatened and endangered species would receive the highest priority for protection. Important stopover, feeding, and breeding habitat for migratory birds would be targeted for acquisition. Aquatic species, wide-ranging wildlife species, and species that require active management would benefit from the habitat improvements, restoration, and land protection actions outlined in the Draft Comprehensive Conservation Plan. Technical assistance, environmental education, Partners in Flight grants, and Challenge Cost-Share Program grants would enhance area-sensitive species on dedicated open space, privately owned lands, and refuge lands.

The development of visitor center facilities, trails, observation platforms, hunter check stations, wetland restoration projects, and forest management practices would result in both short-term and long-term physical impacts on soil and vegetation. These impacts would be localized and confined to the immediate area of the development or construction sites. The increased attention to environmental education and recreation programs would result in more audiences being involved in environmental education and recreation and would provide for a greater appreciation of the land.

Long-term beneficial effects include the increased productivity of threatened and endangered species, songbirds, waterfowl, shorebirds, white-tailed deer, small game, and a myriad of other species dependent on refuge habitats. The public would also gain long-term opportunities for recreation and education on some refuge tracts.

Short-term use of refuge lands includes forest regeneration and prescribed restoration improvements, wetlands enhancement, exotic plant control, management for selected species, wildlife inventories, water quality monitoring, and the administration of education and visitor use programs and facilities. These activities could be implemented with a primary goal of assuring the sustained productivity of refuge resources.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES TO THE PROPOSED ACTION

Irreversible commitments of resources are those which cannot be reversed and result when an area cannot be returned to its natural condition for an extended period of time. For example, the depletion of old-growth forests is irreversible. Irretrievable commitments of resources occur when a renewable resource is allocated to a given use and cannot be recovered without significant effort.

The costs associated with land acquisition for the refuges would be irreversible. Refuge land acquisition removes the land from private ownership, as well as any potential development benefits. However, such land, once placed in public ownership under the National Wildlife Refuge System, provides a new set of uses and benefits a much broader group of people. Traditional public uses may change, since public uses on a refuge must be shown to be appropriate and compatible with the purposes for which the land is acquired. Structural improvements that are purchased with any land may be declared surplus to government needs, and sold or demolished on site. Federal ownership may affect surrounding land use patterns, local economies, and county tax revenues. Property located adjacent to refuge lands generally increases in value, landscapes become protected, revenues to local service businesses increase, and costs to local counties for services decrease.

Management of the refuges and lands acquired would result in an irreversible and irretrievable commitment of funding for operations, administration, and management. Funding and personnel commitments by the Service to purchase and manage refuge lands and facilities render those resources unavailable for other Service programs and projects. The more public use activities and facilities provided, the greater the operating and maintenance costs involved.

Any wetland restoration project would be considered irreversible. Following restoration, the Clean Water Act would make it very difficult to reconvert wetlands on a national wildlife refuge to a drained condition. Irreversible loss of habitat, as part of the Service's proposed action, would occur at construction sites of new facilities.

Animal and plant populations are renewable in different degrees. Construction sites and some habitat management practices may irretrievably damage natural communities, at least for a period of time. These activities would be managed in such a way that the health and viability of wildlife populations would not be threatened.

Table 3. Comparison of environmental consequences of management alternatives for Reelfoot and Lake Isom National Wildlife Refuges.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Fish and Wildlife Populations Management				
Threatened and Endangered Species (T&E Species)	Stable. Management minimizes disturbance of bald eagles.	Possible increased disturbance of bald eagles as a result of increased public use. Increased public awareness.	Reduced disturbance of bald eagles.	Same as Alternative A. Possible increases in T&E species due to enhanced management and increased public awareness.
Nuisance Wildlife and Invasive Species Control	Stable to decreased beaver populations due to control. Reduction of noxious and/or invasive plants.	Stable to increased beaver populations due to limited and reactive control only. Increased public awareness.	Reduced beaver population and greater level of habitat protection through more beaver control.	Same as Alternative C.
Neotropical Migratory Songbirds	Stable but with increasing understanding as a result of ongoing monitoring and study.	Greater public awareness but possible increased disturbance due to increased public access.	Benefits to populations as silvicultural practices enhance habitat.	Same as Alternative C. Increasing understanding as a result of ongoing monitoring and study. Increased public awareness.
Migratory Waterfowl and Shorebirds	Stable through limited access and maximum protection. Target MAV population levels through habitat management.	Increased public access, resulting in increased disturbance, could have impacts upon population levels and distribution patterns.	Population increases due to enhanced management.	Population increases due to enhanced management. Increases in public viewing visitations may slightly increase disturbance.
Resident Wildlife	Stable with monitoring, protection, and control.	Possible increased disturbance, due to increased public use, including possible impacts on wildlife behavior, distribution, and abundance. Increased public awareness.	Stable to increased through increased monitoring and intensive management.	Same as Alternative C.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Fisheries	Stable through current monitoring and protection.	Possible increased disturbance due to increased public access.	Positive impacts through increased monitoring and protection. Possible reduction in public use opportunities.	Positive impacts through enhanced management and increased monitoring. More public use opportunities.
Habitat Management				
Forests	Benefits to forest resources through sound silvicultural practices including, but not limited to, planting and natural regeneration on selected open lands.	Reduction in benefits as result of no active management. Possible increased disturbance through increased public access. Increased public awareness.	Benefits to forest resources through sound silvicultural practices including, but not limited to, planting and natural regeneration on selected and newly acquired open lands.	Benefits to forest resources through sound silvicultural practices including, but not limited to, planting and natural regeneration on selected and newly acquired open lands. Increased public awareness.
Moist Soil Units	Beneficial impacts through intensive management of existing units.	Stable impacts with management of existing units and no additional units developed. Increased public awareness.	Beneficial impacts through intensive management and additional units developed on existing and newly acquired lands.	Beneficial impacts through intensive management and additional units developed on existing and newly acquired lands. Increased public awareness.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Croplands	Stable impacts due to ongoing management and maintenance of existing units.	Reduction in wildlife benefits due to reduction in cropland management. Increased public awareness.	Beneficial impacts due to development of additional units on existing and newly acquired lands and more intensive management, including cooperative and force account farming.	Beneficial impacts due to development of additional units on existing and newly acquired lands and more intensive management, including force account farming. Increased public awareness.
Aquatic Resources	Stable impacts with monitoring and protection.	Increased public awareness.	Enhancement through land acquisitions and more intensive management.	Enhancement through land acquisitions and more intensive management. Increased public awareness.
Visitor Services and Environmental Education				
Fishing	Stable impacts under current management.	More opportunities through improved access and facilities. Increased numbers of fishermen (requiring additional enforcement efforts).	Positive benefits from increased monitoring. Benefits to quality of fishing through additional fisheries management activities. Possible reductions in fishing opportunities due to seasonal closures.	More opportunities through improved access and facilities. Positive benefits from increased monitoring. Benefits to quality of fishing through additional fisheries management activities.
Hunting	Stable level of opportunities according to existing seasons/units.	Increased opportunities with longer seasons and reduced closures (requiring additional law enforcement efforts). Possible negative impacts to migratory bird target population objectives.	Increased quality of hunting with more intensive management. Possible reduction in opportunities due to additional seasonal closures.	Increased quality of hunting with more intensive management. Possible increased opportunities.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Wildlife Observation and Photography	Stable opportunities through current programs and existing facilities.	Significant increase in opportunities through more trails, facilities, and access.	Fewer opportunities through increased seasonal closures.	More opportunities through land acquisitions and enhanced facilities.
Environmental Education and Interpretation	Increase in opportunities through expanded programs and facilities.	Significant increase in opportunities through facilities, staff, access, and new visitor facility.	Some increase in opportunities due to possible new visitor education facility. Overall, reduced emphasis on program and more seasonal closures.	Same as Alternative B.
Outreach and Awareness	Stable level of public information sharing.	Increased levels through new partnering and information-sharing efforts.	Stable level of public information sharing, in keeping with optimum resource management goals.	Same as Alternative B.
Refuge Administration and Operation				
Maintenance	Current maintenance levels (funding levels inadequate to effectively maintain current programs and facilities).	Increased maintenance of public use facilities; maintenance of habitat management facilities decreases.	Maintenance of habitat management facilities increases with some reduction of maintenance of public use facilities.	Maintenance of both public use facilities and habitat management facilities increases. Budget and personnel needs increase.
Law Enforcement (LE)	Current levels of LE (current levels inadequate to address LE needs).	Increased LE needed due to increased public use plus existing unmet need referred to under Alternative A.	Reduced LE need resulting from less public use balances out increased LE needs on newly acquired lands plus existing unmet need referred to under Alternative A.	Increased LE needed due to newly acquired lands and increased public use plus existing unmet need referred to under Alternative A.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Management Emphasis	Alternative D Balanced Public Use and Habitat Management (Proposed Action)
Staff	Existing staff maintains current programs.	Staff emphasis shifted from habitat management to public use. Possible staff increase needed for increased public use programs.	Shift staff emphasis from public use to habitat management. Possible staff increase needed due to additional land acquisitions.	Staff increases needed for both public use and habitat management programs.
Operations	Current levels of operation maintained as supported by current budget (Refuge resources being adversely impacted by current budgetary shortfall).	Operations emphasis shifted from habitat management to public use programs. Increase in operations funding needs.	Operations emphasis shifts from public use programs to habitat management. Increase in operational budget needs.	Operations needs for both public use and habitat management operations increases. Budget needs increase.
Land Protection and Conservation				
Technical Assistance	Stable impacts as current level of technical assistance is provided to landowners, agencies, and individuals.	Program emphasis decreased. Lands outside refuges negatively impacted due to less protection of soil and water, less revegetation.	Beneficial impacts to lands outside refuges as program is increased. Positive impacts to soil, water, and revegetation of cleared lands.	Same as Alternative C.
Land Acquisitions	Increased protection for any lands acquired within current boundary.	Increased land protection benefits as new lands acquired. Increased public use on newly acquired lands.	Increased land protection benefits as new lands acquired. Increased habitat management on newly acquired lands.	Increased land protection benefits as new lands acquired. Increased public use and habitat management on newly acquired lands.
Resource Protection	Protection of natural and cultural resources is maintained at current levels on refuges and adjacent lands.	Increased public awareness of cultural and natural resources. Some reduction in protection of natural resources due to increased public use.	Greater level of protection for cultural and natural resources on existing and newly acquired lands. Reduced public awareness.	Protection of natural and cultural resources is maintained at current levels on refuges, adjacent lands, and newly acquired lands. Increased public awareness.

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VI. Consultation and Coordination

This Draft Comprehensive Conservation Plan and Environmental Assessment for the Reelfoot and Lake Isom national wildlife refuges was prepared with the participation of Service staff, refuge users, environmental resource professionals, and the local community. The comprehensive planning process began in January 2000, when a Core Group was formed to begin the biological planning for an interagency effort in west Tennessee, which incorporated approximately 10,000 square miles of private, state, and federal lands.

This effort eventually produced the West Tennessee Wildlife Resources Conservation Plan. The WTWR Conservation Plan serves as the biological foundation for the development of comprehensive conservation plans for five national wildlife refuges in west Tennessee, including this plan for the Reelfoot and Lake Isom refuges. Later that same year, the Reelfoot and Lake Isom CCP Technical Team was formed to develop the plan, and in November a public scoping meeting was held in Tiptonville, Tennessee. At the meeting, the public was given the opportunity to comment orally or in writing regarding their perceived issues, concerns, and opportunities for management of the refuge. Additional comments were received by mail, telephone, and e-mail. Presentations on the refuges' comprehensive conservation plan were also given to Rotary clubs in west Tennessee, and the plan was advertised in local newspapers and on radio. A mailing list was developed to keep interested parties informed on the progress of the comprehensive planning effort.

A Reelfoot and Lake Isom Planning Review Group, composed of state and federal agency professionals, nongovernmental organizations, private businessmen, sportsmen, local officials, and others with specific knowledge or interest in the refuge, was developed to oversee the refuges' planning process and solicit suggestions from professional counterparts, local citizens, and private interests. The Planning Review Group also reviewed and provided comments on various drafts of the comprehensive conservation plan as it progressed. The recommendations from these working groups provided valuable information for the authors of this plan. Please see Chapter II of the Draft Comprehensive Conservation Plan for more information on the public scoping and involvement process.

Members of the above-described planning groups are listed below.

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Shorebirds: Keith McKnight, Ducks Unlimited, Chair
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Farm Game: Mark Gudlin, TWRA, Chair
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Big Game: Alan Peterson, TWRA, Chair
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Reptiles and Amphibians: Paul Brown, TWRA, Chair
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Mapping/GIS Technical Group: Jeanette Jones, TWRA, Chair

Appendix I. Glossary

Adaptive Management – A process in which projects are implemented within a framework of scientifically driven experiments to test predictions and assumptions outlined within the comprehensive conservation plan. The analysis of the outcome of project implementation helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alternative – One set of objectives and strategies that could be used to achieve refuge goals and the desired future condition.

Approved Refuge Acquisition Boundary – A refuge boundary which the Fish and Wildlife Service approves for acquisition, contingent upon completion of the planning and environmental compliance process.

Biological Diversity or Biodiversity – The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur. The National Wildlife Refuge System's focus for biodiversity is on indigenous species, biotic communities, and ecological processes.

Bottomland Hardwood Forests – A community of hardwood tree species that are adapted to growing in seasonally saturated soils and may have their roots inundated for a portion of the growing season.

Canopy – A layer of foliage; generally the uppermost layer in a forest stand. Canopy can be used to refer to mid- or understory vegetation in multilayered stands. Canopy closure is an estimate of the amount of overhead tree cover (also canopy cover).

Categorical Exclusion – A classification given to federal actions that do not individually or cumulatively have a significant effect on the human environment, in compliance with the National Environmental Policy Act.

CFR – Code of Federal Regulations.

Compatible Use – A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the refuge manager, will not materially interfere with, or detract from, the fulfillment of the mission or the purposes of the refuge. A compatibility determination supports the selection of compatible uses for a specific refuge and identifies stipulations or limits necessary to ensure compatibility.

Comprehensive Conservation Plan – A document that: describes the desired future conditions of the refuge; provides long-range guidance and management direction for the refuge manager to accomplish the purposes, goals, and objectives of the refuge; and contributes to the mission of the National Wildlife Refuge System.

Conservation Easement – A legal document that provides specific land-use rights to a secondary party. A perpetual conservation easement usually grants conservation and management rights to a party in perpetuity.

Cooperative Agreement – A simple habitat protection action in which no property rights are required. Such an agreement is usually long-term and can be modified by either partner. Lands under a cooperative agreement do not necessarily become part of the National Wildlife Refuge System.

Cooperative Farming – Farming of refuge cropland by private individuals under the terms of a cooperative agreement.

Corridor – A route that allows movement of individual wildlife species from one region or place to another.

Cover Type – The present dominant vegetation type of an area.

Cultural Resources – The remains of sites, structures, or objects used by people of the past.

Deciduous – Pertaining to perennial plants that are leafless for some time during the year.

Ecological Succession – The orderly progression of an area through time, in the absence of disturbance, from one vegetative and faunal community to another.

Ecosystem – A dynamic and interrelating 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 the resources of an ecosystem, taking into account all ecological, social, and economic components that make up the whole of the system. Ecosystem management attempts to ensure that all plants and animals in the ecosystem are maintained at viable levels in native habitats and that basic ecosystem processes are perpetuated.

Emergent Growth/Revegetation – Farmland or logged timber that has been reforested (early succession) or may be naturally revegetated.

Endangered Species – A plant or animal species 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.

Endemic Species – Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Environmental Assessment – A concise document, prepared in accordance with the National Environmental Policy Act, which briefly discusses the purpose and need for a federal action as well as alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether or not to prepare an environmental impact statement or finding of no significant impact. Preparation of the document consists of a systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.

Even-aged Forests – Forests that are composed of trees with a time span of less than 20 years between the age of the oldest and youngest individuals.

Fauna – All of the vertebrate or invertebrate animals of an area.

Federal Trust Species – All species for which the federal government has primary jurisdiction, including federally threatened or endangered species, migratory birds, anadromous fish, and certain marine mammals.

Fee title – The acquisition of most or all of the rights to a tract of land accomplished by a transfer of property rights with the formal conveyance of a title. While a fee title acquisition involves most rights to a property, certain rights may be reserved or not purchased, including water rights, mineral rights, or use reservations (for example, the ability to continue using the land for a specified time period, or the remainder of the owner's life).

Finding of No Significant Impact (FONSI) – A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared.

Force-account Farming – Farming of refuge cropland using refuge staff, equipment, and materials.

Fragmentation – The process of reducing the size and connectivity of habitat patches through land clearing or other development practices, often resulting in the disruption of extensive habitats into isolated and small patches.

Goals – Descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but do not define measurable units.

Geographic Information System – A computer system capable of storing and manipulating spatial data which is used widely in land resource quantification and management.

Habitat – The place where an organism lives. The existing environmental conditions required by an organism for survival and reproduction.

Indicator Species – A species of plant or animal that is assumed to be sensitive to habitat changes and represents the needs of a larger group of species.

Indigenous – Having originated in and being produced, growing, living, or occurring naturally in a particular region or environment.

Inholding – Privately owned land inside the boundary of a national wildlife refuge.

Issue – Any unsettled matter that requires a management decision. Examples could include a threat to natural resources, a conflict in uses, or the presence of an undesirable resource condition.

Mid-successional Forest – A forest generally characterized by an even-aged structure resulting from human disturbances, such as a timber harvest. Mid-successional forest may contain mature trees but the forest as a whole does not exhibit functional or structural characteristics associated with old-growth conditions.

Migratory – Relating to the seasonal movement from one area to another and back.

Monitoring – The process of collecting information to track changes of selected parameters over time.

National Environmental Policy Act of 1969 – Legislation that requires all federal agencies, including the Service, to examine the environmental impacts of their actions and incorporate environmental information and public participation in the planning and implementation of such actions. Federal agencies must integrate this Act with other planning requirements, and prepare appropriate policy documents to facilitate better environmental decision-making.

National Wildlife Refuge – A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System.

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

Native Species – Species that normally live and thrive in a particular ecosystem and are indigenous to the region.

Neotropical Migratory Bird – A bird species that breeds north of the United States/Mexican border and winters primarily south of that border, in an area that includes Mexico, the West Indies, Central America, and part of South America.

Natural Levee – Natural embankment created by soil deposited as a stream over-tops its banks. Located adjacent to a stream, a natural levee is often the highest ground in a bottomland or swamp type area.

Objective – A concise, quantitative (where possible) target statement of a desired management outcome. Objectives are derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific.

Old-growth Forest – Forested areas lacking frequent disturbance to vegetation, usually characterized by dominant species entered into a late successional stage and usually associated with high diversity of species, specialization, and structural complexity.

Planning Area – A designated area encompassed by a specific planning activity. In refuge planning, a planning area may include lands outside the existing unit (refuge) boundaries that are being studied for inclusion in the unit and/or partnership planning efforts.

Planning Team – A planning team prepares the comprehensive conservation plan. Planning teams are interdisciplinary in membership and function. A team generally consists of the planning team leader; refuge manager and staff biologists; staff specialists or other representatives of Service programs, ecosystems, or regional offices; and state-partnering wildlife agencies as appropriate.

Preferred Alternative – This is the Service's selected management alternative as identified in the draft comprehensive conservation plan. The alternative determined by the decision-maker to best achieve the refuge purpose, vision, and goals; contribute to the Refuge System mission and

address the significant issues; and be consistent with principles of sound fish and wildlife management.

Refuge Operating Needs System – A national database that contains the unfunded operational needs of each refuge. Projects included are those required to implement approved plans and meet goals, objectives, and legal mandates.

Refuge Purposes – These are the purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.

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

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

Step-down Management Plans – Step-down management plans provide the details necessary for implementation of management strategies and projects identified in the comprehensive conservation plan.

Strategy – A specific action, tool, technique, or combination thereof, used to achieve unit objectives.

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

Trust Species – Species over which the Service has legal authority or managerial responsibility, such as threatened and endangered species, anadromous fish, and migratory birds.

Understory – Any vegetation with canopy below or closer to the ground than the canopies of other plant layers.

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

Vegetation Type – A categorical description of the existing dominant plant species in a particular area.

Watershed – The entire land area that collects and drains water into a stream or stream system. Similar in meaning to drainage area or drainage basin.

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 Corridor – A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat. Such corridors may facilitate several kinds of traffic, including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal

of juvenile animals. These are transition habitats and need not contain all the habitat elements required by migrants for long-term survival or reproduction.

Wildlife-dependent Recreation – A use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the system.

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

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Appendix III. Relevant Legal Mandates

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.

Americans with Disabilities Act (1992): Prohibits discrimination in public accommodations and services.

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.

