Table of Contents

Section B. Environmental Assessment

Appendices

Section C. Appendices

Figures

Guiding Principals of the National Wildlife Refuge System

We are land stewards, guided by Aldo Leopold's teachings that land is a community of life and that love and respect for the land is an extension of ethics. We seek to reflect that land ethic in our stewardship and to instill it in others.

Wild lands and the perpetuation of diverse and abundant wildlife are essential to the quality of the American life.

We are public servants. We owe our employers, the American people, hard work, integrity, fairness, and a voice in the protection of their trust resources.

Management, training from preservation to active manipulation of habitats and populations, is necessary to achieve the missions of the National Wildlife Refuge System and the U.S. Fish and Wildlife Service.

Wildlife-dependent uses involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, are legitimate and appropriate uses of the National Wildlife Refuge System.

Partnerships with those who want to help us meet our mission are welcome and indeed essential.

Employees are our most valuable resource. They are respected and deserve an empowering, mentoring, and caring work environment.

We respect the rights, beliefs, and opinions of our neighbors.

Bayou Cocodrie National Wildlife Refuge

Draft Comprehensive Conservation Plan

March 2001

Bayou Cocodrie
National Wildlife Refuge
P.O. Box 1772
Ferriday, LA 71334
318-336-7119
http://www.fws.gov
http://bayoucocodrie.fws.gov/index.html

VISION

Bayou Cocodrie National Wildlife Refuge will be transformed into one of the finest examples of bottomland hardwood forest complexes, striving to protect the habitats of fish and wildlife, and create new opportunities for visitors to enjoy its unique biological resources.

Cypress swale
USFWS

Reader's Guide

The National Wildlife Refuge System has the mission of integrating public land management; fish, wildlife and plant conservation; and wildlife-dependent recreation and education efforts to support diverse public interests. This Draft Comprehensive Conservation Plan, upon final approval, and Environmental Assessment for Bayou Cocodrie National Wildlife Refuge will assist in guiding management over the next 15 years. The Fish and Wildlife Service's planning process for all national wildlife refuges involves the development of broad comprehensive conservation plans, followed by the development of detailed step-down management plans.

Using public input, the Fish and Wildlife Service developed three alternative approaches to manage Bayou Cocodrie National Wildlife Refuge. Each alternative described in the environmental assessment was formulated to project future conditions. The possible effects of implementing each alternative are also described. Alternative B is tentatively selected as the Service's Proposed Plan (Action).

Section A. Draft Comprehensive Conservation Plan for Bayou Cocodrie National Wildlife Refuge

A key purpose of this section is to detail the proposed conservation actions for the refuge over a 15-year time frame. Chapter I provides an overview of the Fish and Wildlife Service, the National Wildlife Refuge System, and the Lower Mississippi Valley. Chapter II describes the refuge environment and the resource problems and challenges facing Service managers. Chapter III describes public involvement as part of plan development and the underlying problems and concerns raised by the public and Service managers. Chapter IV describes the desired future management direction reflected through goals, objectives, and strategies. Chapter IV also reflects the proposed management outlined in Alternative B, and describes desired management activities and appropriate and compatible recreational and permitted uses of the refuge. Chapter V lists projects that the Service will strive to accomplish to meet the goals set for the refuge.

Section B. Environmental Assessment for Bayou Cocodrie National Wildlife Refuge

The environmental assessment was prepared to comply with the National Environmental Policy Act. Chapter I introduces the reader to the plan, planning study area, issues and problems associated with the refuge, other activities that are relevant to plan development, and planning process and issue identification. Chapter II describes three alternatives formulated by the Service to accomplish the refuge purposes and goals. Chapter III describes the refuge environment. Chapter IV addresses the predicted effects from implementing each alternative. Chapter V describes public and private entities consulted while conducting the planning effort.

Section C. Appendices

This section identifies terms, references, laws and authorities, and methods utilized to develop plans; lists biota; partnering information useful to land owners and managers; and decisions and approvals for implementing the plan. After public comments are received regarding this draft, the Service will publish responses to those comments in the final plan.

Bayou Cocodrie National Wildlife Refuge

Draft Comprehensive Conservation Plan

Located in the Lower Mississippi Valley and established in 1990, Bayou Cocodrie National Wildlife Refuge is composed of fragmented forest patches, parts of which retain a diverse assemblage of mature and old age bottomland hardwood forests. This document proposes management actions to improve conditions for wildlife, associated habitats, and recreation opportunities on the refuge. The vision statement for the refuge reflects the desired future conditions within the context of the National Wildlife Refuge System mission, refuge purposes, and other relevant mandates.

I. Background

SECTION A

Introduction

Contained in this Draft Comprehensive Conservation Plan for Bayou Cocodrie National Wildlife Refuge are the proposed management actions and direction for the refuge over the next 15 years. When fully implemented this plan will strive to achieve the refuge vision. Overriding considerations reflected in the plan are that fish and wildlife conservation requires first priority in refuge management, and that wildlife-dependent recreation is allowed and encouraged as long as it is compatible with, or does not detract from, the mission or the refuge purposes.

A planning team developed a range of alternatives that best met the goals and objectives of the refuge and could be implemented within the 15-year period. After reviewing comments and management needs the alternatives were evaluated. The proposed alternative is described in Chapter IV, Management Direction. Other alternatives are addressed in Section B, Environmental Assessment.

Old growth cypress swale
USFWS

Purpose and Need for Plan

The purpose of the plan is to identify the role the refuge will play in support of the mission 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 refuge;
- Provide refuge neighbors, visitors, and government officials with an understanding of Service management actions on and around the refuge;
- Ensure that Service management actions, including land protection and recreation/education programs, are consistent with the mandates of the National Wildlife Refuge System;
- Ensure that the management of the refuge is consistent with federal, state, and county plans; and
- Provide a basis for the development of budget requests for operations, maintenance, and capital improvement needs.