Archaeological and Historic Preservation Act (1974): Directs the preservation of historic and archaeological data in federal construction projects.

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.

Architectural Barriers Act (1968): Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977): Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

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.

Endangered Species Act (1973): Requires all federal agencies to carry out programs for the conservation of endangered and threatened species.

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

Executive Order 12372 (Intergovernmental Review of Federal Programs): Directs the Service to send copies of environmental assessments to state planning agencies for review.

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 13006, Locating Federal Facilities on Historic Properties in our Nation's Central Cities: Directs federal agencies to select, utilize, and maintain historic properties and districts, especially those located in the central business districts of cities, whenever operationally appropriate and economically prudent.

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.

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.

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.

Federal Records Act (1950): Directs 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.

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 the Interior to provide public fishing areas and accept donations of lands and funds.

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 of the Interior to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

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.

Land and Water Conservation Fund Act (1965): Uses receipts from the sale of surplus federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

Migratory Bird Conservation Act (1929): Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934): Authorized the opening of part of a refuge to waterfowl hunting.

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 nonfederal, to the hunting of migratory birds.

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.

National Historic Preservation Act (1966), as amended: Requires the federal government to provide leadership in the preservation of the Nation's prehistoric and historic resources.

National Trails System Act: Assigns responsibility to the Secretary of the Interior and thus the Service to protect the historic and recreational values of congressionally designated national historic trail sites.

National Wildlife Refuge System Administration Act (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, and environmental education and interpretation); establishes a formal process for determining compatibility; establishes the responsibilities of the Secretary of the Interior for managing and protecting the System; and requires a comprehensive conservation plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

National Wildlife Refuge System Improvement Act (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.

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.

Refuge Recreation Act (1962): Allows the use of refuges for recreation when such uses are compatible with a refuge's primary purposes and when sufficient funds are available to manage the uses.

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.

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.

Rivers and Harbors Act (1899) (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.

Surface Mining Control and Reclamation Act (1977), as amended (Public Law 95-87): Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating certain areas as unsuitable for coal mining operations.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act (1948): Provides that upon a determination by the Administrator of the U.S. General Services Administration, real property no longer needed by a federal agency can be transferred without reimbursement to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.

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.

Wilderness Act (1964), as amended: Directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within the National Wildlife Refuge System and National Park System, and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System.

Appendix IV. Refuge Biota

MAMMALS OF WEST TENNESSEE

Scientific Name	Common Name
Blarina carolinensis	Southern Short-tailed Shrew
Canis latrans	Coyote
Castor canadensis	Beaver
Corynorhinos rafinescruii	Rafinesque's Big-eared Bat
Cryptotis parva	Least Shrew
Dasypus novemcinctus	Nine-banded Armadillo
Didelphis marsupialis	Opossum
Eptesicus fuscus	Big Brown Bat
Felis rufus	Bobcat
Glaucomys volans	Southern Flying Squirrel
Lasionycteris noctivagans	Silver–haired Bat
Lasiurus borealis	Red Bat
Lasiurus cinereus	Hoary Bat
Lasiurus seminolus	Seminole Bat
Lutra canadensis	River Otter
Marmota monax	Woodchuck
Mephitis mephitis	Striped Skunk
Microtus ochrogaster	Prairie Vole
Microtus pinetorum	Pine Vole
Mus musculus	House Mouse
Mustela frenata	Longtail Weasel
Mustela vison	Mink
Myotis austroriparius	Southeastern Myotis
Myotis lucifugus	Little Brown Bat
Neotoma floridana	Eastern Woodrat
Nycticeius humeralis	Evening Bat
Ochrotomys nuttallii	Golden Mouse
Odocoileus virginianus	White-tailed Deer
Ondatra zibethicus	Muskrat
Oryzomys palustris	Marsh Rice Rat
Peromyscus gossypinus	Cotton Mouse
Peromyscus leucopus	White-footed Mouse
Peromyscus maniculatus	Deer Mouse
Pipistrellus subflavus	Eastern Pipistrelle
Procyon lotor	Raccoon
Rattus norvegicus	Norway Rat
Reithrodontomys humulis	Eastern Harvest Mouse
Reithrodontomys megalotis	Western Harvest Mouse
Scalopus aquaticus	Eastern Mole
Sciurus carolinensis	Eastern Gray Squirrel
Sciurus niger	Eastern Fox Squirrel
Sigmodon hispidus	Hispid Cotton Rat

Scientific Name	Common Name
Sorex longirostris	Southeastern Shrew
Spilogale putoris	Spotted Skunk
Sylvilagus aquaticus	Swamp Rabbit
Sylvilagus floridanus	Eastern Cottontail
Synaptomys pinetorum	Southern Bog Lemming
Tamias striatus	Eastern Chipmunk
Urocyon cinereoargenteus	Gray Fox
Vulpes fulva	Red Fox
Zapus hudsonius	Meadow Jumping Mouse

Source: TWRA and USFWS 2002.

AMPHIBIANS OF WEST TENNESSEE

Scientific Name	Common Name	Current Status*
Frogs and Toads:		
Acris crepitians crepitians	Northern Cricket Frog	A
Acris gryllus grullus	Southern Cricket Frog	LC
Bufo americanus charlessmithi	Dwarf American Toad	C
Bufo woodhousii fowler*i*	Fowler's Toad	SA
Gastrophryne carolinensis	Eastern Narrow-mouthed Toad	A
Hyla avivoca	Bird-voiced Treefrog	LC
Hyla chrysoscelis versicolor	Gray Treefrog	SA
Hyla cinerea	Green Treefrog	LC
Pseudacris crucifer crucifer	Northern Spring Peeper	A
Pseudacris triseriata feriarum	Upland Chorus Frog	A
Rana areolata circulosa	Northern Crawfish Frog	U
Rana catesbieana	Bullfrog	A
Rana clamitans clamitans or melanota	Greenfrog	A
Rana palustris	Pickerel Frog	U
Rana utricularia	Southern Leopard Frog	A
Scaphiopus holbrooki holbrooki	EasternSpadefoot Toad	LC
Salamanders:		
Ambystoma maculatum	Spotted Salamander	LC
Ambystoma opacum	Marble Salamander	LC
Ambystoma talpoideum	Mole Salamander	U
Ambystoma texanum	Small-mouthed Salamander	C
Ambystoma tigrinum tigrinum	Eastern Tiger Salamander	R
Amphiuma tridactylum	Three-toed Amphiuma	C
Desmognathus fusus conanti	Spotted Dusky Salamander	LC
Eurycea cirrigera	Southern Two-lined Salamander	A
Eurycea longicauda	Long-tailed Salamander	SU
Necturus maculosus maculosus	Mudpuppy	U
Notophthalmus viridescens louisianensis	Central Newt	LC
Plethedon mississippii	Mississippi Slimy Salamander	C
Pseudotriton ruber vioscai	Southern Red Salamander	A
Siren intermedia nettingi	Western Lesser Siren	LC

*Current Status: This column indicates current status of species in West Tennessee. Key: SA - Super Abundant; A – Abundant; C – Common; LC - Locally Common; U – Uncommon; R – Rare; SU - Status Unknown.

Source: TWRA and USFWS 2002.

REPTILES OF WEST TENNESSEE

Scientific Name	Common Name	Current Status*
Lizards:		
Cnemidophorus sexlineatus sexlineatus	Six-lined Racerunner	U
Eumeces fasciatus	Five-lined Skink	A
Eumeces laticeps	Broad-head Skink	A
Ophisaaurus attenuatus longicaaudus	Eastern Slender Glass Lizard	U
Sceloporus undulatus hyacinthinus	Northern Fence Lizard	A
Scincella lateralis	Ground Skink	SA
Snakes:		
Agkistrodon contortrix contortrix or mokasen	Southern or Northern Copperhead	C
Agkistrodon piscivorus leucostoma	Western Cottonmouth	LC
Carphphis amoenus helenae	Midwest Worm Snake	U
Cemophora coccinea copei	Northern Scarlet Snake	R
Coluber constrictor priapus or latrunculus	Southern Black Racer	A
Crotalus horridus atricaudatus	Canebrake Rattlesnake	U
Diadophis punctatus strictogenys	Mississippi Ringneck Snake	A
Elaphe obsoleta spiloides	Gray Rat Snake	A
Faracura abacura reinwardtii	Western Mud Snake	R
Heterodon platyrhinos	Eastern Hognose Snake	U
Lampropeltis caligaster caligaster or rhombomaculata	Prairie King Snake	U
Lampropeltis getula nigra or holbrooki	Speckled King Snake	C
Lampropeltis triangulum syspila of elapsoides	Red Milk Snake	U
Nerodia cyclopion	Green Water Snake	U
Nerodia erythrogaster flavigaster	Yellow-bellied Water Snake	C
Nerodia fasciata confluens	Broad-banded Water Snake	C
Nerodia rhombifer	Diamondback Water Snake	C
Nerodia sipedon pleuralis	Midland Water Snake	C
Opheodrys aestivus	Rough Green Snake	C
Storeiria decayi wrightorum	Midland Brown Snake	C
Storeiria occipitmaculata occipitmaculata or obscura	Northern or Florida Red-bellied Snake	U
Tantilla coronata	Southeastern Crowned Snake	U
Thamnophis proximus proximus	Western Ribbon Snake	U
Thamnophis sauritus sauritus	Eastern Ribbon Snake	C
Thamnophis sirtalis sirtalis	Eastern Garter Snake	SA
Virginia valeriae elegans	Western Smooth Earth Snake	U

Scientific Name	Common Name	Current Status*
Turtles:		
Apalone mutica mutica	Smooth Softshell Turtle	U
Apalone spinifera spinifera	Eastern Spiny Softshell	C
Chelydra serpentina	Common Snapping Turtle	A
Chrysemys picta dorsalis	Southern Painted Turtle	U
Graptemys kohnii	Mississippi Map Turtle	U
Graptemy pseudogeographica ouachitensis	Ouachita Map Turtle	C
Kinosternon subrubrum subrubrum or hippocrepis	Eastern or Mississippi Mud Turtle	U
Macroclemys temminckii	Alligator Snapping Turtle	R
Pseudemys cocinna hieroglyphica or metteri	Missouri River Cooter	A
Sternotherus odoratus	Stinkpot Turtle	SU
Terrapene carolina carolina	Eastern Box Turtle	C
Trachemys scripta carolina	Red-eared Slider	SA

*Current Status: This column indicates current status of species in west Tennessee. Key: SA - Super Abundant, A - Abundant, C - Common, LC - Locally Common, U - Uncommon, R - Rare, SU - Status Unknown.

Source: TWRA and USFWS 2002.

BIRDS OF WEST TENNESSEE AND RESIDENCE STATUS

Scientific Name	Common Name	Residence	Status
Accipiter cooperii	Cooper's Hawk	Permanent resident	State Thr.
Accipiter striatus	Sharp-shinned Hawk	Migrant	State Thr.
Actitis macularia	Spotted Sandpiper	Migrant	
Agelaius phoeniceus	Red-winged Blackbird	Permanent resident	
Aix sponsa	Wood Duck	Breeds	
Ammodramus leconteii	LeConte's Sparrow	Migrant	
Ammodramus savannarum	Grasshopper Sparrow	Breeds	State Thr
Ammospiza caudacuta nelsoni	Nelson's Sharp-tailed Sparrow	Migrant	
Anas acuta	Northern Pintail	Migrant	
Anas americana	American Widgeon	Migrant	
Anas clypeata	Northern Shoveler	Migrant	
Anas crecca	Green-winged Teal	Migrant	
Anas discors	Blue-winged Teal	Migrant	
Anas platyrhynchos	Mallard	Breeds	
Anas rubripes	American Black Duck	Migrant	
Anas strepera	Gadwall	Migrant	
Anhinga anhinga	Anhinga	Migrant	
Anser albifrons	Greater White-fronted Goose	Migrant	
Anthus spinoletta	American Pipit	Migrant	
Aquila chrysaetos	Golden Eagle	Migrant	State End.
Archilochus colubris	Ruby-throated Hummingbird	Breeds	
Ardea herodias	Great Blue Heron	Permanent resident	
Asio flammeus	Short-eared Owl	Migrant	
Aythya affinis	Lesser Scaup	Migrant	
Aythya collaris	Ring-necked Duck	Migrant	
Aythya marila	Greater Scaup	Migrant	
Aythya mericana	Redhead	Migrant	
Aythya valisineria	Canvasback	Migrant	
Batramia longicauda	Upland Sandpiper	Migrant	
Bombycilla cedrorum	Cedar Waxwing	Migrant	
Botaurus lentiginosus	American Bittern	Migrant	
Branta canadensis	Canada Goose	Resident/migrant	
Bubo virginianus	Great Horned Owl	Permanent resident	
Bubulcus ibis	Cattle Egret	Summer resident	
Bucephala albeola	Bufflehead	Migrant	
Bucephala clangula	Conmon Goldeneye	Migrant	
Buteo jamaicensis	Red-tailed Hawk	Permanent resident	
Buteo lagopus	Rough-legged Hawk	Migrant	
Buteo lineatus	Red-shouldered Hawk	Permanent resident	
Buteo platypterus	Broad-winged Hawk	Summer resident	
Butorides striatus	Green Heron	Breeds	
Calcarius lapponicus	Lapland Longspur	Migrant	

Scientific Name	Common Name	Residence	Status
Calidris himantopus	Stilt Sandpiper	Migrant	
Calidris mauri	Western Sandpiper	Migrant	
Calidris melanotos	Pectoral Sandpiper	Migrant	
Calidris minutilla	Least Sandpiper	Migrant	
Calidris pusilla	Semipalmated Sandpiper	Migrant	
Caprimulgus carolinensis	Chuck-will's-widow	Migrant	
Caprimulgus vociferus	Whip-poor-will	Migrant	
Cardinalis cardinalis	Northern Cardinal	Permanent resident	
Carduelis pinus	Pine Siskin	Migrant	
Carduelis tristis	American Goldfinch	Permanent resident	
Carpodacus mexicanus	House Finch	Breeds	
Carpodacus purpureus	Purple Finch	Migrant	
Casmerodius albus	Great Egret	Summer resident	
Cathartes aura	Turkey Vulture	Permanent resident	
Catharus fuscescens	Veery	Migrant	
Catharus guttatus	Hermit Thrush	Migrant	
Catharus minimus	Gray-cheeked Thrush	Migrant	
Catharus ustulatus	Swainson's Thrush	Migrant	
Catoptrophorus semipalmatus	Willet	Migrant	
Certhia americana	Brown Creeper	Migrant	
Ceryle alcyon	Belted Kingfisher	Permanent resident	
Chaetura pelagica	Chimney Swift	Summer resident	
Charadrius melodus	Piping Plover	Migrant	
Charadrius semipalmatus	Semipalmated Plover	Migrant	
Charadrius vociferus	Killdeer	Permanent resident	
Chen caerulescens	Snow Goose	Migrant	
Chen rossii	Ross' Goose	Migrant	
Chlidonias niger	Black Tern	Migrant	
Chondestes grammacus	Lark Sparrow	Migrant	
Chordeiles minor	Common Nighthawk	Summer resident	
Circus cyaneus	Northern Harrier	Migrant	State Thr.
Cistothorus platensis	Sedge Wren	Migrant	
Cistothorus plaustris	Marsh Wren	Migrant	
Coccothraustes vespertinus	Evening Grosbeak	Accidental	
Coccyzus americanus	Yellow-billed Cuckoo	Migrant/Breed	
Colaptes auratus	Northern Flicker	Permanent resident	
Colinus virginianus	Northern Bobwhite	Permanent resident	
Columba livia	Rock Dove	Permanent resident	
Colymbus auritus	Horned Grebe	Migrant	
Contopus borealis	Olive-sided Flycatcher	Breeds	
Contopus virens	Eastern Wood Peewee	Breeds	
Coragyps atratus	Black Vulture	Permanent resident	
Corvus brachyrhynchos	American Crow	Permanent resident	
Corvus ossifragus	Fish Crow	Permanent resident	
Cyanocitta cristata	Blue Jay	Permanent resident	
Cygnus columbianus	Tundra Swan	Migrant	

Scientific Name	Common Name	Residence	Status
Dendroica castanea	Bay-breasted Warbler	Migrant	
Dendroica cemlea	Cerulean Warbler	Breeds	
Dendroica coronata	Yellow-rumped Warbler	Migrant	
Dendroica discolor	Prairie Warbler	Migrant	
Dendroica dominica	Yellow-throated Warbler	Breeds	
Dendroica fusca	Blackbumian Warbler	Migrant	
Dendroica magnolia	Magnolia Warbler	Migrant	
Dendroica pensylvanica	Chestnut-sided Warbler	Migrant	
Dendroica petechia	Yellow Warbler	Breeds	
Dendroica pinus	Pine Warbler	Migrant	
Dendroica striata	Black-poll Warbler	Migrant	
Dendroica tigrina	Cape May Warbler	Migrant	
Dendroica virens	Black-throated Green Warbler	Migrant	
Dolichonyx oryzivorus	Bobolink	Permanent resident	
Dryocopus pileatus	Pileated Woodpecker	Permanent resident	
Dumetella carolinensis	Gray Catbird	Breeds	
Egretta caerulea	Little Blue Heron	Summer Resident	
Egretta thula	Snowy Egret	Summer Resident	
Empidonax minimus	Least Flycatcher	Migrant	
Empidonax traillii	Willow Flycatcher	Breeds	
Empidonax virescens	Acadian Flycatcher	Breeds	
Eremophila alpestris	Horned Lark	Permanent resident	
Eudocimus albus	White Ibis	Migrant	
Euphagus carolinus	Rusty Blackbird	Migrant	
Euphagus cyanocephalus	Brewer's Blackbird	Migrant	
Falco peregrinus	Peregrine Falcon		
Falco sparverius	American Kestrel	Permanent resident	
Fulica americana	American Coot	Migrant	
Gallinago gallinago	Common Snipe	Migrant	
Gallinula chloropus	Common Moorhen	Migrant	
Gavia immer	Common Loon	Migrant	
Geothlypis trichas	Common Yellowthroat	Breeds	
Guiraca caerulea	Blue Grosbeak	Breeds	
Haliaeetus leucocephalus	Bald Eagle	Migrant/Breeds	Fed. Thr.
Helmitheros vermivorus	Worm-eating Warbler	Migrant	
Himantopus mexicanus	Black-necked Stilt	Migrant	
Hirundo pyrrhonota	Cliff Swallow	Breeds	
Hirundo rustica	Barn Swallow	Breeds	
Hydranassa tricolor ruficollis	Tri-colored Heron	Summer occasional	
Hylocichla mustelina	Wood Thrush	Breeds	
Icteria virens	Yellow-breasted Chat	Breeds	
Icterus galbula	Northern Oriole	Breeds	
Icterus spurius	Orchard Oriole	Breeds	
Ictinia mississippiensis	Mississippi Kite	Migrant/Breeds	State End.

Scientific Name	Common Name	Residence	Status
Ictinia mississippiensis	Mississippi Kite	Migrant/Breeds	State End.
Ixobrychus exilis	Least Bittem	Migrant	
Junco hyemalis	Dark-eyed Junco	Migrant	
Lanius ludovicianus	Loggerhead Shrike	Permanent resident	
Larus argentatus	Herring Gull	Migrant	
Larus delawarensis	Ringed-billed Gull	Migrant	
Larus philadelphia	Bonaparte's Gull	Migrant	
Limnodromus griseus scolopaceus	Long-billed Dowitcher	Migrant	
Limnodromus griseus	Short-billed Dowitcher	Migrant	
Limnothlypis swainsonii	Swainson's Warbler	Breeds	
Lophodytes cucullatus	Hooded Merganser	Permanent resident	
Melanerpes carolinus	Red-bellied Woodpecker	Permanent resident	
Melanerpes erythrocephalus	Red-headed Woodpecker	Permanent resident	
Meleagris gallopavo	Wild Turkey	Permanent resident	
Melospiza georgiana	Swamp Sparrow	Migrant	
Melospiza lincolnii	Lincoln's Sparrow	Migrant	
Melospiza melodia	Song Sparrow	Permanent resident	
Mergus merganser	Common Merganser	Migrant	
Mergus serrator	Red-breasted Merganser	Migrant	
Mimus polyglottos	Northern Mockingbird	Permanent resident	
Mniotilta varia	Black and White Warbler	Migrant	
Molothrus ater	Brown-headed Cowbird	Permanent resident	
Myiarchus crinitus	Great Crested Flycatcher	Breeds	
Parus carolinensis	Carolina Chickadee	Permanent resident	
Nycticorax nycticorax	Black-crowned Night-Heron	Permanent resident	
Nycticorax violaceus	Yellow-crowned Night-Heron	Summer Resident	
Oporomis formosus	Kentucky Warbler	Breeds	
Otus asio	Eastern Screech Owl	Permanent resident	
Oxyura jamaicensis	Ruddy Duck	Migrant	
Pandion haliaetus	Osprey	Migrant	State End.
Parula Americana	Northern Parula	Breeds	
Parus bicolor	Tufted Titmouse	Permanent resident	
Passer domesticus	House Sparrow*	Permanent resident	
Passerculus sandwichensis	Savannah Sparrow	Migrant	
Passerella iliaca	Fox Sparrow	Migrant	
Passerina cyanea	Indigo Bunting	Breeds	

Scientific Name	Common Name	Residence	Status
Pelecanus erythrorhynchos	American White Pelican	Year-round	
Pelidna alpine sakhalina	Dunlin	Migrant	
Phalacrocorax auritus	Double-crested Cormorant	Migrant	
Phalaropus fulicarius	Red-necked Phalarope	Migrant	
Pheucticus ludovicianus	Rose-breasted Grosbeak	Migrant	
Picoides pubescens	Downy Woodpecker	Permanent resident	
Picoides villosus	Hairy Woodpecker	Permanent resident	
Pipilo erythrophthalmus	Rufous-sided Towhee	Breeds	
Piranga olivacea	Scarlet Tanager	Migrant	
Piranga rubra	Summer Tanager	Breeds	
Pisobia bairdi	Baird's Sandpiper	Migrant	
Pisobia fuscicollis	White-rumped Sandpiper	Migrant	
Pluvialis dominica	Lesser Golden Plover	Migrant	
Podilymbus podiceps	Pied-billed Grebe	Migrant/Breed	
Polioptila caerulea	Blue-gray Gnatcatcher	Breeds	
Pooecetes gramineus	Vesper Sparrow	Migrant	
Porzana carolina	Sora	Migrant	
Progne subis	Purple Martin	Breeds	
Protonotaria citrea	Prothonotary Warbler	Breeds	
Quiscalus quiscula	Common Grackle	Permanent resident	
Rallus elegans elegans	King Rail	Breeds	
Rallus limicola	Virginia Rail	Migrant	
Recurvirostra americana	American Avocet	Migrant	
Regulus calendula	Ruby-crowned Kinglet	Migrant	
Regulus satrapa	Golden-crowned Kinglet	Migrant	
Riparia riparia	Bank Swallow	Breeds	
Sayornis phoebe	Eastern Phoebe	Breeds	
Scolopax minor	American Woodcock	Breeds	
Seiurus aurocapillus	Ovenbird	Migrant	
Seiurus motacilla	Louisiana Waterthrush	Migrant	
Seiurus noveboracensis	Northern Waterthrush	Migrant	
Setophaga ruticilla	American Redstart	Breeds	
Sialia sialis	Eastern Bluebird	Permanent resident	
Sitta canadensis	Red-breasted Nuthatch	Migrant	
Sitta carolinensis	White-breasted Nuthatch	Permanent resident	
Sphyrapicus varius	Yellow-bellied Sapsucker	Migrant	
Spiza americana	Dickcissel	Breeds	
Spizella passerina	Chipping Sparrow	Breeds	
Spizella pusilla	Field Sparrow	Permanent resident	

Scientific Name	Common Name	Residence	Status
Squatarola squatarola	Black-bellied Plover	Migrant	
Steganopus tricolor	Wilson's Phalarope	Migrant	
Stelgidopteryx serripennis	Northern Rough-winged Swallow	Breeds	
Sterna antillarum	Least Tern	Summer resident	
Sterna caspia	Caspian Tern	Migrant	
Sterna forsteri	Forster's Tern	Migrant	
Sterna hirundo	Common Tern	Migrant	
Streptopelia decaocto	Eurasian Collared-Dove*	Permanent resident	
Strix varia	Barred Owl	Permanent resident	
Sturnella magna	Eastern Meadowlark	Permanent resident	
Sturnus vulgaris	European Starling*	Permanent resident	
Tachycineta bicolor	Tree Swallow	Breeds	
Thryothorus ludovicianus	Carolina Wren	Permanent resident	
Toxostoma rufum	Brown Thrasher	Breeds	
Tringa flavipes	Lesser Yellowlegs	Migrant	
Tringa melanoleuca	Greater Yellowlegs	Migrant	
Tringa solitaria	Solitary Sandpiper	Migrant	
Scientific Name	Common Name	Residence Status	
Troglodytes aedon	House Wren	Migrant	
Troglodytes troglodytes	Winter Wren	Migrant	
Tryngites subruficollis	Buff-breasted Sandpiper	Migrant	
Turdus migratorius	American Robin	Permanent resident	
Tyrannus tyrannus	Eastern Kingbird	Breeds	
Tyto alba	Common Barn Owl	Permanent resident	
Vermivora celata	Orange-crowned Warbler	Accidental	
Vermivora chrysoptera	Golden-winged Warbler	Migrant	
Vermivora peregrina	Tennessee Warbler	Migrant	
Vermivora pinus	Blue-winged Warbler	Migrant	
Vermivora ruficapilla ruficapila	Nashville Warbler	Migrant	
Vireo bellii	Bell's Vireo	Accidental	
Vireo flavifrons	Yellow-throated	Vireo Breeds	
Vireo gilvus	Warbling Vireo	Breeds	
Vireo griseus	White-eyed Vireo	Breeds	
Vireo olivaceus	Red-eyed Vireo	Breeds	
Vireo philadelphicus	Philadelphia Vireo	Migrant	
Vireo solitarius	Blue-headed Vireo	Migrant	
Wilsonia canadensis	Canada Warbler	Migrant	
Wilsonia citrina	Hooded Warbler	Breeds	
Wilsonia pusilla	Wilson's Warbler	Migrant	

Scientific Name	Common Name	Residence	Status
Zenaida macroura	Mourning Dove	Permanent resident	
Zonotrichia leucophrys	White-crowned Sparrow	Migrant	

*Introduced

Sources: Hamel 1992; Nicholson 1997; and Robinson 1990.

FISH LIKELY TO OCCUR IN MISSISSIPPI RIVER PROPER AND ITS DIRECTLY WESTWARD-FLOWING TRIBUTARIES IN WESTERN TENNESSEE

Common Name	Scientific Name
Chestnut Lamprey	*Ichthyomyzon castaneus*
Least Brook Lamprey	*Lamptera aepyptera*
Pallid Sturgeon	*Scaphirhynchus albus*
Paddlefish	*Polyodon spathula*
Alligator gar	*Atractosteus spatula*
Spotted Gar	*Lepisosteus oculatus*
Longnose Gar	*Lepisosteus osseus*
Shortnose Gar	*Lepisosteus platostomus*
Bowfin	*Amia calva*
Goldeye	*Hiodon alosoides*
Mooneye	*Hiodon tergisus*
Skipjack herring	*Alosa chrysochloris*
Gizzard Shad	*Dorosoma cepedianum*
Threadfin Shad	*Dorosoma petenense*
Goldfish*	*Carassius auratus*
Grass Carp*	*Ctenopharyngodon idella*
Bluntface Shiner	*Cyprinella camura*
Red Shiner	*Cyprinella lutrensis*
Blacktail Shiner	*Cyprinella venusta*
Common Carp*	*Cyprinus carpio*
Cypress (Silver) Minnow	*Hybognathus hayi*
Mississippi Silvery Minnow	*Hybognathus nuchalis*
Pallid Shiner	*Hybopsis amnis*
Striped Shiner	*Luxilus chrysocephalus*
Ribbon Shiner	*Lythrurus fumeus*
Redfin Shiner	*Lythrurus umbratilis*
Speckled Chub	*Macrhybopsis aestivalis*
Sturgeon Chub	*Machrhybopsis gelida*
Silver Chub	*Machrhybopsis storeriana*
Golden Shiner	*Notemigonus crysoleucas*
Orangefin Shiner	*Notropis ammophilus*
Emerald Shiner	*Notropis atherinoides*
River Shiner	*Notropis blennius*
Taillight Shiner	*Notropis maculatus*
Silverband Shiner	*Notropis shumardi*
Mimic Shiner	*Notropis volucellus*
Pugnose Minnow	*Opsopoeodus emiliae*
Bluntnose Minnow	*Pimephales notatus*
Bullhead Minnow	*Pimephales vigilax*
Creek Chub	*Semotilus atromaculatus*
River Carpsucker	*Carpiodes carpio*
Quillback	*Carpiodes cyprinus*
Blue Sucker	*Cycleptus elongatus*
Creek Chubsucker	*Erimyzon oblongus*
Northern Hogsucker	*Hypentelium nigricans*

Common Name	Scientific Name
Smallmouth Buffalo	*Ictiobus bubalus*
Black Buffalo	*Ictiobus niger*
Spotted Sucker	*Minytrema melanops*
Golden Redhorse	*Moxostoma erythrurum*
Blacktail Redhorse	*Moxostoma poecilurum*
Black Bullhead	*Ameiurus melas*
Yellow Bullhead	*Ameiurus natalis*
Blue Catfish	*Ictalurus furcatus*
Channel Catfish	*Ictalurus punctatus*
Tadpole Madtom	*Noturus gyrinus*
Least Madtom	*Noturus hildebrandi*
Brindled Madtom	*Noturus miurus*
Freckled Madtom	*Noturus nocturnus*
Brown Madtom	*Noturus phaeus*
Northern Madtom	*Notorus stigmosus*
Flathead Catfish	*Pylodictis olivaris*
Grass Pickerel	*Esox americanus*
Chain Pickerel	*Esox niger*
Pirate Perch	*Aphredoderus sayanus*
Northern Starhead Topminnow	*Fundulus dispar*
Blackstripe Topminnow	*Fundulus notatus*
Blackspotted Topminnow	*Fundulus olivaceus*
Western Mosquitofish	*Gambusia affinis*
Brook Silverside	*Labidesthes sicculus*
White Bass	*Morone chrysops*
Banded Pygmy Sunfish	*Elassoma zonatum*
Flier	*Centrarchus macropterus*
Green Sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gulosus*
Orange Spotted Sunfish	*Lepomis humilis*
Bluegill	*Lepomis macrochirus*
Dollar Sunfish	*Lepomis marginatus*
Longear Sunfish	*Lepomis megalotis*
Redear Sunfish	*Lepomis microlophus*
Spotted Sunfish	*Lepomis punctatus*
Bantam Sunfish	*Lepomis symmetricus*
Spotted Bass	*Micropterus punctulatus*
Largemouth Bass	*Micropterus salmoides*
White Crappie	*Pomoxis annularis*
Black Crappie	*Pomoxis nigromaculatus*
Naked Sand Darter	*Ammocrypta beani*
Scaly Sand Darter	*Ammocrypta vivax*
Mud Darter	*Etheostoma asprigene*
Bluntnose Darter	*Etheostoma chlorosomum*
Swamp Darter	*Etheostoma fusiforme*
Slough Darter	*Etheostoma gracile*
Harlequin Darter	*Etheostoma histrio*
Brighteye Darter	*Etheostoma lynceum*

Common Name	Scientific Name
Goldstripe Darter	*Etheostoma parvipinne*
Cypress Darter	*Etheostoma proeliare*
Speckled Darter	*Etheostoma stigmaeum*
Gulf Darter	*Etheostoma swaini*
Bandfin Darter	*Etheostoma zonistium*
Blackside Darter	*Percina maculata*
Dusky Darter	*Percina sciera*
River Darter	*Percina shumardi*
Saddleback Darter	*Percina vigil*
Sauger	*Stizostedion canadense*
Freshwater Drum	*Aplodinotus grunniens*

*Introduced

Source: Etnier and Starnes 1993.

MUSSELS KNOWN IN THE OBION AND FORKED DEER RIVERS OF WEST TENNESSEE

Scientific Name	Common Name	Obion River	Forked Deer River	Status
Anadonta suborbicula	Flat Floater	X	X	CS
Arcidens confragosa	Rock Pocketbook	X		CS
Fusconaia flava	Wabash Pigtoe	X		CS
Lampsilis cardium	Plain Pocketbook	X		SC
Lampsilis teres	Yellow Sandshell	X		CS
Lasmigonia complanata	White Heelsplitter	X		CS
Leptodea fragilis	Fragile Papershell	X		CS
Megalonaias nervosa	Washboard	X		CS
Plectomerus dombeyanus	Bankclimber	X		CS
Pyganodon grandis	Giant floater		X	CS
Quadrula pustulosa	Pimpleback	X		CS
Quadrula quadrula	Mapleleaf	X		CS
Tritogonia verrucosa	Pistolgrip	X		CS
Truncilia truncata	Deertoe	X		CS
Uniomerus tetralasmus	Pondhorn		X	CS
Utterbackei imbecilis	Paper Pondshell		X	CS
Villosa lineosa	Little Spectaclecase	X		CS

Status: CS - Currently Stable; SC - Special Concern. X indicates that this species occurs in this river; a blank space indicates that it does not.

Source: Parmalee and Bogan 1998.

FOREST TREES AND SHRUBS KNOWN TO OCCUR ON REELFOOT AND LAKE ISOM NATIONAL WILDLIFE REFUGES

Scientific Name	Common Name
Acer negundo	Boxelder
Acer rubrum	Red Maple
Asimina triloba	Pawpaw
Carya aquatica	Bitter Pecan (Water Hickory)
Carya illinoensis	Sweet Pecan
Carya laciniosa	Shellbark Hickory
Carya ovata	Shagbark Hickory
Carya tomentosa	Mockernut Hickory
Celtis laevigata	Sugarberry
Celtis occidentalis	Hackberry
Cephalanthus occidentalis	Buttonbush
Cercis canadensis	Redbud
Cornus drummondii	Roughleaf Dogwood
Cornus florida	Flowering Dogwood
Diospyros virginiana	Persimmon
Fagus grandifolia	American Beech
Forestiera acuminata	Swamp Privet
Fraxinus pennsylvanica	Green Ash
Gleditsia triacanthos	Honey Locust
Ilex decidua	Possum Haw (Deciduous Holly)
Juglans nigra	Black Walnut
Juniperus virginiana	Eastern Red Cedar
Liquidambar styraciflua	Sweetgum
Liriodendron tulipifera	Yellow Poplar
Morus rubra	Red Mulberry
Nyssa aquatica	Tupelo
Nyssa sylvatica	Black Gum
Planera aquatica	Water Elm
Platanus occidentalis	Sycamore
Populus deltoides	Eastern Cottonwood
Quercus alba	White Oak
Quercus falcata	Southern Red Oak
Quercus falcata var. pagodaefolia	Cherrybark Oak
Quercus lyrata	Overcup Oak
Quercus michauxii	Swamp Chestnut Oak
Quercus nigra	Water Oak
Quercus nuttallii	Nuttall Oak
Quercus palustris	Pin Oak
Quercus phellos	Willow Oak
Quercus shumardii	Shumard Oak
Salix nigra	Black Willow
Sassafras albidum	Sassafras
Taxodium distichum	Baldcypress
Ulmus americana	American Elm

Source: Forestry Records, Reelfoot and Lake Isom NWRs.

HERBACEOUS PLANTS KNOWN TO OCCUR ON REELFOOT AND LAKE ISOM NATIONAL WILDLIFE REFUGES (INCOMPLETE LIST)

Scientific Name	Common Name
Amaranthus retroflexus	Pigweed
Ambrosia artemisiifolia	Common ragweed
Ambrosia trifida	Giant ragweed
Andropogon gerardii	Big bluestem
Andropogon virginicus	Broomsedge
Ammania coccinea	Toothcup
Aster spp.	Aster
Azolla caroliniana	Waterfern
Bidens spp	Beggartick
Chamaecrista fasciculata	Partridge pea
Cyperus erythrorhizos	Red rooted sedge
Cyperus esculentus	Chufa
Cyperus spp.	Flatsedge
Ceratophyllum demersum	Coon's tail
Digitaria didactyla	Crabgrass
Echinochloa colona	Jungle rice
Echinochloa crusgalli	Barnyard Grass
Echinochloa muricata	Wild millet
Eleocharis obtusa	Blunt spikerush
Elodea canadensis	Elodea
Hibiscus moscheutos	Swamp rosemallow
Ipomoea purpurea	Common morning glory
Iva frutescens	Marsh elder
Leersia oryzoides	Rice cut-grass
Lemna spp.	Duckweeds
Leptachloa filiformis	Sprangletop
Nelumbo lutea	American lotus
Nymphaea advena	Yellow pond-lily
Panicum dichotomiflorum	Fall panicum
Panicum virgatum	Switchgrass
Polygonum lapathafolium	Lady's thumb
Polygonum pennsylvanicum	Pennsylvania smartweed
Potamogeton crispus	Curlyleaf pondweed
Pueraria montana	Kudzu
Rhynchospora corniculata	Horned beaked-rush
Sagittaria platyphylla	Delta arrow-head
Saururus cernuus	Lizard's tail
Schizachyrium scoparium	Little bluestem
Sesbania cannabina	Sesbania
Solidago altissima	Goldenrod
Sorgastrum nutans	Indiangrass
Sorghum bicolor	Grain sorghum
Utricularia spp.	Bladderwort
Xanthium strumarium	Cockleburr

Source: Draft Habitat Management Plan, Reelfoot and Lake Isom NWRs.

Appendix V. Decisions and Approvals

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

Originating Person: Randy Cook, Refuge Manager
Telephone Number: 731-287-0650 **E-Mail:** Randy_Cook@fws.gov
Date: _____

PROJECT NAME: Reelfoot and Lake Isom National Wildlife Refuges Comprehensive Conservation Plan

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I. Service Program:
___ Ecological Services
___ Federal Aid
___ Clean Vessel Act
___ Coastal Wetlands
___ Endangered Species Section 6
___ Partners for Fish and Wildlife
___ Sport Fish Restoration
___ Wildlife Restoration
___ Fisheries
_X_ Refuges/Wildlife

II. State/Agency: Tennessee/U.S. Fish and Wildlife Service

III. Station Names: Reelfoot and Lake Isom National Wildlife Refuges

IV. Description of Proposed Action: Implementation of the Comprehensive Conservation Plan for Reelfoot and Lake Isom NWRs by adopting the preferred alternative of Balanced Public Use and Habitat Management which will provide guidance, management direction, and operation plans for the next 15 years.

V. Pertinent Species and Habitat:

A. Include species/habitat occurrence map:

As many as 200 bald eagles are known to winter in the vicinity of Reelfoot and Lake Isom NWRs, with 1 active nest known to exist currently on Lake Isom NWR.

There are active nesting colonies of interior least tern known to exist on Mississippi River sand bars adjacent to the western boundary of Reelfoot NWR. Interior least terns feed regularly on sand bars and in drainage canals within the Refuge boundary.

Pallid sturgeon are known to occur within the Mississippi River. It is possible that pallid sturgeon could enter waterways on Reelfoot NWR during high river stages, however this has never been documented and is unlikely due to their small numbers.

B. Complete the following table:

SPECIES/CRITICAL HABITAT	STATUS[1]
Bald Eagle	T
Interior Least Tern	E
Pallid Sturgeon	E

[1]STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species

VI. Location (attach map):

A. Ecoregion Number and Name: No. 27, Lower Mississippi River

B. County and State: Lauderdale, Tennessee

C. Latitude and longitude:

Approximate center of Reelfoot NWR:	Latitude	36 25 00
	Longitude	89 24 00
Approximate center of Lake Isom NWR:	Latitude	36 18 00
	Longitude	89 25 00

D. Distance (miles) and direction to nearest town: Approximately 8 miles southwest to Tiptonville, TN.

E. Species/habitat occurrence:

Bald eagles occur on the Refuge during winter months. As many as 200 bald eagles are known to winter in the Reelfoot Lake vicinity (which includes Reelfoot and Lake Isom NWRs) and at least 1 active nest is known to currently exist on Lake Isom NWR.

Interior least terns have active nesting colonies on Mississippi River sandbars in close proximity to Reelfoot NWR and occasionally feed on Refuge lands.

Pallid sturgeon are known to occur in the Mississippi River and are likely to occur within close proximity of the Refuge.

VII. Determination of Effects:

A. Explanation of effects of the action on species and critical habitats in item V. B (attach additional pages as needed):

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Bald Eagle	No negative impacts foreseen; more protection.
Interior Least Tern	No negative impacts foreseen; more protection.
Pallid Sturgeon	No negative impacts foreseen; more protection.

B. Explanation of actions to be implemented to reduce adverse effects:

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Bald Eagle	Maintain and expand potential nesting and feeding habitat.
Interior Least Tern	Cooperate with COE to monitor occurrence and protection. active colonies are found. to ensure protection
Pallid Sturgeon	Continue to monitor for possible occurrence in Mississippi River.

VIII. Effect Determination and Response Requested:

SPECIES/ CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE	NA	AA	
Bald Eagle		X		Concurrence
Interior Least Tern		X		Concurrence
Pallid Sturgeon		X		Concurrence

[1]DETERMINATION/RESPONSE REQUESTED:
NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional but a "Concurrence" is recommended for a complete Administrative Record.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a "Concurrence".