Perhaps the greatest need of the Service is communication with the public and the public's participation in efforts to carry out the mission of the National Wildlife Refuge System. Many agencies, organizations, institutions, and businesses have developed relationships with the Service to advance the mission of national wildlife refuges. This draft comprehensive conservation plan supports the Partners-in-Flight Initiative; the Lower Mississippi Valley Migratory Bird Wetland Conservation Initiative; the North American Waterfowl Management Plan; the Western Hemisphere Shorebird Reserve Network; the American Woodcock Management Plan; and the National Wetlands Priority Conservation Plan. For further information regarding migratory birds, see website http://birds.fws.gov/.

Fish and Wildlife Service

Mission

As part of its mission, the Service manages more than 530 national wildlife refuges covering over 92 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands, with 77 million acres in Alaska and the remaining 15 million acres spread across the other 49 states and several island territories.

Description

The 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 shares some conservation responsibilities with other federal, state, tribal, local, and private entities. 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.

National Wildlife Refuge System

Mission

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."

Description

The National Wildlife Refuge 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 complement the direction of this new legislation, including an effort to complete comprehensive conservation plans for all refuges. These plans, which are completed with full public involvement, help guide the future management of refuges by establishing natural resources and recreation/education programs. The Act states that each refuge shall be managed to:

- Fulfill the mission of the National Wildlife Refuge System;
- Fulfill the individual purpose of each refuge;
- 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 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 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 visitation grows, there are significant economic benefits to local communities. By analyzing refuges, economists found that refuge visitors contribute more than $400

million annually to local economies. Nearly 40 percent of the country's adults spent $101 billion on wildlife-related pursuits in 1996, according to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (Fish and Wildlife Service 1996).

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 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 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

Administration of national wildlife refuges is guided by the mission and goals of the National Wildlife Refuge System, Congressional legislation, Presidential Executive Orders, and international treaties. Policies for management options of the refuge 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. Management options of 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, the legal and policy guidance for the operation of national wildlife refuges, are contained in documents and acts listed in Section C. 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; and
- National Wildlife Refuge System Improvement Act of 1997.

Lands within the National Wildlife Refuge System are closed to public uses unless 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 refuge 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 refuge purposes.

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 and national wildlife refuges provide the foundation for protection of species, and contribute to the overall health and sustainment of fish and wildlife species in Louisiana.

The Louisiana Department of Wildlife and Fisheries (http://www.wlf.state.la.vs) is a state-partnering agency with the Service, charged with enforcement responsibilities relating to migratory birds and endangered species as well as managing state natural resources. It also manages approximately 1.4 million acres of coastal marshes and wildlife management areas. The Department coordinates the state wildlife conservation program and provides public recreation opportunities including an extensive hunting and fishing program on state wildlife management areas, such as the 36,000-acre Red River Wildlife Management Area in Concordia Parish (Figures 1). The state's participation and contribution throughout this comprehensive conservation planning process provide for ongoing opportunities and open dialogue to improve the ecological sustainment of fish and wildlife in Louisiana. An integral part of the comprehensive conservation planning process is integrating common mission objectives where appropriate.

Ecosystem Context

Overview
Sustainable communities and species conservation and recovery on refuges require the joint efforts of private landowners, local communities, and state and federal governments. The Fish and Wildlife Service is initiating cooperative partnerships in an effort to reduce the declining trend of fish and wildlife populations and biological diversity. Bayou Cocodrie National Wildlife Refuge is part of the Lower Mississippi Valley (Figure 2).

The Lower Mississippi Valley once supported a vast bottomland hardwood forest complex that extended along the Mississippi River from Illinois to Louisiana. Today, less than 20 percent of this bottomland hardwood forest remains and most is fragmented or remains in scattered patches throughout the region (Figure 3). Flood waters once recharged wildlife habitats and created rich, dynamic systems that supported a diverse abundance of fish and wildlife species. The Lower Mississippi Valley is bisected by levees and its flow is restricted by flood control projects and agricultural diversion. Water quality is significantly impacted by agricultural and industrial runoff. Rivers and water bodies throughout are highly turbid, laden with pesticides, and support a small fraction of the once abundant aquatic resources. These declines prompted the Service to designate bottomland hardwood forests found in this ecosystem as areas of special concern.

The Service is focusing efforts to adopt collaborative resource partnerships within and outside the agency 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. Biological objectives in the Lower Mississippi Valley for species groups targeted in this plan reflect the Partners-in-Flight Plan, North American Waterfowl Management Plan, Western Hemisphere Shorebird Reserve Network, and the recovery of the Louisiana sub-population of black bear (Figure 4).

Hooded warbler
Bill Duyck - Cornell Lab of Ornithology

Threats and Problems

National wildlife refuges in the Lower Mississippi Valley serve as part of the last safety net to support biological diversity—the greatest challenge facing the Service. Impacts and underlying causes and threats to biological diversity within 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 *e.g.* forest fragmentation (Figure 1);
- The effects of constructing navigation and water diversion projects, and the effects of agricultural and timber harvesting practices;