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation". Response Requested for proposed or candidate species is "Conference".

_____ _____
signature (originating station) **date**

_____
title

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence _____ Nonconcurrence _____

B. Formal consultation required _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

_____ _____
signature date

_____ _____
title office

COMPATIBILITY DETERMINATIONS – REELFOOT NATIONAL WILDLIFE REFUGE

Introduction

This set of compatibility determinations describes the wildlife-dependent and other uses that may be included in the public use program under the preferred alternative (Alternative D), as described in the Draft Comprehensive Conservation Plan for Reelfoot National Wildlife Refuge. It determines the conditions under which each use is considered compatible with the purposes, vision, and goals of the refuges and the mission of the National Wildlife Refuge System.

Under the National Wildlife Refuge System Administration Act of 1966, the Refuge Recreation Act of 1962, the National Wildlife Refuge System Improvement Act of 1997, and agency policy, the Service may not permit recreational uses on a national wildlife refuge unless those uses are first determined to be compatible wildlife-dependent uses. The needs of fish, wildlife, and plant resources on national wildlife refuges come first. All public uses must be compatible with these resources. A use is compatible if it is determined that the activity does not materially interfere with, or detract from, the fulfillment of the National Wildlife Refuge System mission or the purposes of the refuge. Furthermore, compatible activities which depend on healthy fish and wildlife populations will be recognized as priority public uses. The 1997 law established the priority public uses to be: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Refuge Name: Reelfoot National Wildlife Refuge.

Refuge Uses: The following uses were evaluated to determine their compatibility with the Refuge System mission and the purposes of the refuge: (1) off-road vehicle use by hunters with disabilities; (2) hunting program; (3) recreational fishing and fishing derbies; (4) environmental education and interpretation; (5) wildlife observation and photography; (6) research studies; (7) horseback riding; (8) farming program; (9) forest management; (10) commercial fishing; (11) bicycling; (12) hiking, jogging, and walking; and (13) nonmotorized boating.

Location: Lake County, Tennessee; Obion County, Tennessee; and Fulton County, Kentucky.

Establishing and Acquisition Authority(ies): Migratory Bird Conservation Act, Refuge Recreation Act, Endangered Species Act

Refuge Purpose(s): "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)" . . . suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species . . . " 16 U.S.C. § 460k-1 " . . . the Secretary . . . may accept and use . . . real . . . property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors . . . " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended)."... for the development, advancement, management, conservation, and protection of fish and wildlife resources . . . " 16 U.S.C. § 742f(a)(4) " . . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . . " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956).

National Wildlife Refuge System Mission: 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.

Description of Use: *Off-road Vehicles (for use by hunters with disabilities only)*

Use of off-road vehicles (four-wheel-drive, all-terrain vehicles or ATVs) by disabled hunters is essential in providing adequate hunting opportunities for these individuals. The difficult and often swampy terrain on the refuge makes individual use of ATVs the most cost-effective method of providing access for hunters with disabilities. Use is restricted to transportation to and from designated hunting locations, including the transport of personal gear and game taken by the disabled hunter. Carrying another person or their game is not permitted.

This use would be allowed in designated areas open to hunting on the refuge, and only during established refuge hunting seasons.

Access by disabled hunters is allowed on a case-by-case basis, with applicants providing necessary documentation of disability, request for areas to be accessed, and species sought. Currently the refuge receives 3–5 requests annually from disabled hunters primarily seeking access for deer hunting. The hunters are responsible for providing all equipment and associated assistance during their hunt. This permit grants no other privileges other than access by ATV on designated trails on the refuge, and the permittee must comply with all other refuge and State hunting regulations.

Disabled hunters routinely apply for a special use permit to participate in hunting programs currently offered on the refuge. While these opportunities currently exist on private lands and State WMAs, we still have an obligation to provide access to disabled hunters wishing to utilize the refuge.

Availability of Resources:

Resources involved in the administration and management of the use: Review and issuance of special use permits: $50.00/permit

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Several existing trails will be utilized by disabled hunters. As these trails are currently maintained to support other recreational activities, no additional costs would be attributable to this program.

Monitoring costs: All monitoring of this use will be conducted in conjunction with the refuge hunting program, and no additional costs will be attributed to this program.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Impacts to wildlife, plants, and habitat by the use of ORVs are well documented and some disturbance to wildlife, plants and their habitats is expected to occur. However, this minor impact is acceptable in providing suitable access to disabled hunters who use ATVs to access hunting opportunities on the refuge.

Long-term impacts: No long term impacts are expected, due to the short duration and limited scope of anticipated use.

Cumulative: No cumulative impacts are anticipated with this use.

Determination (check one below):

Off-road vehicles (other)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: The refuge has established a policy for the level of disability that necessitates the use of ORVs for hunting. Prior to issuance of a special use permit, persons applying for disabled hunter status must provide written proof of disability from their physician which is reviewed. All other refuge regulations apply.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreation. Allowing handicapped hunters to use off-road vehicles to pursue their sport provides this group with no more opportunity than that which is afforded to the general public. Provided this activity adheres to the refuge regulations, it is an activity which is compatible with refuge objectives.

Description of Use: *Reelfoot NWR Hunting Program*

The U.S. Fish and Wildlife Service currently allows squirrel, raccoon, deer (archery, muzzleloader, and gun), and turkey hunting on Reelfoot National Wildlife Refuge. Season lengths and regulations vary for each species group, but when open, the entire 10,428 acres of the refuge are available to hunting access. Due to the popularity of deer and turkey hunting on the refuge, firearms deer and turkey hunting opportunities are limited to quota drawings. Season lengths and bag limits are set annually in coordination with the states of Tennessee and Kentucky. Service policy concerning hunting on national wildlife refuges, as recorded in the National Wildlife Refuges Manual section 8 RM 5.1, states: "The Secretary of the Interior is authorized by the National Wildlife Refuge System Administration Act of 1966, as amended, and the Refuge Recreation Act of 1962 to permit hunting on any refuge within the Refuge System upon a determination that hunting is compatible with the major purposes for which such areas were established. Hunting is a priority public use.

Reelfoot National Wildlife Refuge (refuge) is located on and adjacent to Reelfoot Lake in the northwest corner of Tennessee and southwest corner of Kentucky. The entire refuge lies in the flood plain of the Mississippi River. The main ecotype is bottomland hardwood forest. With the exception of administrative sites, the entire refuge is open to hunting activities during part of the hunting seasons, with the exception of administrative sites. The refuge is closed seasonally to all public access to provide sanctuary for wintering migratory birds.

Hunting will be allowed as follows:

A. Squirrel - Approximately six weeks starting on the opening day of the squirrel hunting season in Tennessee. Daily bag limit in accordance with State regulations.
B. Raccoon - At least eight nights occurring before major waterfowl concentrations arrive in mid-November. No bag limit if approved by the State.
C. Deer (Firearms) - Two to four days each fall. If hunter interest remains high, the quota permit system will continue to be used. The hunts are usually scheduled on weekends following the archery season, but before the major influx of waterfowl in mid-November. The bag limit is two deer, only one may be antlered deer. Through mutual agreement with the states of TN and KY this season is established outside the regular deer seasons for each State, and all animals harvested do not count towards the state bag limit. Hunter quota will be annually adjusted based on population indicators.
D. Deer (Archery) - Typically set to run concurrently with the first segment of the Tennessee Archery Deer season. The bag limit shall be the same as set by the licensing State.
E. Turkey - One 3-day hunt each year, typically the second weekend in April. Hunter numbers will be annually adjusted based on population indicators. The bag limit will be one male turkey per hunter. Additional weekends may be added as populations permit

All hunting activities on the refuge are subject to refuge specific regulations published annually in the Federal Register and in the refuge public use brochure/permit, as well as regulations published by the state of Tennessee. Where these regulations differ, the refuge regulations shall supersede those published by the Tennessee Wildlife Resources Agency, or Kentucky Department of Natural Resources.

Hunting was a traditional recreational use of the refuge proper prior to inclusion into the National Wildlife Refuge System, and continues to be a popular recreational pursuit with the public. However, opportunities for hunting have become very limited in the surrounding area due to the posting of private land, major expansion of hunting leased lands, and the significant decline in available wildlife

habitat on private land in the vicinity. Refuge hunting will continue to provide additional public hunting opportunities in a region that is lacking sufficient amounts of acreage open to the public.

Availability of Resources:

Resources involved in the administration and management of the use: Refer to the Reelfoot Hunt Plan, Environmental Assessment, and Section 7 Evaluation.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Road Maintenance - $500.00
Parking Areas - $500.00
Kiosks - $250.00
Signs - $250.00

Monitoring costs: Annual monitoring - $500.00

Offsetting revenues: The refuge is a participant in the Recreational Fee Demonstration Project which currently returns 80% of fees generated from recreational activities back to the refuge. At current levels, this provides approximately $2,500.00 to the refuge to support hunting activities.

Anticipated Impacts of the Use:

Short-term impacts: The opening of Reelfoot National Wildlife Refuge to small game and big game hunting has resulted in only temporary disturbance to refuge habitats and caused no noticeable impact on the abundance of species hunted or other wildlife affected by hunter disturbance. Seasonal zoning to coincide with game species abundance and low waterfowl use periods have resulted in minimal disturbance to migratory waterfowl and permits hunting to occur on the entire 7,600-acre land portion of the 10,427-acre refuge.

Long-term impacts: There has been substantial historical use of this forested wetland area for hunting. Based on available information, there is no indication of adverse biological impacts associated with these activities. The refuge has the latitude to adjust hunting seasons and bag limits annually, or even close the refuge entirely due to safety or habitat condition concerns. This latitude coupled with monitoring of wildlife populations and habitat conditions by both the State Wildlife Resources Agency and the Fish and Wildlife Service ensures long term impacts to either wildlife populations and or habitats on the refuge are unlikely. Limited quota hunts and seasonal closure of the entire refuge are utilized to limit impacts.

Cumulative: The refuge resident small game populations are primarily regulated by environmental influences, including weather, food supply, cover, and disease. The refuge squirrel population, composed primarily of fox squirrels and a few gray squirrels, is notably influenced by the annual supply of mast foods which provide the primary winter sustenance. The squirrel population is cyclic due to its dependence on an unpredictable food supply, but normally provides a fair to good huntable population for the public. Seasonal reduction in the squirrel population by hunting has not affected other forms of recreation or management objectives. The refuge raccoon population is one of the largest and most stable of any in the West Tennessee area. Habitat conditions are ideal due to the great diversity of low terrestrial and aquatic habitats present over the entire refuge. The hunting

public and occasional disease outbreaks (e.g. Distemper) are the only major factors controlling the raccoon population. The annual harvest of raccoons during the usual eight-night season on the refuge is very high, with an average harvest of 300 animals per season. This rate of harvest does not significantly impact the opportunities for wildlife observation as the raccoon is primarily a nocturnal species.

Due to high populations of deer that currently exist on the refuge, we have formulated an agreement with Tennessee and Kentucky to allow deer hunting on the refuge outside the established state seasons. These deer hunts are conducted to optimize hunter utilization of the refuge without impacting wintering waterfowl populations.

Timing and duration of the refuge's hunting program does not coincide with other popular programs on the refuge, and would not result in cumulative impacts to refuge resources.

Determination (check one below):

Hunting	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Hunting and possible conflicts with other refuge objectives are minimized by an annual review of the hunting program. Coordination with Service field and Regional Office personnel and representatives of the Tennessee Wildlife Resources Agency and the Kentucky Department of Fish and Wildlife Resources prevents unnecessary conflicts with other Service and state agency hunting programs. Hunting seasons and bag limits are established annually, and generally fall within the state framework for Tennessee. All hunters are required to possess a free, refuge hunting permit/public use brochure while participating in refuge hunts. Small game hunters must possess steel shot while hunting on the refuge. All other refuge regulations apply. Law Enforcement patrols are conducted throughout the hunt seasons to ensure compliance with refuge laws and regulations. No Waterfowl hunting is allowed on the refuge. All hunts are completed before the start of the waterfowl sanctuary period (November 15 to March 15) thus minimizing potential disturbance.

Justification: The Refuge Recreation Act provides the public with compatible wildlife-oriented recreation opportunities on refuges not specifically established for public use. Hunting has historically been allowed on Reelfoot NWR. This form of outdoor recreation which adheres to the refuge regulations is an activity that is compatible with refuge objectives. Hunting is a viable management tool for controlling wildlife populations.

Description of Use: *Reelfoot Recreational Fishing and Fishing Derbies*

Fishing is the most popular activity on the refuge, as Reelfoot Lake is world renowned for its crappie fishery. Fishing pressure is heaviest during the spring spawning season when flotillas of boats ply these waters in search of bass, crappie, bluegill, and catfish. Fishing for game species (largemouth bass, black and white crappie, bluegill bream, and other sunfish species), and rough fish (catfish, gar, bowfin, carp, and freshwater drum) is permitted on waters of Reelfoot Lake within the Long Point unit of the refuge from March 15- November 15, and fishing is permitted on waters of Reelfoot Lake within the Grassy Island unit from February 1 to November 15 annually. Access is available at several boat ramps on state and privately controlled lands, as well as one refuge boat ramp. Access from the refuge ramp is limited to daylight hours only. Fishing is permitted 24 hours a day on the waters of Reelfoot Lake. Several fishing derbies are held annually at the headquarters ponds for handicapped individuals and area youths.

Reelfoot Lake can be described as a typical lowland cypress swamp that is comprised of a combination of palustrine and lacustrine habitats. Approximately 75 percent of the lake area is open water ranging from 3 feet to 20 feet in depth with the remaining 25 percent a progressively shallower gradient from cypress groves to red oak flats. The abundance of shallow water areas produce tremendous amounts of biomass that feed the large populations of fish that occur. The refuge provides approximately 1,200 acres open water/cypress swamp suitable for recreational fishing. This represents approximately 10% of the nearly 15,000 acres available for fishing on Reelfoot Lake. Most of the waters on the refuge average less than 3 feet in depth and provide excellent fishing opportunities during the spring and fall.

The waters of Reelfoot Lake contained inside the refuge boundary are closed from November 15 to March 15 on the Long Point Unit, and from November 15 to January 31 on the Grassy Island Unit to provide sanctuary for wintering waterfowl and bald eagles.

Fishing is conducted on Reelfoot NWR subject to seasons and regulations established by the Tennessee Wildlife Resources Agency. Fishing is further restricted on the refuge by special refuge regulations which limit access to established boat ramps, prohibits access after dark, prohibits the use of certain fishing methods, prohibits the taking of frogs and turtles, and provides seasonal closures for the benefit of wintering waterfowl and other trust species.

The waters of Reelfoot Lake currently managed as Reelfoot NWR are owned by the State of Tennessee and managed as part of a lease agreement, which requires that the Service provide recreational opportunities, including fishing.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for the fishing program is borne by annual operation and maintenance funds, which include activities involving the public such as recreation, interpretation, environmental education, as well as refuge hunting and fishing programs. The refuge spends approximately $5,000.00 of an annual refuge budget of approximately $500,000 in direct support of the fishing program on Reelfoot NWR. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Annual maintenance of existing boat ramps - $200.00
Annual maintenance of existing parking areas - $250.00
Annual maintenance of existing roads - $500.00

Monitoring costs: Monitoring - $1,000

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Minor impacts such as littering and gasoline contamination will occur but not at a level that would cause great concern. Historically, fishing has been one of the most prominent activities on the refuge resulting in only temporary disturbance to refuge habitats and wildlife populations and causing no noticeable impact on the abundance of species sought or other wildlife. Seasonal closure of the refuge virtually eliminates any impacts of sport fishing during critical periods on wintering trust species. Anglers accessing the refuge during the open fishing season can create disturbance to resident bald eagles that may be nesting nearby. This has not yet caused a problem, but will be monitored for any detrimental effects to the bald eagle population.

Long-term impacts: No long-term impacts are expected.

Cumulative: No cumulative impacts are known to occur.

Determination (check one below):

Fishing (general) Boating (motorized)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Refuge fishing seasons are set within the constraints permitted by the state of Tennessee and participants must comply with State fishing and boating regulations. Law Enforcement efforts will be directed at ensuring compliance with State and refuge regulations. Boat launching is allowed only at ramp located at the terminus of the Grassy Island Auto Tour Route A. All public access to waters within the Grassy Island unit prohibited from November 15 through January 31.B. All public access to waters within the Long Point unit prohibited from November 15 through March 15C. The taking of frogs and turtles is prohibited.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreation. A substantial amount of recreational fishing occurs on the refuge and is compatible with that objective provided it adheres to refuge regulations. Refuge waters are a subset of a larger lake system administered by the State. Reelfoot Lake is a nationally acclaimed crappie fishery that also supports a fish population composed of largemouth bass, bluegill, channel catfish, and a host of other game and rough fish. These species are primarily regulated by environmental factors including weather, forage supply, cover, and disease. Harvest rates have also played a part in maintaining the fishery in a healthy condition, as some species, including crappie and bluegill, can quickly overpopulate the available habitat and result in a large population of stunted individuals. Thus, fishing functions as a valuable management tool in this outstanding fishery.

Description of Use: *Environmental Education and Interpretation*

Environmental education: Non-staff conducted activities, teacher workshops, teaching students, interpretation. Those activities which seek to increase the public's knowledge and understanding of wildlife and contribute to the conservation of such wildlife. Activities would include traditional environmental education such as teacher-led or staff-led on-site field trips, off-site programs in classrooms, nature study such as teacher and student workshops, and interpretation of the wildlife resources incorporated in support of facilities such as interpretive trails and the visitor contact station.

The entire refuge has the potential to be utilized for environmental education and interpretation. This is a year-round activity, conducted on an as-requested basis. Although this activity does not require a special use permit, it is most often closely coordinated with the refuge manager. Opportunities for classroom activities on those portions open to the general public, which do not violate general refuge regulations may be conducted without coordination with the refuge manager.

The refuge will serve as an outdoor classroom for a variety of audiences with an interest in wildlife conservation and management. Typically, teachers, students, and other groups will learn from hands on demonstrations, projects, and activities delivered by refuge staff. Activities will be conducted on site utilizing existing refuge facilities. Group size will typically be limited to ensure effective presentation of desired materials which may be specifically tailored to meet the educational needs of the group.

Environmental education is utilized to encourage understanding in citizens of all ages to develop land ethics, foster public support, increase visibility, and improve the image of the Service. Environmental Education and Interpretation are a priority public use.

Availability of Resources:

Resources involved in the administration and management of the use:

Facilities (including kiosks, interpretive signs and brochures, visitor contact station): $3,000
On-site activities $200
Off-site activities $200

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Kiosk maintenance $1,500
Signs $1,500
Mowing and trash $200
Travel off site $200

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: The use of on-site, hands-on, action-oriented activities by groups of teachers/students to accomplish environmental education objectives may impose a low level impact on the sites used for these activities. Impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate vicinity during such activities. It is not anticipated that such impacts would be permanent.

Long-term impacts: Current use is incidental to overall refuge programs and no long-term negative impacts have been experienced. Long-term beneficial impacts include the furthering of the refuge mission through the education of the general public.

Cumulative: No negative cumulative impacts are anticipated.

Determination (check one below):

Environmental education Environmental interpretation	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: On-site activities should be held where minimal impact will occur. Evaluation of sites and programs should be held periodically to assess if objectives are being met and the resources are not being degraded. If evidence of unacceptable adverse impacts begin to appear, it may be necessary to change the location of outdoor classroom activities.

Justification: Environmental education is used to encourage understanding in citizens of all ages to act responsibly in protecting a healthy ecosystem. It is a tool to use in building the land ethic, developing political support, and decreasing wildlife violations. It constitutes one method of increasing visibility in the community and improving the image of the Service. Environmental education at the refuge is incidental since full-time staff to conduct activities has only recently been established. However, the program is important and provides visitors with an awareness of refuge specific issues such as wetland ecology, endangered species protection, and migratory bird management, as well as issues relating to the entire refuge system. Environmental education activities are expected to increase while ensuring compatibility with the purpose for which the refuge was established.

Description of Use: Wildlife Observation and Photography

Wildlife observation and photography are priority public uses. Reelfoot NWR allows foot travel refuge-wide from March 15 to November 15. Two hiking trails are provided; one is a loop off the Grassy Island Auto Tour Route and the other is a network of gravel and wood chip trails within the Backyard/Watchable Wildlife Showcase. From November 16 to March 14, foot travel is restricted to designated trails. Boats are allowed from March 15 to November 15 on the Long Point Unit and February 1 to November 15 on the Grassy Island Unit. Motorized vehicles are restricted to designated gravel roads within the refuge. Roads are open from March 15 to November 15 on the Long Point Unit and year-round on the Grassy Island Unit (Auto Tour Route). Bicycles are permitted only on designated motorized vehicle routes when open.