Figure 1. Conservation Management Focus Areas

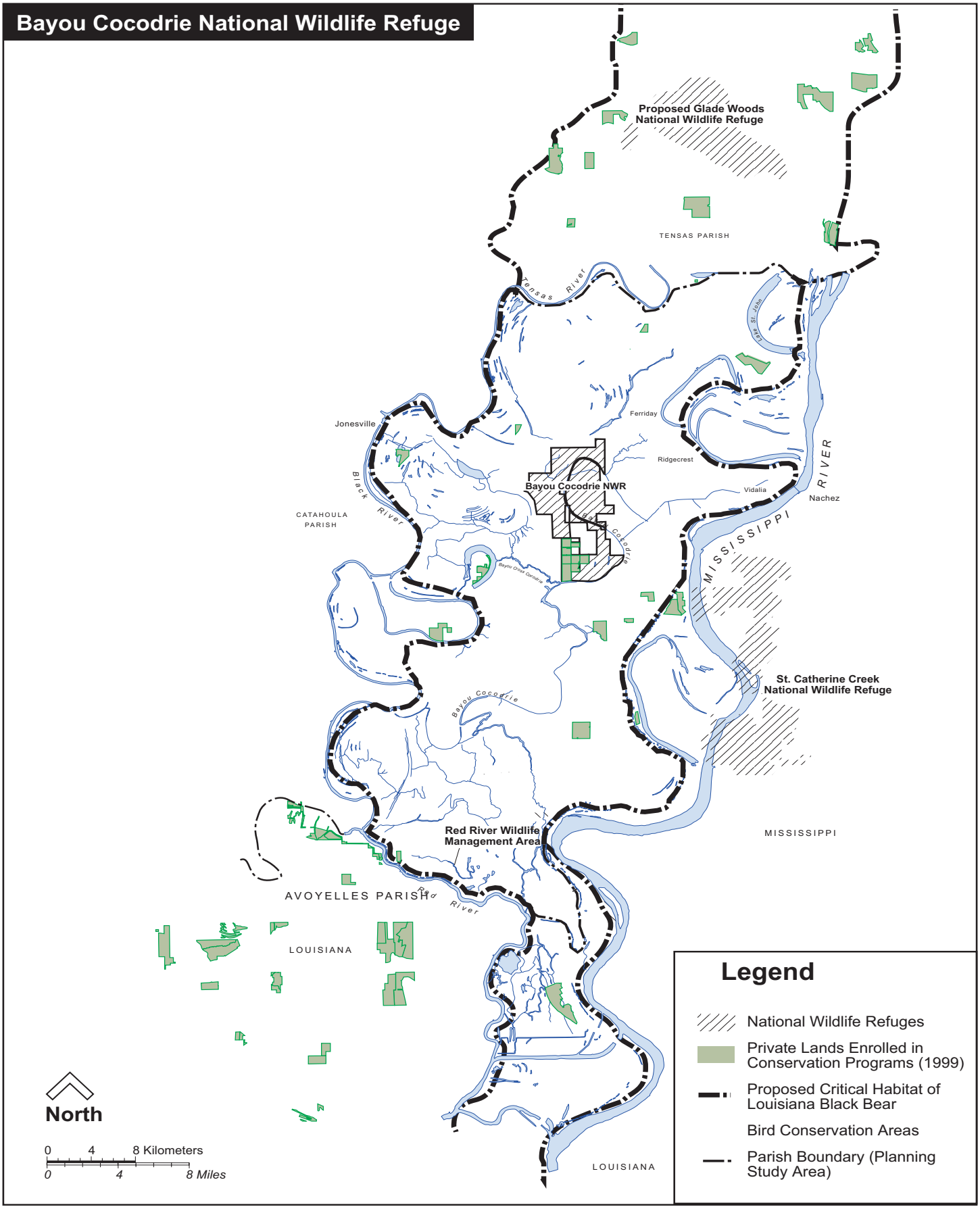


Figure 2. Lower Mississippi Valley Ecosystem

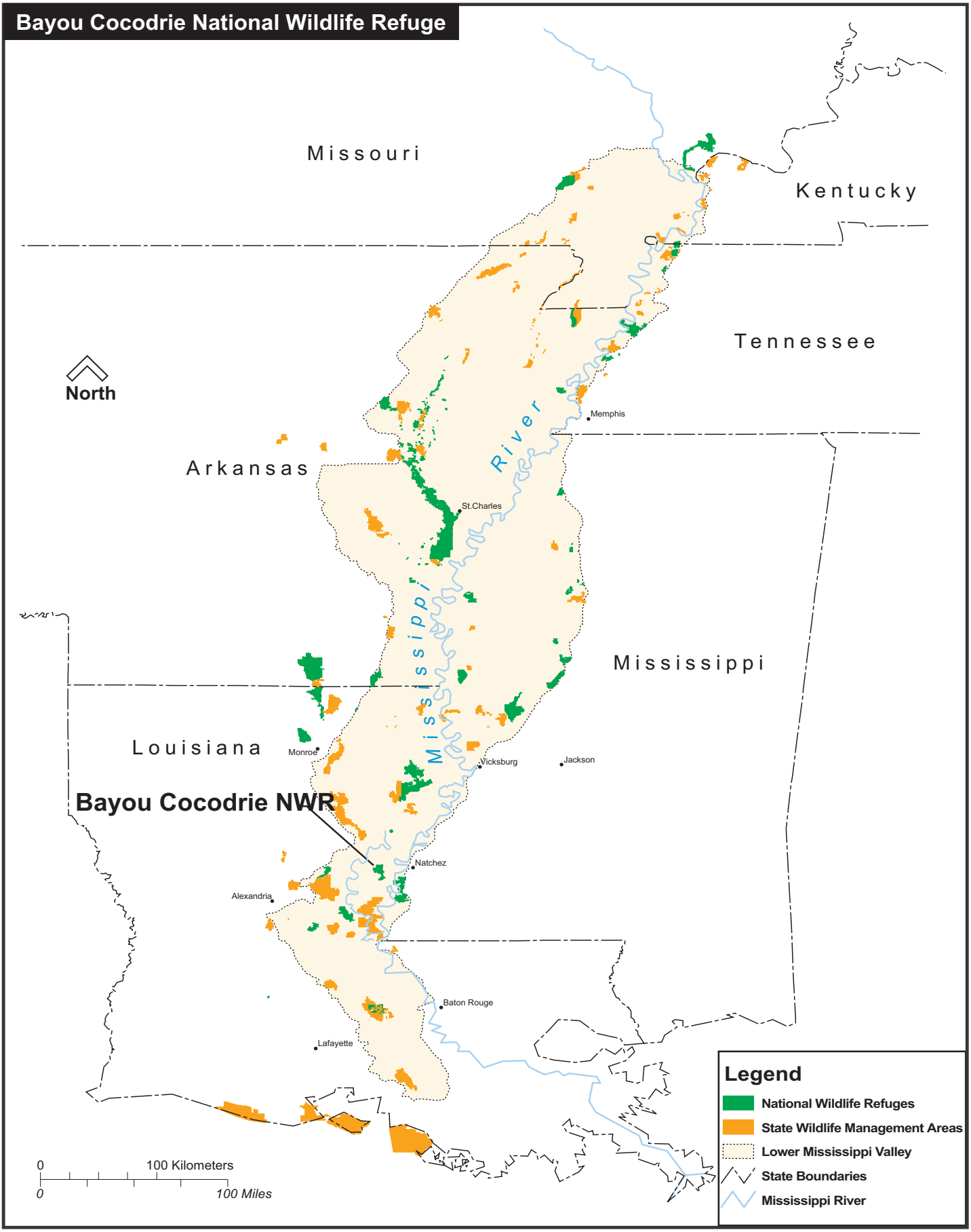


Figure 3. Forest Cover Changes in the Lower Mississippi Valley

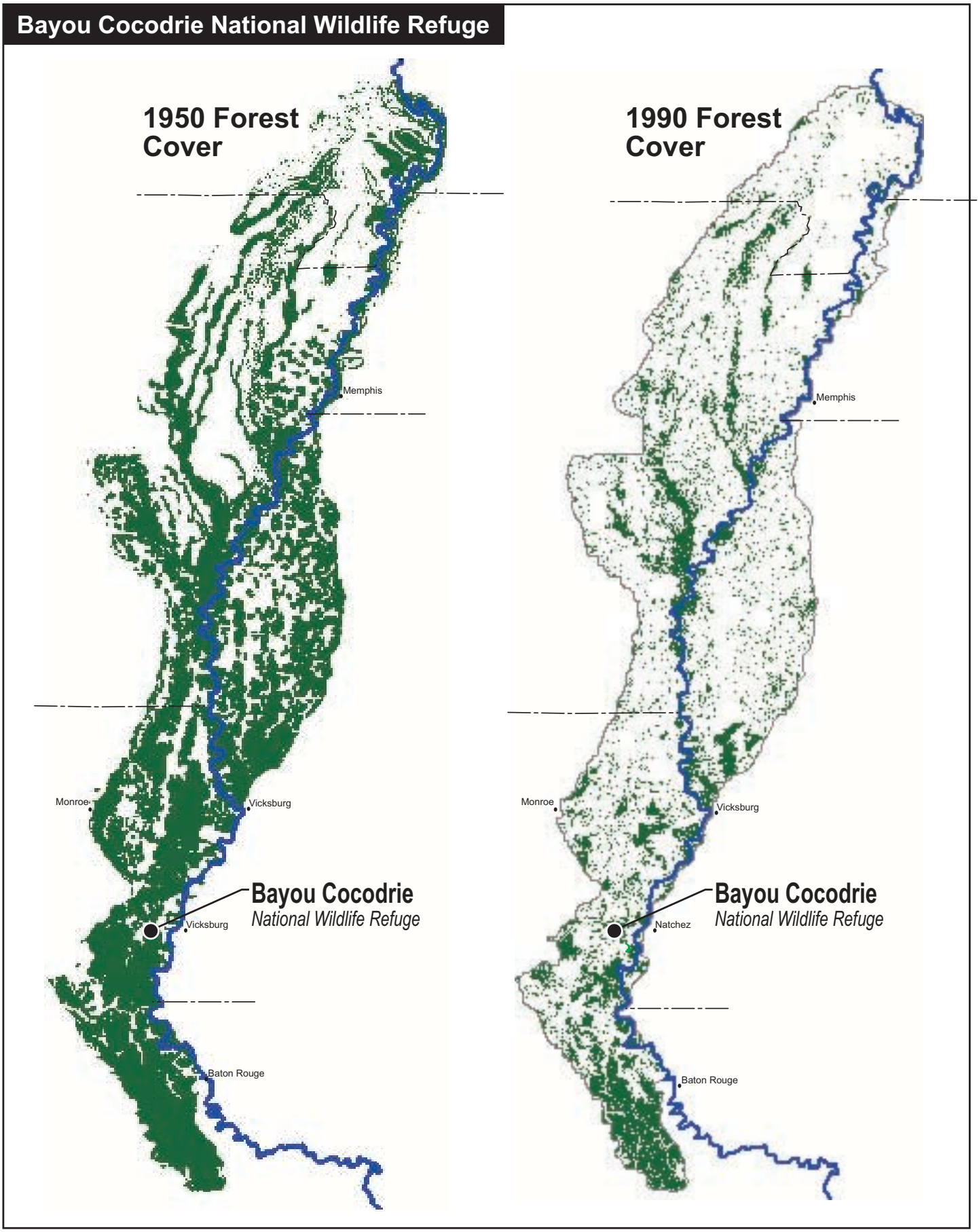
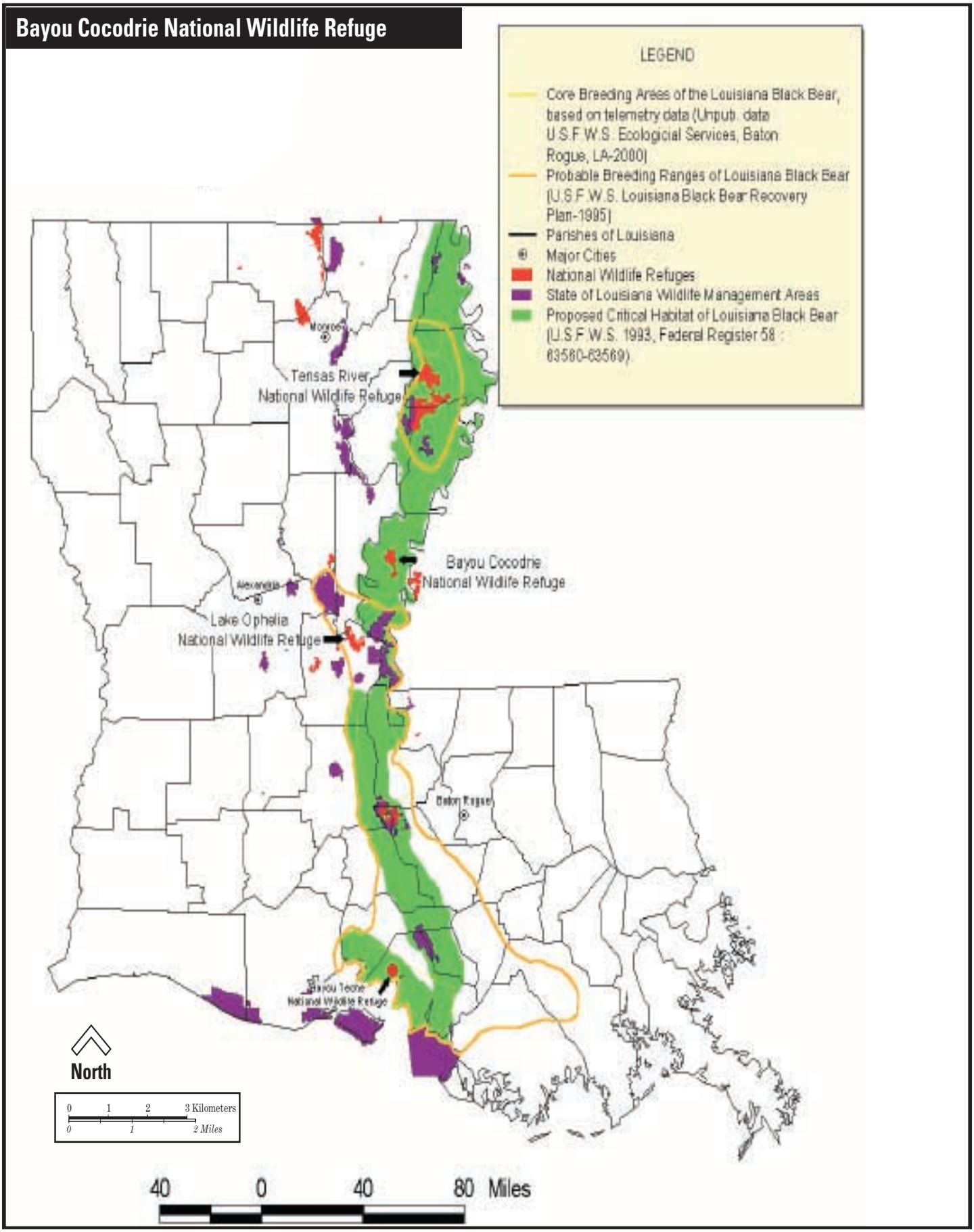