The refuge is open to these activities year-round, except for those portions of the refuge that are closed from November 15 through March 15.

Most of the recreational activities on the refuge are centered on wildlife viewing, which is conducted on refuge roads and at the observation towers. Additional uses such as hunting and fishing are supported by refuge roads and a boat ramp, which provides access to the lake.

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Wildlife observation and photography are very popular activities in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and as well as refuge hunting and fishing programs. The refuge spends approximately $6,000.00 of an annual refuge budget of $500,000.00 in direct support of these programs on Reelfoot NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated, however programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Wildlife Photography Wildlife Observation	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations. Expansion of wildlife viewing opportunities beyond the current level may be explored with the acquisition of additional lands.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Wildlife observation and wildlife photography at the refuge, which adheres to the established regulations, are activities that are compatible with that purpose. The 2.5 mile self-guided auto tour route and associated boardwalk/observation tower at the Grassy Island Unit, and the universally accessible observation tower at Long Point, provide access to visitors of all physical capabilities with the opportunity to observe wildlife.

Description of Use: *Reelfoot NWR Resource Research Studies*

This activity would allow university students and professors, nongovernmental researchers, and governmental scientists access to the refuge's natural environment to conduct both short-term and long-term research projects. The outcome of this research would result in better knowledge of our natural resources and improved methods to manage, monitor, and protect the refuge resources.

This activity will be conducted throughout the refuge in a variety of habitat types. Activities carried out during approved research projects may be limited to avoid unnecessary disturbance to refuge resources.

These activities will vary in scope and duration, as needed, to satisfy the requirements of the research project. Projects may involve everything from a limited one-time sampling to long-term study plots.

Research projects will be conducted by accredited universities, state and federal governmental representatives, and rarely, private individuals. The refuge will act solely in a supportive role, providing minimal assistance in most cases.

Furthering the knowledge of the impacts and benefits of management decisions, life histories of wildlife species utilizing the refuge, and interrelationships of habitats and wildlife occurring on the refuge is crucial to the effective management of the refuge. The refuge provides secure sites for long-term evaluation of management actions, population trends, and ecological functions within the bottomland ecosystems in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: No additional fiscal resources are needed to conduct this use. Existing staff can administer permits and monitor use as part of routine management duties.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: There should be no significant negative impacts from scientific research on the refuge. The knowledge gained from the research would provide information to improve management techniques and better meet the needs of trust resource species. Impacts such a trampling vegetation and temporary disturbance to wildlife would occur, but should not be significant. A small number of individual plants and animals may be collected for further study. These collections would have an insignificant effect on the refuge plant and animal populations.

Long-term impacts: Long term benefits associated with improved management techniques developed through research would far outweigh any negative impacts which may occur.

Cumulative: No negative cumulative effects are anticipated.

Determination (check one below):

Research	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Each request for use of the refuge for research would be examined on its individual merit. Questions of who, what, when, where, and why would be asked to determine if requested research contributed to the refuge purposes and could best be conducted on the refuge without significantly affecting the resources; if so, the researcher would be issued a Special Use Permit. Progress would be monitored and the researcher would be required to submit annual progress reports and copies of all publications derived from the research.

Justification: The benefits derived from sound research provide a better understanding of species and the environmental communities present on the refuge. These benefits far outweigh any short term disturbance or loss of individual plant and animals that might occur.

Description of Use: *Horseback Riding*

Recreational horseback riding on roads within Reelfoot NWR is popular. While not one of the "Big Six," it is often associated with priority public uses.

Horseback riding will be permitted on refuge roads open to the public for vehicle traffic.

Horseback riding will be permitted year-round during daylight hours only, on roads open to the public. Areas closed to the general public for management or safety purposes will be closed to horseback riding as well.

Horseback riding will be a self-initiated activity on the refuge, with no amenities provided specifically for this activity. Participants in this activity will be responsible for all aspects of their visit and use of the refuge.

This is a popular activity that has historically occurred on lands which are now refuge lands within west Tennessee. Development and the paving of most of the roads in west Tennessee have significantly decreased the amount of gravel roads available for horseback riding.

Availability of Resources:

Resources involved in the administration and management of the use: No additional administrative costs are associated with this activity.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Negative impacts are expected to be minimal. These impacts include trampling of vegetation, hoof damage during wet periods, and potential browse damage adjacent to roads.

Long-term impacts: No long term impacts are expected.

Cumulative: No cumulative impacts are expected.

Determination (check one below):

Horseback riding	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Horseback riding limited to daylight hours only. Horseback riding restricted to graveled public roads open to vehicle traffic.

Justification: Horseback riding supports wildlife observation by providing an alternative mode of travel on refuge roads.

Description of Use: *Reelfoot Farming Program*

Cooperative farming has been a management tool on Reelfoot NWR since its establishment in 1941. Primarily serving as a supplement to natural food resources, this program is designed to assist the refuge in meeting wintering waterfowl population goals.

Contracts with cooperative farmers are established annually prior to the planting season. These contracts describe the location and amount of acreage to be planted during the coming year. The contract is then signed by the cooperative farmer and the Service representative (refuge manager). Shares are acreage-based, with a 75% cooperator's share and a 25% refuge share. The cooperator assumes responsibility for all associated costs for the crops raised. Modifications to the original contract may occur throughout the farming season with amendments agreed upon and signed by all parties involved.

In addition to providing winter food resources, this program may be utilized to maintain newly acquired tracts of land in an open condition until permanent natural habitat communities can be established. Farming is used to compliment natural food production on the refuge and assist in meeting the minimum waterfowl maintenance objectives of 15.5 million use-days. Providing wintering and migrating habitat can be achieved in part through a successful cropland program. By incorporating a system of impoundments with the cropland program, the waterfowl maintenance objectives should be easily achieved. Preferred waterfowl crops include corn, milo, millet, wheat, buckwheat, and natural (moist-soil) foods. By planting crops such as corn or millet in impoundment areas, their availability to waterfowl can be enhanced through flooding in the fall/winter.

Cooperative farming is utilized on some 820 to 1,000 acres annually within the refuge to provide for the needs of wintering waterfowl species without subjecting them to hunting pressure. This acreage can vary each year based on the rotation of moist soil management activities on the refuge. Newly acquired tracts may be farmed in preparation for the establishment of native habitats.

The cooperative farming contracts are generally valid from March 15 to November 15 annually.

This activity is a contracted activity, with the cooperator providing all materials, equipment, and labor to fulfill the requirements of the contract. Facilities such as roads and access points are maintained by refuge staff.

This use is deemed necessary to fulfill refuge obligations to provide for the wintering needs of waterfowl. While agricultural lands are abundant off the refuge, they do not provide a secure habitat for wintering waterfowl.

Availability of Resources:

Resources involved in the administration and management of the use: The refuge currently spends approximately $8,000.00 per year in the administration of the refuge cooperative farming program. The cost of providing the same resources for waterfowl utilizing refuge staff and equipment would cost approximately $80,000.00 per year.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance of roads, trails, and access points for cooperative farmers $5,000.00 (This maintenance also benefits numerous refuge conducted activities.)

Monitoring costs: Monitoring cooperative contacts, and cooperator activities $ 3,500.00

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Soil disturbance is likely to occur when the areas are disked during spring planting season, but these impacts can be lessoned by the implementation of no-till and conservation tillage farming methods. Buffer strips adjacent to waterways and sensitive areas help trap sediments and hold agricultural run-off. Impacts from unapproved, or improperly applied chemicals may occur. Monotypic stands of agricultural crop reduces the diversity and suitability of refuge lands for a variety of migratory and resident wildlife species.

Long-term impacts: None

Cumulative: The cumulative impacts should be minimal if integrated pest management practices and conditions within the cooperative farming agreement are followed.

Determination (check one below):

Farming	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Cooperative farming agreements, which are contractual agreements between the refuge and local farmers, require special conditions to be met. Cooperators are subject to dismissal for not meeting those conditions. Integrated Pest Management administered by the refuge and implemented by cooperators will help to reduce the potential for chemical misuse. See the Habitat Management Plan for the list of special conditions.

Justification: Section 6 RM 4.1 of the National Wildlife Refuge System (NWRS) Refuge Manual states, "Service policy is to use the most natural means available to meet wildlife objectives. In situations where objectives cannot be met through maintenance of more natural ecosystems, the more intensive and artificial method of cropland management may be employed. The acreage devoted to croplands will be that required to meet minimum habitat objectives." The specific objective is as follows: 1. To provide wintering waterfowl habitat for: Ducks - 12 million use days Geese - 2.5 million use days Although cropland management will be directed primarily to satisfy certain habitat and life requirements of waterfowl, other bird and mammal species will also benefit. The production of crops is essential for waterfowl management to meet the primary objectives for which the refuge was established. Farming is an essential management tool for providing "hot" foods for migratory birds. The Habitat Management Plan addresses the management of the refuge farm fields. These fields are farmed by a cooperator under an annual contractual agreement with the refuge. Under this agreement, the refuge receives a 25% share of each cooperative farmer's allotment, where one acre out of four is planted for waterfowl food production. For their share (75%), the cooperative farmers plant primarily soybeans.

Description of Use: *Reelfoot Forest Management*

The Forest Management objectives for the refuge are to (1) maintain and enhance necessary habitat for threatened and endangered species, by promoting plant communities beneficial to these species; (2) manage forest stands to enhance waterfowl habitat, by manipulating stand composition in order to produce high quality food and to provide adequate nesting areas. This will include promoting red oak and other favored tree species and by assuring that adequate den and snag trees remain in the stands; (3) manipulate forest stands to provide diverse habitat for a wide variety of wildlife species present throughout the refuge, by providing a variety of plant successional stages ranging from regeneration to mature timber; (4) perform management actions that will compliment recreational and educational activities, by carefully planning when and where management actions should take place; and (5) use management techniques which do not adversely affect soils, water bodies, or any other natural resources present. These techniques should include harvesting under proper climatic conditions and placing buffer strips where necessary to protect water quality or other natural resources.

Various silvicultural treatments will be used to accomplish these forest management objectives. Silvicultural decisions will be based upon the favored wildlife species and their habitat requirements as it relates to the favored tree species as outlined in the habitat management plan. Our goal is to promote the favored trees species which will meet the wildlife habitat requirements. We must recognize the importance of these tree species and the special management considerations which they must have in order to assure that they remain a high percentage of the stand composition. Silvicultural decisions should consider the age and vigor of the existing stands and the availability of desirable reproduction. When harvesting timber, we will be concerned with the promotion of diverse, vigorous stands of timber which benefit trust species. An important factor to consider when making silvicultural decisions is the availability of advanced red oak regeneration. After reviewing the data collected and surveying the refuge there is a great concern about the future of red oak species on the refuge. Much of our time will be spent making timber cuts to aid the red oak reproduction and to promote it to an advanced stage so that it can be released. During the initial survey of the refuge, extensive data were collected concerning reproduction. These areas will receive high priority management attention. It is crucial that this reproduction be released to promote the growth of new stands with a relatively high red oak component. Various silvicultural treatments will be used to promote favored timber species. These treatments include, intermediate cuttings, timber stand improvement, shelterwood, clearcut, and patch cuts.

Reelfoot currently contains 5,019 acres of bottomland forest with an additional 141 acres of recently planted red oak-dominated stands. Forest management activities may occur on all 5,160 acres of forested habitats on the refuge.

Activities will be conducted during the driest months of the year, usually July through November. Timber harvest operations will be conducted using local contractors who will bid on the timber to be harvested. Timber stand improvements will be conducted by the staff using a dozer with shearing blade or chemical injection of undesirable species.

This use is being proposed by the refuge as a management tool, designed to improve habitat conditions on the refuge for trust species.

Availability of Resources:

Resources involved in the administration and management of the use: Complex forestry staff will spend an estimated 10% of their time at Reelfoot NWR. The habitat management plan goes into sufficient detail regarding station resources needed to accomplish forest management activities.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: All maintenance activities associated with commercial timber harvest will be carried out by a private contractor. While this will reduce the payment to the government for the value of timber removed, no additional costs will be incurred by the refuge.

Monitoring costs: Monitoring of timber sales is an administrative function and all costs associated with this activity are previously accounted for.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Short term impacts will vary with the scope of the timber harvest technique utilized. Thinning and timber stand improvement projects will result in very limited impacts to habitats, and virtually no impacts to trust species. Clearcuts and patch cutting will have moderate impacts to localized blocks of habitats, and may temporarily displace trust species.

Long-term impacts: Long term impacts will be beneficial for all timber harvest operations, as they are designed to improve habitat conditions over time for trust species. Benefits include, but are not limited to; increased vigor of key species, increased diversity both in structure and species composition of the forest habitats, and improved wildlife habitat.

Cumulative: No negative cumulative impacts are expected as a result of timber management. Timber management, in concert with other refuge management activities will greatly enhance the suitability of the various habitats on the refuge for a variety of wildlife species.

Determination (check one below):

Forest Management	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: All commercial activities will be conducted under the regulations set forth by Special Use permits. These regulations will follow all guidelines outlined in the Lake Isom Habitat Management Plan. Forest management activities will follow the Tennessee Forest Best Management Practices.

Justification: The forest management program is compatible with the purposes for which the refuge was established and is in compliance with the National Wildlife Refuge System Act, the Refuge Recreation Act, and the Refuge Improvement Act of 1997. These activities also support the following plans: Partners in Flight, Lower Mississippi Valley Joint Venture, and West Tennessee Wildlife Resources Conservation Plan.

Description of Use: *Commercial Fishing*

Commercial fishing is currently permitted subject to State regulations and guidelines established by the Tennessee Wildlife Resources Agency specifically for Reelfoot Lake. Harvest of rough fish (drum, carp, catfish, bowfin, and gar) is essential for maintaining the ecological balance in the lake, and enhancing recreational fishing opportunities. This use is mandated within the terms of the 1941 lease agreement, under which Reelfoot NWR was established.

This use is restricted to the Grassy Island Unit and Long Point Unit containing 900 acres of water. Boat ramps accessible to refuge waters are located on the Grassy Island auto tour route. Refuge waters are also accessible through State boat ramps and waterways.

Commercial fishing is permitted from sunrise to sunset during February 1 to November 15 on the Grassy Island Unit and the Long Point Unit from March 15 to November 15. The Grassy Island Auto Tour boat ramp is available only during daylight hours. All refuge access is prohibited after dark unless specifically authorized by the refuge manager. Regulations will be in accordance with statewide creel and size limits.

Commercial harvest of rough fish will be conducted by area fishermen licensed and permitted by the state of Tennessee to fish on the waters of Reelfoot Lake. This is a limited use on the refuge, as most commercial fisherman chose more suitable waters outside the refuge boundaries to conduct this activity. All aspects of the fishing operations are monitored by the state of Tennessee.

Maintained roadways will support transportation to boat ramps allowing utilization of refuge waters. Refuge waterways are inaccessible due to encroaching vegetation. The "cookie cutter" is used to open these waterways to allow full utilization.

The harvest of rough fish is essential in maintaining a healthy balance between these species, and the more highly sought game species on the lake. The harvest of rough fish has been deemed essential by State fisheries biologists in maintaining the ecological balance in Reelfoot Lake. The waters of Reelfoot Lake are highly productive and the fishery is capable of supporting tremendous fishing pressure. Positive impacts include the removal of rough fish which improves habitat attractiveness to waterfowl and increases the size of crappie which is favored by sport fishermen.

Availability of Resources:

Resources involved in the administration and management of the use: This use is monitored and managed by the Tennessee Wildlife Resources Agency. No administrative and/or management costs are incurred by the refuge for this activity.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:
Annual maintenance of existing roads - $500
Annual maintenance of existing parking areas - $250
Garbage Pickup - $100
Annual maintenance of existing boat ramp - $500
Annual maintenance of existing signs - $250
Use of "Cookie Cutter" to clear waterways - $2,500

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Minor impacts such as littering and gasoline contamination will occur, but not at a level that would cause great concern.

History has shown that commercial fishing on Reelfoot National Wildlife Refuge has resulted in only temporary disturbance to refuge habitats and caused no noticeable impacts on the wildlife affected by commercial fishing disturbance. Passive disturbance of wildlife is low in the fishable portions of the refuge, and wintering waterfowl disturbance is kept at a minimum through enforcement of refuge closure periods.

The goals and objectives of the National Wildlife Refuge System (Attachment 1) provide the framework for refuge objectives (RO approval 8/85) which are:

1. Provide for 30,000 activity hours of wildlife interpretation/year.
2. Provide for 6,000 activity hours of hunting/year
3. Provide for 90,000 activity hours of fishing/year
4. Provide for 45,000 activity hours of wildlife observations/year
5. Provide 19,000 use days for endangered/threatened species maintenance/year
6. Provide 2,500,000 use days for goose maintenance/year
7. Provide 13,000,000 use days for duck maintenance/year

Long-term impacts: No long term impacts are expected.

Cumulative: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbing of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Law enforcement efforts will be directed at ensuring compliance with State and refuge regulations. Passive disturbance of wildlife in general or waterfowl during sanctuary periods are minimized with the above-mentioned restrictions.

Determination (check one below):

Fishing (commercial)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Refuge fishing seasons are set within the constraints permitted by the state of Tennessee and participants must comply with State fishing and boating regulations. Law enforcement efforts will be directed at ensuring compliance with State and refuge regulations. Boat launching is allowed at ramps located at the terminus of the Grassy Island Auto Tour Road and on neighboring State-managed facilities.

A. All fishing is completed before the start of the waterfowl sanctuary period (November 15 to January 31) thus minimizing potential disturbance.

B. Fishing is seasonally permitted from sunset to sunrise (Central time) on the waters of Reelfoot NWR.

C. Frogging and commercial turtle harvesting are prohibited.

Justification: A small amount of commercial fishing occurs on the refuge and is compatible with refuge objective provided it adheres to refuge regulations (Attachment 2). Refuge waters are subset of a larger lake system administered by the state. The waters of Reelfoot Lake are highly productive and the fishery is capable of supporting tremendous fishing pressure. Positive impacts include the removal of rough fish which improves habitat attractiveness to waterfowl and an increase in size of crappie which is favored by sport fishermen. Therefore the commercial fishing program is compatible with the purposes for which the refuge was established and is in compliance with the National Wildlife Refuge System Act, the Refuge Recreation Act, and the Refuge Improvement Act of 1997.

Description of Use: *Bicycling*

Bicycling is not a priority public use. However, it can be associated with other uses such as hunting.

Motorized vehicles are restricted to designated gravel roads within the refuge. Roads are open from March 15 to November 15 on the Long Point Unit and year-round on the Grassy Island Unit (Auto Tour Route). Bicycles are permitted only on designated motorized vehicle routes when open.

The refuge is open to these activities year-round, except that portions of the refuge are closed from November 15 through March 15.

Most of the recreational activities on the refuge are centered on wildlife viewing and hunting. Additional uses such as hunting and fishing are supported by refuge roads and trails. Bicycling occurs on refuge roads and areas that are open to such activities.

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Bicycling is a very popular activity in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and as well as refuge hunting and fishing programs. The refuge spends approximately $6,000.00 of an annual refuge budget of $500,000.00 in direct support of these programs on Reelfoot NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated; however, programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Bicycling	Use is compatible w/ the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Bicycling at the refuge, which adheres to the established regulations, is an activity that is compatible with that purpose.

Description of Use: *Hiking, Jogging, and Walking*

Hiking, jogging, and walking activities are not a priority public uses; however, many times they are associated with other uses such as hunting.

Reelfoot NWR allows foot travel refuge-wide from March 15 to November 15. Two hiking trails are provided; one is a loop off the Grassy Island Auto Tour Route, and the other is a network of gravel and wood chip trails within the Backyard/Watchable Wildlife Showcase. From November 16 to March 14, foot travel is restricted to designated trails. Roads are open from March 15 to November 15 on the Long Point Unit and year-round on the Grassy Island Unit (Auto Tour Route).

The refuge is open to these activities year-round, except that portions of the refuge are closed from November 15 through March 15. Most of the recreational activities on the refuge are centered on wildlife viewing, which is conducted on refuge roads and trails. Hiking, jogging, and walking all occur on refuge roads/trails and areas that are open to such activities.

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Hiking, jogging, and walking are very popular activities in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and as well as refuge hunting and fishing programs. The refuge spends approximately $6,000.00 of an annual refuge budget of $500,000.00 in direct support of these programs on Reelfoot NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated; however, programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Hiking, Jogging, and Walking	Uses are compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Jogging, walking, and hiking at the refuge, which adhere to the established regulations, are activities that are compatible with that purpose.

Description of Use: *Nonmotorized Boating*

Nonmotorized boating is not a priority public use; however, it many times is associated with other uses such as fishing.

Motorized vehicles are restricted to designated gravel roads within the refuge. Roads are open from March 15 to November 15 on the Long Point Unit and year-round on the Grassy Island Unit (Auto Tour Route). A boat ramp is provided at the end of Grassy Island Road.

The refuge is open to these activities year-round, except that portions of the refuge are closed from November 15 through March 15.

Most of the recreational activities on the refuge are centered on wildlife viewing, fishing, and hunting. Additional uses such as hunting and fishing are supported by refuge roads and trails. Non-motorized Boating occurs on the lake that are open to such activities.

Providing the public with wildlife oriented recreation is one of the priority uses on the refuge. Non-motorized Boating is a very popular activity in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and as well as refuge hunting and fishing programs. The refuge spends approximately $6,000.00 of an annual refuge budget of $500,000.00 in direct support of these programs on Reelfoot NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated; however, programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Nonmotorized boating	Use is compatible w/ the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Nonmotorized boating at the refuge, which adheres to the established regulations, is an activity that is compatible with that purpose.

COMPATIBILITY DETERMINATIONS – LAKE ISOM NATIONAL WILDLIFE REFUGE

Introduction

This set of compatibility determinations describes the wildlife-dependent and other uses that may be included in the public use program under the preferred alternative (Alternative D), as described in the Draft Comprehensive Conservation Plan for Lake Isom National Wildlife Refuge. It determines the conditions under which each use is considered compatible with the purposes, vision, and goals of the refuges and the mission of the National Wildlife Refuge System.

Under the National Wildlife Refuge System Administration Act of 1966, the Refuge Recreation Act of 1962, the National Wildlife Refuge System Improvement Act of 1997, and agency policy, the Service may not permit recreational uses on a national wildlife refuge unless those uses are first determined to be compatible wildlife-dependent uses. The needs of fish, wildlife, and plant resources on national wildlife refuges come first. All public uses must be compatible with these resources. A use is compatible if it is determined that the activity does not materially interfere with, or detract from, the fulfillment of the National Wildlife Refuge System mission or the purposes of the refuge. Furthermore, compatible activities which depend on healthy fish and wildlife populations will be recognized as priority public uses. The 1997 law established the priority public uses to be: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Refuge Name: Lake Isom National Wildlife Refuge

Location: Lake County, Tennessee

Establishing and Acquisition Authority(ies): Migratory Bird Conservation Act, Executive Order 7953

Refuge Purpose(s): "... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7953, dated Aug. 12, 1938 "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission: 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.

Description of Use: *Off-road Vehicles (for use by hunters with disabilities only)*

Use of off-road vehicles (four-wheel-drive all-terrain vehicles, or ATVs) by disabled hunters is essential in providing adequate hunting opportunities for these individuals. The difficult and often swampy terrain on the refuge makes individual use of ATVs the most cost-effective method of providing access for disabled hunters. Use is restricted to transportation to and from designated hunting locations, including the transport of personal gear and game taken by the disabled hunter. Carrying another person or their game is not permitted.

This use would be allowed in designated areas open to hunting on the refuge, and only during established refuge hunting seasons.

Access by disabled hunters is allowed on a case-by-case basis, with applicants providing necessary documentation of disability, request for areas to be accessed, and species sought. Currently the refuge receives 3–5 requests annually from disabled hunters primarily seeking access for deer hunting. The hunters are responsible for providing all equipment and associated assistance during their hunt. This permit grants no other privileges other than access by ATV on designated trails on the refuge, and the permittee must comply with all other refuge and State hunting regulations.

Disabled hunters routinely apply for a special use permit to participate in hunting programs currently offered on the refuge. While these opportunities currently exist on private lands and State WMAs, we still have an obligation to provide access to disabled hunters wishing to utilize the refuge.

Availability of Resources:

Resources involved in the administration and management of the use: Review and issuance of special use permits: $50.00/permit

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Several existing trails will be utilized by disabled hunters, as these trails are currently maintained to support other recreational activities, no additional costs would be attributable to this program.

Monitoring costs: All monitoring of this use would be conducted in conjunction with the refuge hunting program, and no additional costs would be attributed to this program.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Impacts to wildlife, plants, and habitat by the use of ORVs are well documented and some disturbance to wildlife, plants, and their habitats is expected to occur. However, this minor impact is acceptable in providing suitable access to disabled hunters who use ATVs to access hunting opportunities on the refuge.

Long-term impacts: No long term impacts are expected, due to the short duration and limited scope of anticipated use.

Cumulative: No cumulative impacts are anticipated with this use.

Determination (check one below):

Off-road vehicles (other)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: The refuge has established a policy for the level of disability that necessitates the use of ORVs for hunting. Persons applying for disabled hunter status must possess written proof of disability from their physician. This proof is then reviewed prior to issuance of a special use permit. All other refuge regulations apply.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreation. Allowing disabled hunters to use off-road vehicles to pursue their sport provides this group with no more opportunity that that which is afforded to the general public. Provided this activity adheres to the refuge regulations, it is an activity which is compatible with refuge objectives.

Description of Use: *Lake Isom NWR Hunting Program*

The U.S. Fish and Wildlife Service currently allows several forms of hunting on Lake Isom National Wildlife Refuge (NWR). Types of hunting allowed at Lake Isom include squirrel, raccoon, and deer (archery). Season lengths and regulations vary for each species group, but when open, the entire 1,873 acres of the refuge are available to hunting access. Season lengths and bag limits are set annually in coordination with the State of Tennessee.

Service policy concerning hunting on National Wildlife Refuges, as recorded in the National Wildlife Refuges Manual section 8 RM 5.1, states: "The Secretary of the Interior is authorized by the National Wildlife Refuge System Administration Act of 1966, as amended, and the Refuge Recreation Act of 1962 to permit hunting on any refuge within the Refuge System upon a determination that hunting is compatible with the major purposes for which such areas were established."

Lake Isom National NWR is located south of Reelfoot Lake in the northwest corner of Tennessee. The entire refuge lies in the flood plain of the Mississippi River. The main ecotype is bottomland hardwood forest. The entire refuge is open to hunting activities during part of the hunting seasons, with the exception of administrative sites. The refuge is closed seasonally to all public access to provide sanctuary for wintering migratory birds.

Hunting will be conducted as follows:

A. Squirrel - Approximately six weeks starting on the opening day of the squirrel hunting season in Tennessee. Daily bag limit in accordance with State regulations.
B. Raccoon - At least eight nights occurring before major waterfowl concentrations arrive in mid-November. No bag limit if approved by the State.
C. Deer (Archery) - Typically set to run concurrently with the first segment of the Tennessee Archery Deer season. The bag limit of four deer to include no more than two antlered deer.

All hunting activities on the refuge are subject to refuge-specific regulations published annually in the Federal Register and in the refuge public use brochure/permit, as well as regulations published by the state of Tennessee. Where these regulations differ, the refuge regulations shall supersede those published by the Tennessee Wildlife Resources Agency.

Hunting was a traditional recreational use of the refuge proper prior to inclusion into the National Wildlife Refuge System and continues to be a popular recreational pursuit with the public. However, opportunities for hunting have become very limited in the surrounding area due to the posting of private land, major expansion of hunting leased lands, and the significant decline in available wildlife habitat on private land in the vicinity. Refuge hunting will continue to provide additional public hunting opportunities in a region that is lacking sufficient amounts of acreage open to the public.

Availability of Resources:

Resources involved in the administration and management of the use: Refer to the Reelfoot and Lake Isom Hunt Plan, Environmental Assessment and Section 7 Evaluation.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Road Maintenance - $500.00

Parking Areas - $500.00
Kiosks - $250.00Signs - $250.00

Monitoring costs: Annual monitoring - $200.00

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: The opening of Lake Isom NWR to small game and big game hunting (archery) has resulted in only temporary disturbance to refuge habitats and no noticeable impact on the abundance of species hunted or other wildlife affected by hunter disturbance. Seasonal zoning to coincide with game species abundance and low waterfowl use periods have resulted in minimal disturbance to migratory waterfowl and permits hunting to occur on the entire 1,873 acre refuge.

Long-term impacts: There has been substantial historical use of this forested wetland area for hunting. Based on available information, there is no indication of adverse biological impacts associated with these activities. The refuge has the latitude to adjust hunting seasons and bag limits annually, or even close the refuge entirely due to safety or concerns about habitat conditions. This latitude coupled with monitoring of wildlife populations and associated habitat conditions by both the State Wildlife Resources Agency and the Fish and Wildlife Service ensure that long term impacts to either wildlife populations and or habitats on the refuge are unlikely. As hunting pressure increases on the refuge, alternatives such as limited quota hunts can be utilized to limit impacts. Seasonal closure of the refuge provides additional protection of critical habitats for trust species and/or threatened and endangered species

Cumulative: Timing and duration of the refuge's hunting program does not coincide with other popular programs on the refuge, and would not result in cumulative impacts to refuge resources.

Determination (check one below):

Hunting (big game) Hunting (small game)	Uses are compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Hunting seasons and bag limits are established annually and generally fall within the state framework for Tennessee as agreed upon during annual hunt coordination meetings with State personnel. All hunters are required to possess a free refuge hunting permit/public use brochure while participating in refuge hunts. Small game hunters must possess steel shot while hunting on the refuge. All other refuge regulations apply. Law Enforcement patrols are conducted throughout the hunt seasons to ensure compliance with refuge laws and regulations. No Waterfowl hunting is allowed on the refuge. All hunts are completed before the start of the waterfowl sanctuary period (November 15 to March 15), thus minimizing potential disturbance.

Justification: The Refuge Recreation Act provides the public with compatible wildlife-oriented recreation opportunities on refuges not specifically established for public use. Hunting has historically been allowed on Lake Isom NWR. This form of outdoor recreation which adheres to the refuge regulations is an activity that is compatible with refuge objectives. Hunting is a viable management tool for controlling wildlife populations.

Description of Use: *Lake Isom Recreational Fishing*

Fishing has been allowed on Lake Isom since its establishment in 1938. Sport fishing for game species (largemouth bass, black and white crappie, bluegill bream, and other sunfish), and rough fish (catfish, gar, bowfin, carp, and freshwater drum) is permitted during daylight hours from March 15-November 15.

The 1,873 acre Lake Isom National Wildlife Refuge was established by Presidential Proclamation in 1938 as a migratory bird refuge and provides approximately 800 acres of shrub swamp and open water suitable for recreational fishing. Lake Isom National Wildlife Refuge is located approximately two miles south of Reelfoot Lake in Lake County, Tennessee.

All public access is prohibited from November 15 to March 15 on Lake Isom NWR to provide sanctuary for wintering waterfowl and bald eagles.

Fishing is conducted on Lake Isom NWR subject to seasons and regulations established by the Tennessee Wildlife Resources Agency. Fishing is further restricted on the refuge by special refuge regulations which limit access to established boat ramps, prohibit access after dark, prohibit the use of certain fishing methods, prohibit the taking of frogs and turtles, and provide seasonal closures for the benefit of wintering waterfowl and other trust species.

Fishing on Lake Isom is a historical use of the refuge. While ample opportunities exist nearby on Reelfoot Lake, Lake Isom provides a unique setting, and offers excellent opportunities for this renewable resource.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for the fishing program is borne by annual operation and maintenance funds, which include activities involving the public such as recreation, interpretation, environmental education, and conduct of refuge hunting and fishing programs. The refuge spends approximately $1,000.00 of an annual refuge budget of approximately $1,300,000.00 in direct support of the fishing program on Lake Isom NWR. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Annual maintenance of existing boat ramps - $200.00
Annual maintenance of existing parking areas - $250.00
Annual maintenance of existing roads - $500.00

Monitoring costs: Monitoring - $100.00

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Minor impacts such as littering and gasoline contamination will occur but not at a level that would cause great concern. Historically, fishing has been one of the most prominent activities on the refuge, resulting in only temporary disturbance to refuge habitats and wildlife

populations and causing no noticeable impact on the abundance of species sought or other associated wildlife. Seasonal closure of sanctuary areas virtually eliminates any impacts of sport fishing during critical periods on wintering trust species.

Long-term impacts: No long-term impacts are expected.

Cumulative: No cumulative impacts are known to occur.

Determination (check one below):

Fishing (general)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Refuge fishing seasons are set within the constraints permitted by the State of Tennessee and participants must comply with State fishing and boating regulations. Law Enforcement efforts will be directed at ensuring compliance with State and refuge regulations. Boat launching is allowed only at ramp located at the terminus of the Isom Lake Road.

A. The entire refuge, except for designated areas, is closed to all public access from November 15 to March 15.
B. Only boats with motors of 10 hp or less are permitted on Lake Isom.
C. The taking of frogs and turtles is prohibited.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreation. A substantial amount of recreational fishing occurs on the refuge and is compatible with that objective provided it adheres to refuge regulations. Harvest rates have also played a part in maintaining the fishery in a healthy condition, as some species, including crappie and bluegill, can quickly overpopulate the available habitat and result in a large population of stunted individuals. Thus, fishing functions as a valuable management tool in this outstanding fishery.

Description of Use: *Environmental Education and Interpretation*

Environmental education and interpretation are described as those activities which seek to increase the public's knowledge and understanding of wildlife and contribute to the conservation of such wildlife. Activities would include traditional environmental education such as teacher-led or staff-led on-site field trips, off-site programs in classrooms, nature study such as teacher and student workshops, and interpretation of the wildlife resources incorporated in support of facilities such as interpretive trails and the visitor contact station.

The entire refuge has the potential to be utilized for environmental education and interpretation.

This is a year-round activity, conducted on an as-requested basis. Although this activity does not require a special use permit, it is most often closely coordinated with the refuge manager. Opportunities for classroom activities on those portions open to the general public, which do not violate general refuge regulations, may be conducted without coordination with the refuge manager.

The refuge will serve as an outdoor classroom for a variety of audiences with an interest in wildlife conservation and management. Typically, teachers, students, and other groups will learn from hands-on demonstrations, projects, and activities delivered by refuge staff. Activities will be conducted on-site utilizing existing refuge facilities. Group size will typically be limited to ensure effective presentation of desired materials, which may be specifically tailored to meet the educational needs of the group.

Environmental education is utilized to encourage understanding in citizens of all ages to develop land ethics, foster public support, increase visibility, and improve the image of the Service.

Availability of Resources:

Resources involved in the administration and management of the use:

Facilities (including kiosks, interpretive signs and brochures, visitor contact station):
$500 on-site activities
$200 off-site activities

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Kiosk maintenance	$250
Signs	$250
Mowing and trash	$200
Travel off site	$200

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: The use of on-site, hands-on, action-oriented activities by groups of teachers/students to accomplish environmental education objectives may impose a low level impact on the sites used for these activities. Impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate vicinity during such activities. It is not anticipated that such impacts would be permanent.

Long-term impacts: Current utilization of this use is incidental to overall refuge programs and no long-term negative impacts have been experienced. Long-term beneficial impacts include the furthering of the refuge mission through the education of the general public.

Cumulative: No negative cumulative impacts are anticipated.

Determination (check one below):

Environmental education and interpretation	Use is compatible w/ the following stipulations.

Stipulations Necessary to Ensure Compatibility: On-site activities should be held where minimal impact will occur. Evaluation of sites and programs should be held periodically to assess if objectives are being met and the resources are not being degraded. If evidence of unacceptable adverse impacts begin to appear, it may be necessary to change the location of outdoor classroom activities.

Justification: Environmental education is used to encourage understanding in citizens of all ages to act responsibly in protecting a healthy ecosystem. It is a tool to use in building the land ethic, developing political support, and decreasing wildlife violations. It constitutes one method of increasing visibility in the community and improving the image of the Service. Environmental education at the refuge is incidental since full-time staff to conduct activities has only recently been established. However, the program is important and provides visitors with an awareness of refuge specific issues such as wetland ecology, endangered species protection, and migratory bird management, as well as issues relating to the entire refuge system. Environmental education activities are expected to increase while ensuring compatibility with the purpose for which the refuge was established.

Description of Use: *Wildlife Observation and Photography*

Wildlife observation and photography are priority public uses at Lake Isom National Wildlife Refuge. The refuge is open to public use from March 15 through November 15. Much of the refuge is subject to flooding, which may result in parts or all of the refuge being closed for safety reasons. Motorized vehicles must remain on designated gravel roads within the refuge. The observation tower is open year-round.

The refuge is open to these activities year-round, except for those portions of the refuge that are closed from November 15 through March 15.

Most of the recreational activities on the refuge are centered on wildlife viewing, which is conducted on refuge roads, trails, and at the observation tower.

Providing the public with wildlife oriented-recreation is one of the priority uses on the refuge. Wildlife observation and photography is a very popular activity in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and conduct of refuge hunting and fishing programs. The refuge spends approximately $3,000.00 of an annual refuge budget of $1,300,000.00 in direct support of these programs on Lake Isom NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated; however, programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Wildlife Photography and Observation	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change is waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations. Expansion of wildlife viewing opportunities beyond the current level may be explored with the acquisition of additional lands.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Wildlife observation and photography activities at the refuge which adhere to the established regulations are activities that are compatible with that purpose.

Description of Use: *Lake Isom NWR Resource Research Studies*

This activity would allow university students and professors, nongovernmental researchers, and governmental scientists access to the refuge's natural environment to conduct both short-term and long-term research projects. The outcome of this research would result in better knowledge of our natural resources and improved methods to manage, monitor, and protect the refuge resources.

This activity will be conducted throughout the refuge in a variety of habitat types. Activities carried out during approved research projects may be limited to avoid unnecessary disturbance to refuge resources.

These activities will vary in scope and duration, as needed, to satisfy the requirements of the research project. Projects may involve everything from a limited one-time sampling to long-term study plots.

Research projects will be conducted by accredited universities, state and federal governmental representatives, and rarely private individuals. The refuge will act solely in a supportive role, providing minimal assistance in most cases.

Furthering the knowledge of the impacts and benefits of management decisions, life histories of wildlife species utilizing the refuge, and interrelationships of habitats and wildlife occurring on the refuge are crucial to the effective management of the refuge. The refuge provides secure sites for long-term evaluation of management actions, population trends, and ecological functions within the bottomland ecosystems in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: No additional fiscal resources are needed to conduct this use. Existing staff can administer permits and monitor use as part of routine management duties.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: There should be no significant negative impacts from scientific research on the refuge. The knowledge gained from the research would provide information to improve management techniques and better meet the needs of trust resource species. Impacts such a trampling vegetation and temporary disturbance to wildlife would occur, but should not be significant. A small number of individual plants and animals may be collected for further study. These collections would have an insignificant effect on the refuge plant and animal populations.

Long-term impacts: Long-term benefits associated with improved management techniques developed through research would far outweigh any negative impacts which may occur.

Cumulative: No negative cumulative effects are anticipated.

Determination (check one below):

Research	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Each request for use of the refuge for research would be examined on its individual merit. Questions of who, what, when, where, and why, would be asked to determine if requested research contributed to the refuge purposes and could best be conducted on the refuge without significantly affecting the resources. If so, the researcher would be issued a Special Use Permit. Progress would be monitored and the researcher would be required to submit annual progress reports and copies of all publications derived from the research.

Justification: The benefits derived from sound research provide a better understanding of species and the environmental communities present on the refuge. These benefits far outweigh any short term disturbance or loss of individual plant and animals that might occur.

Description of Use: *Lake Isom Farming Program*

Cooperative farming has been a management tool on Lake Isom NWR since its establishment in 1938. Primarily serving as a supplement to natural food resources, this program is designed to assist the refuge in meeting wintering waterfowl population goals.

Contracts with cooperative farmers are established annually prior to the planting season. These contracts describe the location and amount of acreage to be planted during the coming year. The contract is then signed by the cooperative farmer and the Service representative (refuge manager). Shares are acreage-based, with a 75% cooperator's share and 25% refuge share. The cooperator assumes responsibility for all associated costs for the crops raised. Modifications to the original contract may occur throughout the farming season, with amendments agreed upon and signed by all parties involved.

In addition to providing winter food resources, this program may be utilized to maintain newly acquired tracts of land in an open condition until permanent natural habitat communities can be established. Farming is used to compliment natural food production on the refuge and assist in meeting the minimum waterfowl maintenance objective of 3.5 million use-days. Providing wintering and migrating habitats can be achieved in part through a successful cropland program. By incorporating a system of impoundments with the cropland program, the waterfowl maintenance objectives should be easily achieved. Preferred waterfowl crops include corn, milo, millet, wheat, buckwheat, and natural (moist soil) foods. By planting crops such as corn or millet in impoundment areas, their availability to waterfowl can be enhanced through flooding in the fall/winter.

Cooperative farming is utilized on some 320 to 408 acres annually within the refuge to provide for the needs of wintering waterfowl species without subjecting them to hunting pressure. This acreage can vary each year, based on the rotation of moist soil management activities on the refuge. Newly acquired tracts may be farmed in preparation for the establishment of native habitats.