Figure 4. Breeding Ranges and Proposed Critical Habitat for the Lousiana Black Bear



■ The simplification of the remaining wildlife habitats within the ecosystem and gene pools; and
■ The cumulative habitat effects of land and water resource development activities.

As a result of these causes and threats, many species endemic to the Lower Mississippi Valley have become either extinct, threatened, or endangered. The Louisiana black bear is listed as threatened under the Endangered Species Act. 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 endangered, if not extinct.

Fragmentation
USFWS Tensas River National Wildlife Refuge

Elimination of forest habitats and forest fragmentation has decimated wildlife species throughout the Lower Mississippi Valley (Figure 3). Species most adversely affected by fragmentation are species 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. Forest fragmentation affects migratory songbirds mostly through high rates of nesting failure due to predation and cowbird parasitism--both are recognized by the Service as serious threats to wildlife in Louisiana. More than 70 species of breeding migratory songbirds are found in this region. Some of these species, including Swainson's warbler, prothonotary warbler, wood thrush, and cerulean warbler have declined significantly and need the benefits of large forest blocks to recover and sustain their existence (pers. comm. Hunter, Fish and Wildlife Service).

Modifications to the historic flood plains have caused major declines in fisheries and aquatic resource productivity. The reduction of ecological functions from non-point source runoff of sediments, excess nutrients, and pesticides/herbicides is a continual threat to the remaining fisheries resources. The Service's Draft Fisheries and Aquatic Resources Strategic Management Plan for the Lower Mississippi River Ecosystem identifies 67 fish species as endangered, and 39 species as threatened. In addition, 16 other species are species of concern or proposed for listing. Only two threatened/endangered fish species occur in Louisiana.

Cowbird in Willow flycatcher nest
John Harris

The lack of bottomland hardwood forests, coupled with the impacts associated with fragmented forests, poses a serious threat to migratory bird populations, black bear, and other resident species.

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. By working with others, the Service is more effective in achieving its overall mission and management goals. A combination of land protection and habitat management methods is utilized by the Service and others to compensate for bottomland hardwood habitat loss and to meet shared/common long-term goals established for this area (Figure 2).

Bottomland hardwood forests are ranked as the highest conservation priority of the Fish and Wildlife Service and other agencies on which to focus management efforts. For example, the U.S. Department of Agriculture is working with the Fish and Wildlife Service and landowners to restore forests on private lands to contribute to the recovery of the Louisiana black bear. The Lower Mississippi River Joint Venture (a consortium of public and private conservation groups) initiated cooperative efforts to restore lands that provide maximum benefits to migratory songbirds and has identified conservation areas on which to focus future

Discussing bird conservation
USFWS

land protection and restoration efforts. The long-term goal is to provide "forest islands" called forest bird conservation zones in the Lower Mississippi Valley ranging in size from 10,000 to more than 100,000 acres. The forest bird conservation zones are priority areas for forest restoration and will someday serve as important "anchors" for biological diversity (Figure 1).

The Lower Mississippi Valley serves as the primary wintering habitat for mid-continent waterfowl populations, as well as breeding and migration habitat migratory songbirds returning from Central and South America.

Restoration of migratory songbird populations is a high priority of the Partners-in-Flight Plan, 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 species (Bonney 1999). Further, 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 refuge (Figure 5).