Cooperative farming contracts are generally valid from March 15-November 15 annually.

This activity is a contracted activity, with the cooperator providing all materials, equipment, and labor to fulfill the requirements of the contract. Facilities such as roads and access points are maintained by refuge staff.

This use is deemed necessary to fulfill refuge obligations to provide for the wintering needs of waterfowl. While agricultural lands are abundant off the refuge, they do not provide a secure habitat for wintering waterfowl.

Availability of Resources:

Resources involved in the administration and management of the use: The refuge currently spends approximately $5,000.00 per year in the administration of the cooperative farming program. The cost of providing the same resources for waterfowl utilizing refuge staff and equipment would be approximately $40,000.00 per year.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance of roads, trails, and access points for cooperative farmers $3,000.00 (this maintenance also benefits numerous refuge conducted activities)

Monitoring costs: Monitoring cooperative contacts, and cooperator activities $ 2,500.00

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Soil disturbance is likely to occur when the areas are disked during spring planting season, but these impacts can be lessened by the implementation of no-till and conservation tillage farming methods. Buffer strips adjacent to waterways, and sensitive areas help trap sediments and hold agricultural run-off. Impacts from unapproved or improperly applied chemicals may occur. Monotypic stands of agricultural crops reduce the diversity and suitability of refuge lands for a variety of migratory and resident wildlife species.

Long-term impacts: None

Cumulative: The cumulative impacts should be minimal if integrated pest management practices and conditions within the cooperative farming agreement are followed.

Determination (check one below):

Farming	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Cooperative Farming agreements, which are contractual agreements between the refuge and local farmers, require special conditions to be met. Cooperators are subject to dismissal for not meeting those conditions. Integrated Pest Management administered by the refuge and implemented by cooperators will help to reduce the potential for chemical misuse. See the Habitat Management Plan for the list of special conditions.

J**ustification:** Section 6 RM 4.1 of the National Wildlife Refuge System (NWRS) Refuge Manual states, "Service policy is to use the most natural means available to meet wildlife objectives. In situations where objectives cannot be met through maintenance of more natural ecosystems, the more intensive and artificial method of cropland management may be employed." The specific objective is as follows: To provide wintering waterfowl habitat for Ducks - 2.5 million use days; Geese - 1.0 million use days. Although cropland management will be directed primarily to satisfy certain habitat and life requirements of waterfowl, other bird and mammal species will also benefit. The production of crops is essential for waterfowl management to meet the primary objectives for which the refuge was established. Farming is an essential management tool for providing "hot" foods for migratory birds.

The Habitat Management Plan addresses the management of the refuge farm fields. These fields are farmed by a cooperator under a contractual agreement, issued annually, with the refuge. Under this agreement, the refuge receives a 25% share of each cooperative farmer's allotment where one acre out of four is planted for waterfowl food production. For their share (75%), the cooperative farmers plant primarily soybeans.

Description of Use: *Lake Isom Forest Management*

The forest Management objectives for the refuge are to (1) maintain and enhance necessary habitat for threatened and endangered species by promoting plant communities beneficial to these species; (2) manage forest stands to enhance waterfowl habitat by manipulating stand composition in order to produce high quality food and to provide adequate nesting areas. This will include promoting red oak and other favored tree species, and by assuring that adequate den and snag trees remain in the stands; (3) manipulate forest stands to provide diverse plant successional stages ranging from regeneration to mature timber, which will support a variety of wildlife species; (4) perform management actions that will complement recreational and educational activities by carefully planning when and where management actions should take place; and (5) use management techniques that do not adversely affect soils, water bodies, or any other natural resources present.

These techniques should include harvesting under proper climatic conditions and placing buffer strips where necessary to protect water quality or other natural resources. Various silvicultural treatments will be used to accomplish these forest management objectives. Silvicultural decisions will be based upon the favored wildlife species and their habitat requirements as it relates to the favored tree species as outlined in the habitat management plan. Our goal is to promote the favored trees species which will meet the wildlife habitat requirements. We must recognize the importance of these tree species and the special management considerations which they must have in order to assure that they remain a high percentage of the stand composition. Silvicultural decisions should consider the age and vigor of the existing stands and the availability of desirable reproduction. When harvesting timber, we will be concerned with the promotion of diverse, vigorous stands of timber which benefit trust species. An important factor to consider when making silvicultural decisions is the availability of advanced red oak regeneration. After reviewing the data collected and surveying the refuge, there is a great concern about the future of red oak species on the refuge. Much of our time will be spent implementing those silvicultural practices which enhance the re-establishment or productivity of the historical red oak component. During the initial survey of the refuge, extensive data were collected concerning reproduction. These areas will receive high priority management attention. It is crucial that this reproduction be released to promote the growth of new stands with a relatively high red oak component. Various silvicultural treatments will be used to promote favored timber species. These treatments include intermediate cuttings, timber stand improvements, shelterwood, clearcut, and patch cuts.

Lake Isom currently contains 811 acres of bottomland forest with an additional 113 acres of recently planted red oak dominated stands. Forest management activities may occur on all 924 acres of forested habitats on the refuge.

Activities will be conducted during the driest months of the year, usually July through November

Timber harvest operations will be conducted using local contractors who will bid on the timber to be harvested. Timber stand improvements will be conducted by the staff using a dozer with shearing blade or chemical injection of undesirable species.

This use is being proposed by the refuge as a management tool, designed to improve habitat conditions on the refuge for trust species.

Availability of Resources:

Resources involved in the administration and management of the use: Complex forestry staff will spend an estimated 5% of their time at Lake Isom NWR. The habitat management plan goes into sufficient detail regarding station resources needed to accomplish forest management activities.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: All maintenance activities associated with commercial timber harvest will be carried out by the contractor. While this will reduce the payment to the government for the value of timber removed, no additional costs will be incurred by the refuge.

Monitoring costs: Monitoring of timber sales is an administrative function and all costs associated with this activity are previously accounted for.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Short-term impacts will vary with the scope of the timber harvest technique utilized. Thinning and timber stand improvement projects will result in very limited impacts to habitats, and virtually no impacts to trust species. Clearcuts and patch-cutting will have moderate impacts to localized blocks of habitats, and may temporarily displace trust species.

Long-term impacts: Long-term impacts will be beneficial for all timber harvest operations, as they are designed to improve habitat conditions over time for trust species. Benefits include, but are not limited to, increased vigor of key species, increased diversity both in structure and species composition of the forest habitats, and improved wildlife habitat.

Cumulative: No negative cumulative impacts are expected as a result of forest management. Forest management, in concert with other refuge management activities, will greatly enhance the suitability of the various habitats on the refuge for a variety of wildlife species.

Determination (check one below):

Forest Management	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: All commercial activities will be conducted under the regulations set forth by Special Use permits. These regulations will follow all guidelines outlined in the Lake Isom Habitat Management Plan. Forest management activities will follow the Tennessee Forest Best Management Practices.

Justification: The forest management program is compatible with the purposes for which the refuge was established and is in compliance with the National Wildlife Refuge System Act, the Refuge Recreation Act, and the Refuge Improvement Act of 1997. These activities also support the following plans: Partners in Flight, Lower Mississippi Valley Joint Venture, and West Tennessee Wildlife Resources Conservation Plan.

Description of Use: *Horseback Riding*

Recreational horseback riding on roads within Lake Isom NWR. While not one of the "Big Six," it is often associated with priority public uses.

Horseback riding is to be permitted on refuge roads open to the public for licensed vehicular traffic.

Horseback riding will be permitted year-round during daylight hours only, on roads open to vehicular traffic. Areas closed to the general public for management or safety purposes will be closed to horseback riding as well.

Horseback riding will be a self-initiated activity on the refuge, with no amenities provided specifically for this activity. Participants in this activity will be responsible for all aspects of their visit and use of the refuge.

This is a popular activity that has historically occurred on lands which are now refuge lands within west Tennessee. Development and the paving of most of the roads in west Tennessee has significantly decreased the amount of gravel roads available for horseback riding.

Availability of Resources:

Resources involved in the administration and management of the use: No additional administrative costs are associated with this activity.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: No short-term impacts are expected.

Long-term impacts: No long-term impacts are expected.

Cumulative: No cumulative impacts are expected.

Determination (check one below):

Horseback riding	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Horseback riding is limited to daylight hours only. Horseback riding is restricted to graveled public roads open to licensed vehicular traffic.

Justification: Horseback riding supports wildlife observation by providing an alternative mode of travel on refuge roads.

Description of Use: *Bicycling*

Bicycling is generally associated with hunting on the refuge.

Lake Isom NWR is open to public use from March 15 through November 15. Much of the refuge is subject to flooding which may result in parts or all of the refuge being closed for safety reasons. Motorized vehicles must remain on designated gravel roads within the refuge. Bicycles are permitted only on open designated motorized vehicle routes and refuge trails.

The refuge is open to these activities year-round, except for those portions of the refuge that are closed from November 15 through March 15.

Most of the recreational activities on the refuge are centered on wildlife viewing, which is conducted on refuge roads and at the observation tower. Additional uses such as hunting are supported by refuge roads and trails which provides access to the refuge. Bicycling occurs on refuge roads and areas that are open to such activities.

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Bicycling is a very popular activity in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and conduct of refuge hunting and fishing programs. The refuge spends approximately $3,000.00 of an annual refuge budget of $1,300,000.00 in direct support of these programs on Lake Isom NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated; however, programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Bicycling	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations. Expansion of wildlife viewing opportunities beyond the current level may be explored with the acquisition of additional lands.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Bicycling at the refuge, which adheres to established regulations, is an activity that is compatible with that purpose.

Description of Use: *Hiking, Jogging, and Walking*

Hiking, jogging, and walking are activities that are many times associated with wildlife observation and wildlife photography, which are priority public uses.

Lake Isom NWR is open to public use from March 15 through November 15. Much of the refuge is subject to flooding which may result in parts or all of the refuge being closed for safety reasons. Motorized vehicles must remain on designated gravel roads within the refuge.

The refuge is open to these activities year-round, except for those portions of the refuge that are closed from November 15 through March 15.

Most of the recreational activities on the refuge are centered on wildlife viewing, which is conducted on refuge roads and trails. Hiking, jogging, and walking all occur on refuge roads and in areas that are open to such activities.

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Hiking, Jogging, and walking are very popular activities in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and conduct of refuge hunting and fishing programs. The refuge spends approximately $3,000.00 of an annual refuge budget of $1,300,000.00 in direct support of these programs on Lake Isom NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short-term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated; however, programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Hiking, Jogging, and Walking	Uses are compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations. Expansion of these opportunities beyond the current level may be explored with the acquisition of additional lands.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Jogging, walking, and hiking activities at the refuge, which adhere to established regulations, are activities that are compatible with that purpose.

Description of Use: *Nonmotorized Boating*

Nonmotorized boating is an activity that is associated with wildlife observation, wildlife photography, and fishing, which are priority public uses.

Lake Isom NWR is open to public use from March 15 through November 15. Much of the refuge is subject to flooding, which may result in parts or all of the refuge being closed for safety reasons. Motorized vehicles must remain on designated gravel roads within the refuge.

The refuge is open to these activities year-round, except for those portions of the refuge that are closed from November 15 through March 15.

Nonmotorized boating and additional uses such as hunting and fishing are supported by refuge roads, and a boat ramp which provides access to the lake. Nonmotorized boating is permitted on all open refuge waters.

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Nonmotorized boating is a very popular activity in the surrounding area, and the refuge is one component in a complex of public lands that lie in west Tennessee.

Availability of Resources:

Resources involved in the administration and management of the use: Funding for these programs is borne by annual operations and maintenance funds which include activities involving the public such as recreation, interpretation, environmental education, and conduct of refuge hunting and fishing programs. The refuge spends approximately $3,000.00 of an annual refuge budget of $1,300,000.00 in direct support of these programs on Lake Isom NWR. Therefore, the program is in compliance with the specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Most of the impacts that could occur will involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short term impacts to facilities such as roads and structures can be avoided by special closures due to unsafe conditions.

Long-term impacts: No long-term negative impacts are anticipated.

Cumulative: No cumulative negative impacts are anticipated; however, programs may be modified in the future to mitigate unforeseen impacts.

Determination (check one below):

Nonmotorized boats	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours will be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use will prompt further consideration of refuge regulations.

Justification: A primary objective for which the refuge was established is to provide the public with wildlife oriented recreational opportunities. Non-motorized boating at the refuge, which adheres to established regulations, is an activity that is compatible with that purpose.

Appendix VI. Management Methods and Procedures

PARTNERSHIPS

The Service's Partners for Fish and Wildlife program helps accomplish its mission by offering technical and financial assistance to private landowners to voluntarily restore wetlands and other fish and wildlife habitats on their land. The program emphasizes the reestablishment of native vegetation and ecological communities for the benefit of fish and wildlife in concert with the needs and desires of private landowners.

The Service also enlists the assistance of a wide variety of other partners to help restore wildlife habitat on private lands. These partners include other Federal agencies, Tribes, State and local governments, conservation organizations, academic institutions, industries, and other businesses, school groups, and private individuals. While not a program requirement, a dollar-for-dollar cost share is usually sought on a project-by-project basis.

Since the project's inception in 1987, these partnerships have generated significant habitat restoration accomplishments on private lands, primarily focused on the restoration of wetlands, native grasslands, stream banks, riparian areas, and in-stream aquatic habitats. These restored habitats now provide important food, water, and cover for Federal trust species, including migratory birds (e.g., waterfowl, shore and wading birds, songbirds, and birds of prey), anadromous fish, and threatened and endangered species, as well as other fish, wildlife, and plant species that have experienced population declines in the recent past. Many of these projects are located near existing National Wildlife Refuge System lands or State Wildlife Management Areas providing increased benefits to fish and wildlife that rely on these lands for survival.

The assistance that the Service offers to private landowners may take the form of informal advice on the design and location of potential restoration projects, or it may consist of designing and funding restoration projects under a voluntary cooperative agreement with the landowner. Under the cooperative agreements, the landowner agrees to maintain the restoration project as specified in the agreement for a minimum of 10 years.

Typical restoration projects may include, but are not limited to:

- Restoring wetland hydrology by plugging drainage ditches, breaking tile drainage systems, installing water control structures, constructing levees, and reestablishing old connections with waterways.
- Installing fencing and off-stream livestock watering facilities to allow for restoration of stream and riparian areas.
- Removal of exotic plants and animals which compete with native fish and wildlife and alter their natural habitats.
- Prescribed burning as a method of removing exotic species and to restore natural disturbance regimes necessary for some species survival.
- Reconstruction of in-stream aquatic habitat through bioengineering techniques.

In addition to providing restoration assistance to private landowners, the Service also provides biological technical assistance to U.S. Department of Agriculture agencies implementing key

conservation programs of the Farm Bill. The Service's assistance helps the Department of Agriculture meet the technical challenges presented by these programs while maximizing benefits to fish and wildlife resources. The Service also assists in on-the-ground habitat restoration actions associated with several of these programs.

Under the Wetlands Reserve Program, conservation easements are required to protect and restore formerly degraded agricultural wetlands. The Service provides technical assistance to Department of Agriculture agencies and to private landowners on site selection, restoration planning, and compatible uses for easements offered voluntarily by interested landowners.

AVIFAUNAL ANALYSIS

WINTERING WATERFOWL

The North American Waterfowl Management Plan (NAWMP) identified a continental waterfowl population goal of 62 million breeding ducks, goals for specific populations of geese, and the actions needed to achieve those goals. The NAWMP identified the Lower Mississippi Valley (LMV) as one of the priority habitat areas, and a plan of action for the LMV was implemented in 1990 to achieve NAWMP goals. The goal of the LMV Plan focused on providing an adequate quantity, quality, and distribution of habitats on public and private lands to ensure that the LMV could support a wintering population of at least 8.7 million ducks and 1.4 million geese. The geographic area covered by the WTWR Conservation Plan needs to provide an adequate quantity, quality, and distribution of habitats to support a wintering population of 599,000 ducks and 61,000 Canada geese. Achieving this goal will require maintaining the current 10,600 acres managed in West Tennessee for ducks and geese and developing a minimum of 6,300 additional acres of habitat with water management capability for ducks.

The WTWR Conservation Plan identified minimum waterfowl foraging objectives for the Obion, Forked Deer, and Hatchie/Wolf River Watersheds, along with strategies and actions designed to meet those needs. It should be recognized that providing adequate foraging habitats to support duck population objectives depends upon current habitat conditions and food availability, which vary annually. In some years, food resources will be abundant and readily available, but much less in other years. Therefore, management efforts should focus, at a minimum, on meeting foraging needs during critical periods. It was assumed that if adequate foraging habitats are available, other habitat types needed by waterfowl will also be adequate. Other life history needs related to sanctuary, water, cover, molting, pairing, etc., will be considered throughout the planning area as well as species specific requirements such as nest and brood habitat for wood ducks.

Duck population and habitat carrying capacity goals for the WTWR Conservation Plan were stepped down from the Lower Mississippi Valley Joint Venture Plan (Loesch et al, 1994), which was developed to implement the NAWMP. Duck population goals were calculated using data from the Midwinter Waterfowl Inventory, county duck harvest estimates, and continental population goals. This method involves calculating the number of ducks that must winter in the WTWR Conservation Plan area if the NAWMP is to achieve the 62 million average continental breeding population objective. The steps involved in making these calculations were described in the Lower Mississippi River Joint Venture Evaluation Plan. Other documents that provided guidance in formulating goals and objectives for the WTWR Conservation Plan were the Tennessee Wildlife Resources Strategic Plan for 2000-2006 and the Tennessee Implementation Plan for the NAWMP.

Guidelines from the WTWR Conservation Plan used in this CCP included:

- The average number of geese counted during the January Mid-Winter Waterfowl Survey for the 1985-89 period was selected as the population goal for the WTWR Conservation Plan.
- Procedures used to calculate waterfowl objectives in the LMV (Loesch et al, 1994) were also used for the WTWR Conservation Plan. However, since calculated foraging objectives are considered to be the minimum needed and the Tennessee Wildlife Resource Agency's (TWRA) Strategic Plan calls for a 15% increase in populations and habitat, objectives were increased by 15%.

Under existing management, Reelfoot and Lake Isom NWRs provides 385 acres of managed impoundments, all of which are flooded. In addition, 344 acres of winter wheat or corn are planted annually on agricultural lands that surround the impoundments. According to objectives and strategies developed as part of the WTWR Conservation Plan, Reelfoot and Lake Isom NWRs have combined target objectives of 6.7 million duck use days and 3.5 million goose use days.

TRANISENT SHOREBIRDS

Habitat objectives (acres) derived from shorebird population estimates have been developed by the Mississippi Alluvial Valley Migratory Bird Initiative (MBI) and adopted by the U.S. Shorebird Conservation Plan (USSCP). Whereas these acreage objectives are useful in shorebird management, it is generally recognized that intensive management of smaller basins likely results in consistently greater carrying capacity for shorebirds than does less intensive management on extensive areas (Rohs, Short, 1999; USSCP, 2000). This results mainly from the fact that optimal habitat conditions for shorebirds occupy a relatively narrow band in the water depth and vegetation density continuums. Providing mudflat/shallow water (i.e. < 2 in. water) conditions with less than 25% vegetative cover over extensive areas is difficult under most management situations in West Tennessee, especially during the fall. As a result, the approach in developing the WTWR Conservation Plan is not only to identify areas potentially suitable for shorebird habitat management (i.e. acquisition, protection, etc.), but also to provide information necessary to manage effectively for shorebirds on existing and potential management areas. Note that this is in contrast to an approach of taking the existing acreage objective and stepping it down to various specific management units (WMAs, Refuges, etc.).

Stopover habitat during southward migration has been identified by the U.S. Shorebird Conservation Plan as the critical factor for shorebird habitat management in the LMV region. Quality habitat for shorebirds during this portion of the annual cycle consists of shallow (0-2 in.) water with little standing vegetation (< 25% cover) from late July through October. Because this typically is a dry time of year in West Tennessee, sites that naturally hold water (i.e. low-lying sites with poorly drained, hydric soils) likely offer the most favorable conditions for effective wetland restoration and management.

Current public land habitat objectives for shorebirds in the MAV of Tennessee total 224 acres, whereas planned shorebird habitat acres total 230. In 1999, publicly managed areas within the MAV in West Tennessee provided 97 acres of habitat in the fall specifically for shorebirds (LMV Joint Venture Office, unpubl. data). Shorebird habitat goals for TWRA in Fall 2000 for Eagle Lake, White Lake, and Reelfoot WMA were 90, 120, and 80, respectively, totaling 290 acres. This would have provided well over half of the MBI objective (457 acres). However, due to excessively dry conditions, these goals were not met. If properly managed, a small percentage of the areas identified as potentially suitable for shorebird habitat management in the WTWR Conservation Plan, plus the objective acreage on existing TWRA areas, would more than satisfy the MBI shorebird habitat objective for Tennessee.

Shorebird habitat is largely compatible with waterfowl habitat. Perhaps the most substantial difference between shorebird and waterfowl habitat management is the timing of prescribed actions. Fall shorebird migration occurs earlier than migration for most waterfowl species. However, managing for early fall migrant shorebirds will provide optimal habitat for southward-migrating blue-winged teal. Basins drawn down in late summer for shorebird habitat can be reflooded in November, making seeds in the substrate available to waterfowl. Additionally, shallow water habitat during late summer/early fall is beneficial to many species of wading birds, including herons and egrets.

Waterfowl and shorebirds also differ somewhat in their use of water depth. Generally, dabbling ducks use a wider range of water depths than shorebirds. Hence, maintaining shallow water (< 6 inches) accommodates both shorebirds and dabbling ducks, whereas deeper water (8-12 inches) excludes most of the shorebird species common to this region. Likewise, ducks tolerate a greater density of standing vegetation than shorebirds. Fortunately, reducing standing vegetation by disking in late summer/fall enhances benthic invertebrate density, creates conditions suitable for shorebird use, and can increase seed density for waterfowl in the subsequent growing season (Gray et al,1999). However, note that disking or mowing prior to October (as is recommended for some fall shorebird habitat scenarios) will reduce seed production by late seeding grasses, such as millet and panic grasses, which are heavily utilized by waterfowl. Managing multiple units under a variety of regimes will ensure that such loss of potential waterfowl food occurs on only a few units (< 2) in a given year.

Under existing management on Reelfoot and Lake Isom NWRs, approximately 200 acres are managed during the spring shorebird migration period, and approximately 60 acres are provided during the fall migration period.

FOREST-BREEDING BIRDS

Habitat objectives for land birds in the MAV have been established by Partners in Flight in the Mississippi Alluvial Valley Bird Conservation Plan (Twedt et al, 1998). Swallow-tailed kite restoration, stable or increasing cerulean warbler populations, and stable or increasing Swainson's warbler populations are the primary land bird goals in the MAV Bird Conservation Plan. In order to meet the population objectives for these species, the Plan has identified 87 Bird Conservation Areas, broken down into 52 10,000-to-20,000-acre blocks, 36 20,000-to-100,000-acre blocks, and 13 blocks of over 100,000 acres, as MAV Bird Conservation Areas were identified by Ford (1998).

Bottomland hardwoods have been identified as the habitat of primary concern in the MAV, with at least 70 species of land birds occurring in this habitat type in the physiographic area (Twedt et al, 1998). The highest priority land birds species in the MAV include Swainson's warbler, cerulean warbler, and swallow-tailed kite, all of which occur in bottomland hardwood forests.

In the MAV in Tennessee, there are currently 70,475 acres of bottomland hardwoods currently under some kind of conservation protection that benefits land birds. The majority of these acres are in public ownership. An additional 6,964 acres of bottomland hardwoods are planned for future conservation actions, and an additional 89,941 acres of bottomland hardwoods are desired for future conservation action in order to attain target objectives for land birds in the MAV of Tennessee (TWRA and USFWS, 2002). These conservation activities have been further refined into implementation zones.

Migratory bird habitat objectives are segregated by implementation zones, and the "Upper Implementation Zone" for the West Tennessee MAV is shown in Figure 5 (in the Draft CCP). The Upper Implementation Zone reaches from the northern boundary of Moss Island Wildlife Management

Area and extends northward to encompass Reelfoot and Lake Isom NWRs. Currently, 15,350 acres are under migratory bird management, with an additional 4,835 acres planned or under development. An additional 42,076 acres are necessary to meet migratory bird habitat objectives in this zone. These acreage figures reflect actual migratory bird habitat; the total acreage is higher to include open water, buildings, and other miscellaneous land uses. The necessary future condition for migratory land birds will include bottomland hardwood forests, dry scrub/shrub, and managed grasslands.

At Reelfoot Lake, forest management is proposed for a strip from Reelfoot Lake, along the State line to Phillippy pits and connecting with forested batture lands near the Mississippi River. Primary goals for upland forest include acreage along the bluffs to a minimum of 300 feet beyond the top of the bluff. Scrub/shrub and managed grassland habitats would be most beneficial when integrated with forests.

Under existing management, Reelfoot and Lake Isom NWRs provide approximately 6,136 managed acres of bottomland hardwood forest for land birds and approximately 11 acres of upland forest.

THREATENED AND ENDANGERED BIRD SPECIES

Part of the Service mission is to protect, enhance, and manage habitat for threatened and endangered species, in keeping with the enforcement of the Endangered Species Act. Two federally listed bird species known to use the Reelfoot and Lake Isom NWRs vicinity during at least part of their life cycle include the bald eagle and the interior least tern.

The bald eagle, a threatened species that the Service plans to de-list, winters in the Mississippi Alluvial Valley of Tennessee in large numbers. Reelfoot Lake has one of the largest overwintering populations in the lower 48 States, as many as 200 bald eagles have been known to occur in the Reelfoot and Lake Isom vicinity, and two active nests are known to exist on the Refuge. The Refuge's continuing habitat restoration and protection activities provide suitable habitat for nesting eagles.

The interior least tern interior population is an endangered species which has a number of active nesting colonies on sandbars within the Mississippi River adjacent to Tennessee. There are active nesting colonies of interior least tern known to exist on Mississippi River sand bars within 4 miles of the western boundary of Reelfoot NWR. Interior least terns feed regularly on sand bars and in drainage canals within the Reelfoot NWR boundary. The Refuges' protection of lands immediately adjacent to the Mississippi River provides protection to sand bars where least tern nesting colonies exist during summer months.

A Section 7 Intra-Service Biological Evaluation addressing those species is found in Appendix 5.

ARCHAEOLOGICAL AND HISTORIC RESOURCE PROTECTION

With the enactment of the Antiquities Act of 1906, the Federal government recognized the importance of cultural resources to the national identity and sought to protect archaeological sites and historic structures on those lands either owned, managed, or controlled by the United States.

The body of historic preservation laws has grown dramatically since 1906. Several themes are consistently present in the laws and the establishing regulations. They include: 1) each agency to systematically inventory the "historic sites" on its holdings and to scientifically assess each site's eligibility for the National Register of Historic Places; 2) consideration of impacts to cultural resources during the agency's management activities and seeking to avoid or mitigate adverse impacts; 3)

protection of cultural resources from looting and vandalism to be accomplished through a mix of informed management, law enforcement efforts, and public education; and 4) the increasing role of consultation with groups, such as Native American tribes, to address how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups.

The objectives and strategies below outline the Service's attempt to achieve mandated historic preservation responsibilities in a manner consistent with its mission and the Refuges' mission.

The Fish and Wildlife Service Regional Archaeologist coordinates a Memorandum of Understanding with pertinent Federal and State agencies, such as the Tennessee Wildlife Resources Agency, to enhance law enforcement of the Archaeological Resources Protection Act, the Native American Grave Protection and Repatriation Act, and Section 50 of the Code of Federal Regulations, as well as to facilitate investigations of Archaeological Resources Protection Act violations and unpermitted artifact collection on the Refuge.

A review of the State Site files located at the Tennessee Department of Environment and Conservation Division of Archaeological Resources will provide preliminary information on known or potential archaeological sites and historic structures within or near the Refuge. Such information will aid the Service in the development of a long-term management plan for cultural resources. A comprehensive Refuge-wide archaeological survey is recommended so that the Service's management options can be fully realized in a cost-effective manner. The survey will provide a site predictive model based upon the region's cultural history, known site distribution, oral history interviews, historic documents, historic land use patterns, topography, geomorphology, soils, hydrology, and vegetative patterns.

ECOSYSTEM MANAGEMENT

Ecosystems are communities of living organisms interacting among themselves and with the physical components of their environment. Ecosystems worldwide are experiencing increasing impacts from human activities, resulting in greater challenges to effective management and conservation. In recent years, conservationists have fostered the idea that resource conservation can best be achieved by taking a holistic approach to management. The ecosystem approach to fish and wildlife conservation means protecting or restoring the function, structure, and species composition of an ecosystem while providing for its sustainable socioeconomic use. It involves recognizing that, in some way, all things within the ecosystem are interconnected. As such, the Service is working with divergent interests on ecosystem-based approaches to conserve the variety of life and its processes in the Nation's diverse ecosystems.

The Service's mission is to conserve, protect, and enhance the Nation's fish and wildlife and their habitats for the continuing benefit of the American people. Healthy habitats are necessary to sustain fish, wildlife, and plants on lands in the National Wildlife Refuge System. In the past, the administrative boundaries of Refuges have often bounded the scope of planning and policy decisions. The Service's objective in ecosystem management is to implement consistent policies and procedures that will embrace the larger "management environment," considering the needs of all resources in decision making. This holistic approach to fish and wildlife conservation enables the Service to more efficiently and effectively maintain healthy ecosystems on a long-term basis and to conserve the Nation's rich biological heritage.

In the early 1990s, the Service adopted an ecosystem approach to resource management, identifying 53 separate ecosystems within the United States (USFWS, 1994). Included in this group is the Lower Mississippi River Ecosystem which encompasses Reelfoot and Lake Isom National

Wildlife Refuges. The Lower Mississippi River Ecosystem Team, composed of Service personnel and partners with professional expertise in the Lower Mississippi River Valley, focuses on landscape-level problems affecting fish and wildlife resources and provides specific guidance that will best serve trust species and species of concern and reduce impacts associated with forest fragmentation. The ecosystem approach emphasizes conservation and management of discrete land units, watersheds, or ecosystems and requires the identification of ecosystem goals that represent resource priorities. On a more local level, the comprehensive conservation planning team reflects the conservation strategies for National Wildlife Refuges within the ecosystem and identifies strategies on which to focus management efforts. The Service must work closely and consistently with external partners, public and private, who share responsibility for ecosystem health and biological diversity. This approach enables the Service to fulfill its fish and wildlife trust responsibilities with greater efficiency and effectiveness. (See Chapter 1 of the Draft CCP for further discussion of specific ecosystem issues).

LAND PROTECTION AND MANAGEMENT

All Federal agencies by law have the power of eminent domain, which allows the use of condemnation to acquire lands and interests in lands for the public good. However, it is the policy of the Service to acquire lands from willing sellers only and only when other protective means, such as local zoning restrictions and regulations, are not appropriate, available, or effective.

The Service acquires lands and interests in lands, such as easements and management rights, through leases or cooperative agreements consistent with legislation or other Congressional guidelines and Executive Orders, for the conservation of fish and wildlife and to provide wildlife-oriented public use for educational and recreational purposes. These lands include National Wildlife Refuges, national fish hatcheries, research facilities, and other areas.

When land is needed to achieve fish and wildlife conservation objectives, the Service seeks to acquire the minimum interest necessary to reach those objectives. If fee title is required, the Service gives full consideration to extended use reservations, exchanges, or other alternatives that will lessen the impact on the owner and the community. Donations of desired lands or interests are encouraged. In all fee title acquisition cases, the Service is required by law to offer 100 percent of the property's appraised market value, as set out in an approved appraisal that meets professional standards and Federal requirements.

Reelfoot NWR currently encompasses 10,428 acres (as of June 1, 2004). This acreage includes 7,847 acres managed by the Service under a 1941 lease agreement with the State of Tennessee, as well as 2,581 acres owned in fee title. In addition to lands within the original Refuge boundary, an expansion to the acquisition boundary was approved in 1989 and includes an additional 7,587 acres adjacent to the existing Refuge boundary (USFWS, 1989). If funding and opportunities become available, the Service proposes to acquire these lands through conservation easements, cooperative agreements, or fee title purchases from willing sellers. The proposed acquisition, when complete, would increase the total Reelfoot NWR acreage to 18,015 acres.

Lake Isom NWR currently encompasses 1,850 acres (as of June 1, 2004). In addition to lands within the original Refuge boundary, an expansion to the acquisition boundary was approved in 1989 and includes an additional 5,283 acres adjacent to the existing Refuge boundaries (USFWS, 1989). If funding and opportunities become available, the Service proposes to acquire these lands through conservation easements, cooperative agreements, or fee title purchases from willing sellers. The proposed acquisition, when complete, would increase the total Lake Isom NWR acreage to 7,133 acres.

Although opportunities for land acquisition are limited in the immediate vicinity of the Refuges, the Refuge staff focuses on land acquisition opportunities within the Refuge acquisition boundaries by coordinating priorities identified by the Lower Mississippi River Ecosystem Team. Planning for the acquisition of land, water, or other interests is initiated with the identification of a need to meet resource objectives that require a real property base. Land protection goals set for the Refuges would support strategic growth in areas where there is greatest concern, mainly lands identified for migratory waterfowl and songbirds. In acquisition considerations, lands adjacent to Service-owned lands within the existing Refuge boundaries and larger contiguous forest tracts (inside or outside the current acquisition boundaries), and marginal farmland are given the highest priority.

The recommendations in the Proposed Expansion of Reelfoot and Lake Isom National Wildlife Refuges (USFWS, 1989) define important and sensitive areas that could be protected and managed as part of the Refuge system. The plan proposal was eventually forwarded to the Director of the U.S. Fish and Wildlife Service for approval. During the review of the draft plan, the public was given opportunities to comment on and respond to the proposed plan.

Once the expanded Refuge boundary is approved and funds are available, the Service proceeded to contact all landowners within the new boundary to determine if there are any willing sellers. If a landowner expresses an interest in selling lands to the Service, a professional real estate appraiser conducts an appraisal to determine the fair market value of the property. Once the value is determined, a meeting is held with the landowner and the Service presents its offer. If the landowner agrees with the offer, the purchase agreement is signed and the process of acquiring the land is set in motion.

Generally, the Service seeks to acquire the minimum interest necessary in the land to provide the level of protection needed to achieve management goals and objectives. Other options may be available on a particular project, such as conservation easements, leases, or cooperative agreements. Owners sometimes choose to donate all or a portion of their land because of tax advantages or as a lasting memorial.

The acquisition methods that could be used by the Service are described as follows:

1. Leases and Cooperative Agreements

Potentially, the Service can protect and manage habitat through leases and cooperative agreements. Management control on privately owned lands can be obtained by entering into long-term renewable leases or cooperative agreements with the landowners. Short-term leases can be used to protect or manage habitat until more secure land protection can be negotiated.

2. Conservation Easements

Conservation easements give the Service the opportunity to manage lands for their fish and wildlife habitat values. Such management precludes all other uses that are incompatible with the Service's management objectives. Only land uses that would have minimal or no conflicts with the management objectives are retained by the landowner. In effect, the landowner transfers certain development rights to the Service for management purposes as specified in the easement. Easements would likely be useful when: (a) most, but not all, of a private landowner's uses are compatible with the Service's management objectives, and (b) the current owner desires to retain ownership of the land and continue compatible uses under the terms set by the Service in the easement. Land uses that are normally restricted under the terms of a conservation easement

include: (a) development rights (agricultural, residential, etc.); (b) alteration of the area's natural topography; (c) uses adversely affecting the area's floral and faunal communities; (d) private hunting and fishing lease; (e) excessive public use and access; and (f) alteration of the natural water regime.

3. Fee Title Acquisition

A fee title interest is normally acquired when (a) the area's fish and wildlife resources require permanent protection not otherwise assured; (b) land is needed for visitor use development; (c) a pending land use could adversely impact the area's resources; or (d) it is the most practical and economical way to assemble small tracts into a manageable unit. Fee title acquisition conveys all ownership rights to the Federal government and provides the best assurance of permanent resource protection. A fee title interest may be acquired by donation, exchange, transfer, or purchase.

Funds for the acquisition of lands for Reelfoot and Lake Isom NWRs will likely come from the Land and Water Conservation Fund or the Migratory Bird Conservation Fund. Sources of revenue for this fund include Federal Duck Stamp sales, Refuge entrance fees, fish and wildlife fines, import taxes on arms and ammunition, offshore oil and gas leases, and Congressional appropriations.

Lands acquired by the Service are removed from the tax rolls. To offset the fiscal impact associated with the removal of these lands from the public tax rolls, the Refuge Revenue Sharing Act of 1935, as amended in 1978, provides for payments in lieu of taxes. Revenue- sharing payments for the county would compare favorably with current tax rates. If fully funded, the revenue-sharing rate is 1 per cent of the fair market value of a property. For lands purchased by the Service, the following formulas are used to determine the annual payment amount to the county. Payment for acquired land is computed on whichever of the formulas yields the highest result: (1) three-fourths of 1 percent of the fair market value of the lands acquired in fee title; (2) 25 percent of the net Refuge receipts collected; or (3) 75 cents per acre of the lands acquired in fee title within the county.

Lands subject to Refuge revenue-sharing payments are reappraised every 5 years. The appraisals set the fair market value of the land, based on the highest and best use. The appraised market value of the fee title lands within the Refuge, and thus the revenue-sharing payments, would change over time in relation to the changing value of non-Refuge lands.

The Service's proposed action (Alternative D) could result in the acquisition of an additional 7,587 acres of wildlife habitat as an expansion of Reelfoot NWR, and 5,283 acres of wildlife habitat as an expansion of Lake Isom NWR, through a combination of fee title purchases and/or donations from willing sellers and less-than-fee interests (conservation easements, cooperative agreements) from willing landowners. The Service believes these are the minimum interests necessary to preserve and protect the fish and wildlife resources in the proposed area.

The private property has been prioritized for acquisition using the following criteria:

- Biological significance;
- Existing and potential threats;
- Significance of the area to Refuge management and administration; and
- Existing commitments to purchase or protect land.

Appendix VII. Public Involvement

A part of the planning process is to inform the public and solicit their ideas. To accomplish this objective, a number of different means were employed and are described below.

Early in the planning process, a Notice of Intent was published in the *Federal Register*. Local publicity was provided by newspaper interviews and radio interviews prior to public scoping meetings. Presentations describing the upcoming planning process were given at West Tennessee Rotary Clubs, Friends of West Tennessee National Wildlife Refuges meetings, Planning Review Group meetings, as well as Service Ecoteam meetings. Mailings were sent to about 150 persons, media representatives, local officials, and agencies, providing information about the planning process and four upcoming open house/scoping meetings to be held in the West Tennessee area. Flyers were posted in local communities, and newspaper articles and radio interviews advertised the upcoming meetings and the comprehensive conservation planning (CCP) process. A news release went out from the Service's Regional Office which was carried by numerous other media sources.

A public open house and scoping meeting was held on November 14, 2000, in Tiptonville, Tennessee, in which attendees were provided an opportunity to learn about the refuges' purpose, mission, and goals, as well as issues and opportunities currently facing refuge management. The comprehensive conservation planning process was described, and attendees had the chance to provide oral or written comments to be considered in the development of the plan. Attendees at the scoping meeting were provided a sign-up sheet for the CCP mailing list, a written questionnaire, and opportunities to give public comments and ask questions, both in the scoping meeting as well as to managers at the open house.

All mailings, presentations, interviews, and meetings provided instructions as to how public input could be provided for the planning process. Throughout the planning process, comments were received by telephone, personal visits, e-mail, and mail.

In addition to public outreach and scoping meetings, a Planning Review Group was developed, consisting of resource professionals, local officials, and interested citizens who were willing to provide input during the planning process. The Planning Review Group for the refuges included representatives from Ducks Unlimited, Dyersburg State Community College, Tennessee Wildlife Resources Agency, Tennessee State Parks, Tennessee Ornithological Society, Friends of West Tennessee National Wildlife Refuges, and the University of Tennessee at Martin, as well as local officials, businessmen, landowners, bird enthusiasts, and sportsmen. This group met and was provided an overview of the planning process. Members of this group continued to provide comments during the planning process by reviewing sections of the document which were relevant to their areas of expertise. A copy of the initial draft CCP was provided to each member of this group for comments.

The comments received during the public scoping process are summarized as follows:

- Provide improved or additional access for consumptive and nonconsumptive recreation.
- Provide additional hunting and fishing opportunities.
- Provide more nature trails and boardwalks on the Reelfoot and Lake Isom national wildlife refuges.
- Need for more assessment and inventory of refuge plants and animals.
- Address "public opposition" to killing of wildlife on national wildlife refuges.

- Develop ”humane and socially acceptable” predator management strategies to protect threatened and endangered species.
- Assess and mitigate impacts of recreational activities on plants and animals.
- Examine the emphasis on management for particular species/groups.
- Need for a thorough discussion of proposed refuge habitat management practices.

Additional comments are expected from public review of this Draft Comprehensive Conservation Plan and Environmental Assessment. All relevant comments received will be addressed specifically in the Final Comprehensive Conservation Plan.