The recovery of the Louisiana black bear involves a major conservation endeavor between federal, state, and private participants, including the Service, Natural Resources Conservation Service, state agencies, universities, private conservation organizations, and the Black Bear Conservation Committee. The Service's recovery plan is to establish viable populations, promote various land protection methods that will establish migration corridors, and protect habitat. The Black Bear Conservation Committee is made up of public and private partners in Mississippi, Louisiana, and east Texas. The committee adheres to the Service's recovery plan. The overall goal of both the committee and the Service is to restore and protect a series of large forest blocks connected by corridors; to facilitate recovery of the bear in Louisiana; to identify protection areas in Louisiana as special focus areas; and to support black bear populations and provide movement corridors that serve as conduits of genetic exchange within the Lower Mississippi Valley. These forest blocks overlay the forest bird conservation zones identified by the Service. Forest bird conservation zones are identified for this refuge as well as Tensas River National Wildlife Refuge in Madison and Tensas Parishes, Louisiana, the Red River/Three Rivers Wildlife Management Area Complex in Concordia Parish, and the Atchafalaya Basin. The Black Bear Conservation Committee uses education and outreach as tools to promote the recovery of the black bear (Figure 1).

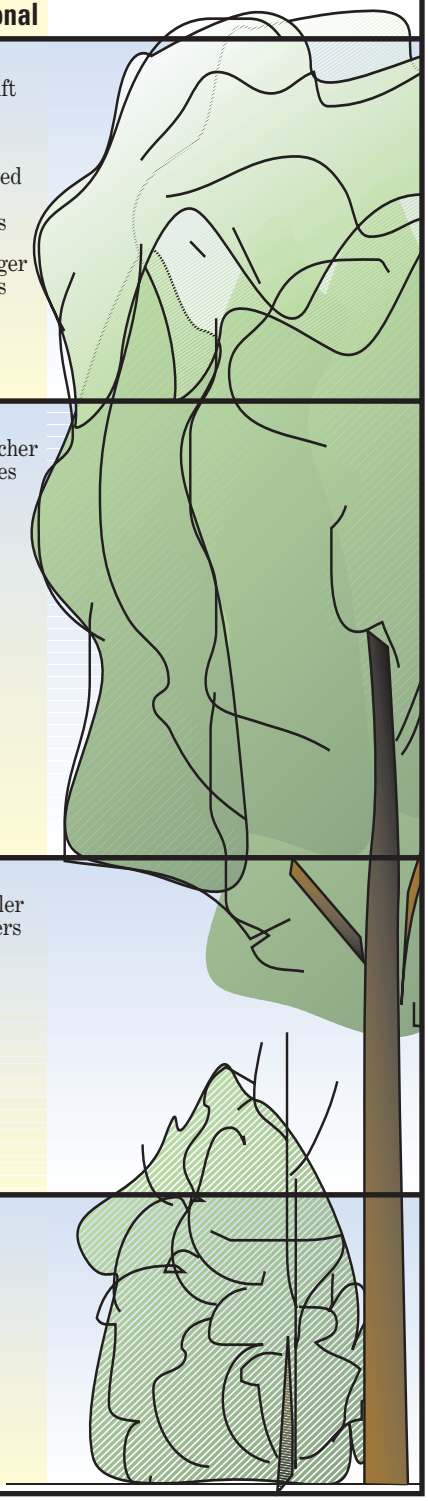
Black bear
Tensas River National Wildlife Refuge

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 the all federal, state, tribal, and private organizations working together will ensure that the Service not only protects the more important areas, but also reduces redundancy and overlap. See Appendix II for a detailed description of private landowner/partnership opportunities.

Figure 5. Priority Bird Species Associated with the Refuge Bottomland Hardwood Forest

Shows present species status and desired density expressed in pairs per 100 acres (from Hamel 1992)

	Priority Level: Extremly High	High	Moderate	Low or Regional
Canopy	Swallow-tailed Kite (Extirpated) Cerulean Warbler (Extirpated)	Red-headed Woodpecker 2-3/100 acres Northern Parula 11-16/100 acres	Blue-gray Gnatcatcher 9-11/100 acres Rusty Blackbird (winter) 1-3/100 acres	Chimney Swift 1/100 acres Yellow-throated Warbler 4-6/100 acres Summer Tanager 5-7/100 acres
Midstory		Yellow-billed Cuckoo 5-7/100 acres Wood Thrush (nest) 13-15/100 acres Prothonotary Warbler 11-19/100 acres	Ruby-throated Hummingbird 3-4/100 acres Eastern Wood-Pewee 7-8/100 acres Carolina Chickadee 9-10/100 acres	Acadian Flycatcher 13-16/100 acres
Understory	Swainson's Warbler (nest) 6-11/100 acres	White-eyed Vireo 9-12/100acres Prothonotary Warbler		Hooded Warbler 14-18/100 acrers
Ground	Swainson's Warbler (forage)	American Woodcock (winter) 7-11/100 acres Wood Thrush (forage)		



USFWS,
Chuck Hunter

II. Refuge Description

Introduction

Although Bayou Cocodrie National Wildlife Refuge was established in 1990, to date, only 13,168 acres have been acquired within the 22,269-acre acquisition boundary. The Nature Conservancy was instrumental in securing lands for the refuge. The potential wildlife habitat values of old growth bottomland hardwoods and adjacent forests provided the impetus to purchase the property from its original owners. In 1988, The Nature Conservancy purchased 11,230 acres from the Fisher Lumber Company, a subsidiary of General Motors, for resale to the Service (Figure 6).

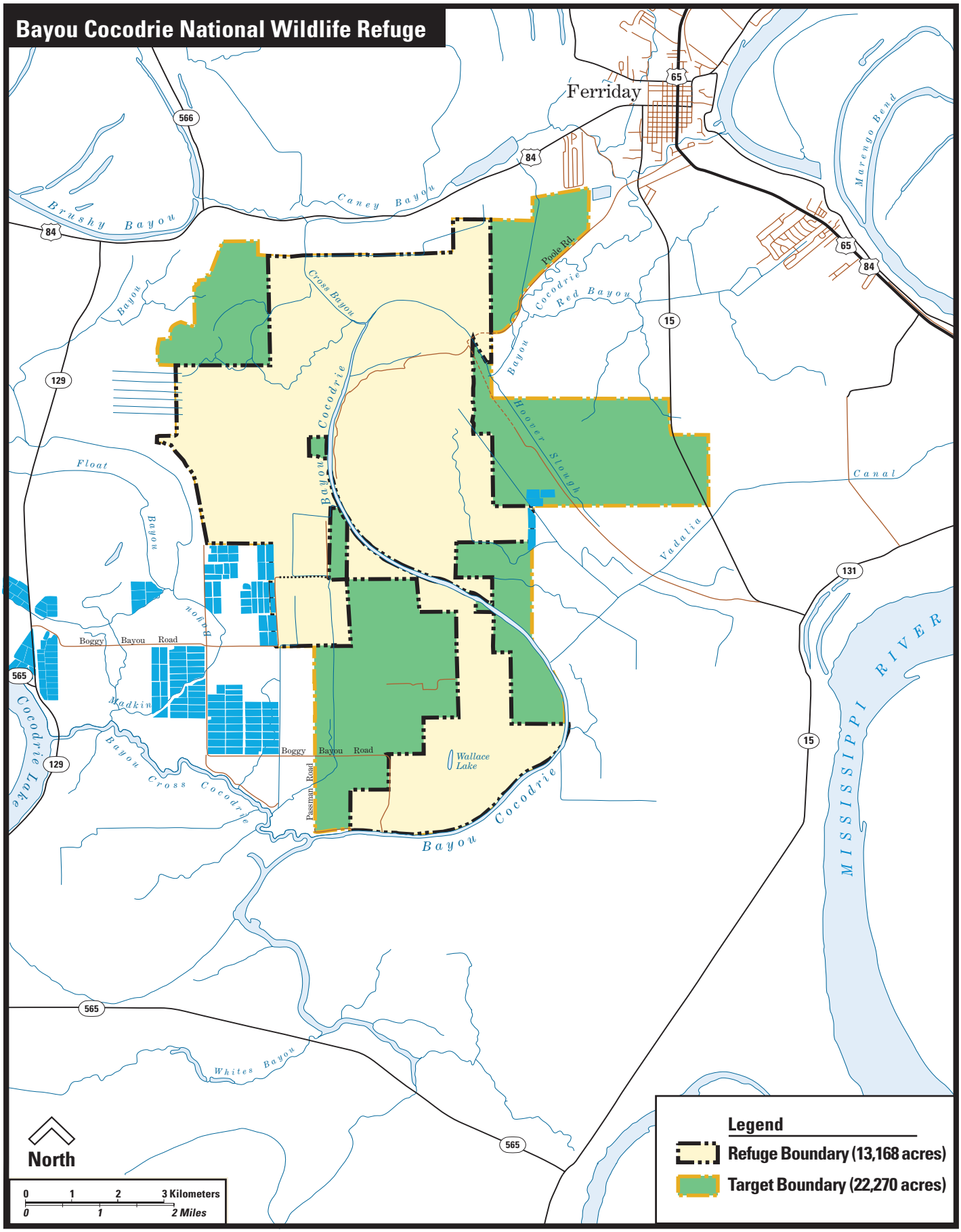
Management efforts since 1990 have emphasized acquiring land, securing staff to operate the new facility, and initiating conservation programs that benefit resident wildlife species. However, Service acquisition of key properties such as inholdings and bottomland hardwood habitat may not be realized within the 15-year planning period due to budget constraints and landowner preferences. The 22,269-acre boundary has a significant "edge" which contributes to predation of nesting forest birds. Edge effect is the tendency of a transitional zone between communities to contain a greater variety of species and more dense populations of species than any surrounding community. Such is the case between wildlife communities that occupy dense bottomland hardwood forests and wildlife found in open, cultivated agricultural lands.

Conservation management projects for the refuge include:

- Conducting comprehensive assessments of existing fish and wildlife resources;
- Recruiting and training staff and improving existing facilities;
- Defining refuge objectives that will contribute to maintaining biological diversity within the Lower Mississippi Valley;
- Managing habitats to reduce threats and problems (i.e., forest fragmentation, loss of old growth forests) associated with species of concern;
- Assisting in black bear recovery efforts; and
- Defining research within the old growth area and involving partners to accomplish the research.

Northern parula
Bill Dyer - Cornell Lab of Ornithology

Figure 6. Approved Acquisition Target Areas



Purpose

Congress authorized the establishment of Bayou Cocodrie National Wildlife Refuge on November 16, 1990, through Public Law 101-593 (Section 108, House Report 3338), to protect some of the last remaining, least disturbed bottomland hardwoods in the Lower Mississippi Valley. Congress stated the refuge purpose as follows:

"The Bayou Cocodrie National Wildlife Refuge is established and shall be managed for the purposes of (1) conservation and enhancement of wetlands; (2) general wildlife management as a unit of the National Wildlife Refuge System, including management of migratory birds; and (3) fish and wildlife-oriented recreational activities."

In establishing the refuge, Congress recognized the significance of this area in its findings:

"The Bayou Cocodrie area is a bottomland hardwood swamp which borders (supports or harbors) more than one hundred and fifty species of birds and many other types of wildlife, including several species threatened with extinction, such as the Louisiana population of black bears. The Bayou Cocodrie area includes some of the least disturbed bottomland hardwood forests in the southeast and significantly contributes to the biological diversity in the region."

In managing the refuge, the Secretary of the Interior shall manage:

"...an amount of refuge woodlands as a contiguous forest sufficient to benefit the species of passerine birds that occupy this type of habitat. The Secretary shall give special consideration to accomplishing this objective through the use of current authority, including his authority to establish Research Natural Areas within the Refuge."

Expanding on the primary purpose, objectives were defined in the June 1992 Environmental Assessment and Land Protection Plan prepared by the Service. The management objectives include:

- Providing wintering habitat for migratory waterfowl;
- Establishing habitat for a natural diversity of wildlife;
- Providing habitat for non-game migratory birds (neotropical migrants);
- Establishing a Research Natural Area; and
- Providing opportunities for environmental education, research, interpretation, and other wildlife-dependent recreation.

Wood thrush
Mike Hopiak - Cornell Lab of Ornithology

Refuge Environment And Other Related Information

Fish, Wildlife, and Plant Populations

The refuge serves as a critical repository of gene pools, species, and communities that must contribute to the overall health of the Lower Mississippi Valley ecosystem. Named after the native alligator (crocodile) and the bayou that runs through it, the refuge provides an important ecological niche for fish, wildlife, and plant species. The Service manages refuge resources and, where possible, coordinates with neighboring land managers and agencies to conserve biological diversity. The high quality forests, long growing season, abundant rainfall, and geographical proximity to the Mississippi River provide habitat for a diversity of resident species including migratory songbirds and black bear. The refuge is home to a wide variety of amphibians, reptiles, mammals, and birds and is well known locally for its wildlife habitat. Songbirds, white-tailed deer, waterfowl, shorebirds, raptors, reptiles, amphibians, woodcock, furbearers, and other mammals utilize this area. A list of wildlife species known or predicted to inhabit the refuge is included in Section C. V.

A thorough documentation of the population status of wildlife other than neotropical songbirds has not been conducted. Excellent documentation of neotropical bird use of portions of the refuge has been accomplished under Service sponsorship by the Louisiana State University Avian Laboratory.

Threatened Species and Species of Management Concern

Infrequently, refuge staff observe footprints of the transient Louisiana black bear, which is listed as threatened under the Endangered Species Act. The threatened bald eagle has been observed on the refuge. Initial and unpublished studies have indicated that old growth trees on the refuge are important roosting sites for the Rafinesque's big-eared bat , a species of management concern (unpub. reports, Cochran and Fish and Wildlife Service 1999). The eastern cougar and the red wolf were former residents of the area, but none have been documented in the last 40 years.

Bear cub
Don Anderson Tensas River National Wildlife Refuge

The refuge location and habitat features are significant for the future conservation of the Louisiana black bear. Restoration efforts proposed by the Black Bear Conservation Committee include proposed bear management units that would expand the refuge boundary. The Service, the Louisiana Department of Wildlife and Fisheries, and members of the Black Bear committee are planning to eventually move females onto the refuge, and other public lands near the refuge, in an effort to reestablish breeding populations. The committee has also identified private lands that could be used as corridors between breeding bear populations. A combination of protected and managed public and private lands would provide the necessary forested blocks and corridors for bears to move about with minimal disturbance. The Natural Resources Conservation Service plays a major role in black bear recovery efforts by implementing land protection programs which provide an economic incentive for farmers to restore farmlands and place them in conservation easements.

Avian Species

Avian species are extremely important wildlife resources identified on the refuge with more than 186 species recorded within the refuge border (unpub. data, Ouchley). The bottomland hardwood forests serve as important habitat for breeding birds and migrants in the spring and fall. Surveys and studies indicate that this refuge may contain the most diverse assemblage of migratory bird species remaining in the Lower Mississippi Valley.

For migratory forest breeding songbirds and shorebirds, the ecological and biological significance is transcontinental, providing breeding and migration habitat for Gulf migrants returning from their wintering grounds in Central and South America. Songbird studies have been conducted in the Brooks Brake Unit, which contains a 750-acre old growth forest stand. Additional surveys and monitoring would confirm breeding songbird survey information, nest success, and other key measurements. Such species as warblers, vireos, tanagers, flycatchers, and indigo buntings are common residents.

The refuge and the Lower Mississippi Valley serve as the primary wintering ground for mid-continent waterfowl populations breeding in the prairies and parklands of Canada and the United States. Historic conditions typical of refuge habitats once supported excellent habitat for migratory waterfowl. Management efforts to improve wintering waterfowl habitat on refuge lands are underway and will increase as additional lands are purchased. Typical winter residents include mallards, teal, and wood ducks. Waterfowl species known to nest in this area include wood ducks and hooded mergansers. Restoration and management of wetlands on the refuge would create additional resources for dabbling ducks.

Yellow-crowned night heron
USFWS

Waterfowl population objectives are tied to supporting the North American Waterfowl Management Plan. A 440-acre moist soil impoundment is managed adjacent to a recently reforested area and cropland. The refuge impoundments, in conjunction with naturally flooded forest habitat, will eventually support about 480,000 duck-use-days. The refuge population objective will average between 5,000-10,000 ducks for 110 days (unpub. report, Bayou Cocodrie National Wildlife Refuge 1998). This population objective is supported by the moist soil unit, flooded sloughs, Wallace Lake and Little Wallace Lake, as well as brakes subject to flooding. Managers focus work on the moist soil units, selected sloughs in the Brooks Brake Unit, and construction of wood duck boxes. The only breeders utilizing the bottomland hardwood forests are wood ducks and hooded mergansers.

Wading birds are abundant in the small lakes and numerous sloughs. The backwater bays, sloughs, and depressions provide habitat for shorebirds such as yellowlegs, sandpipers, plovers, gulls, and terns which can be found using wetland mudflats and bayous during their spring and fall migrations. Herons and egrets are plentiful.

Mammals

Mammals are numerous and observed throughout the refuge. No comprehensive list of mammalian species exists for the refuge, although it is known which mammals occur in this area (St. Amant 1951 and Lowery 1981). The refuge area contains seven orders of mammals including pouched mammals (opossums); insect-eaters (shrews and moles); bats; flesh-eaters (long-tail weasel); gnawing mammals (southern flying squirrel); rabbits; and even-toed hoofed mammals (white-tailed deer).

The bottomland hardwood communities are very productive for a wide array of wildlife species, including game animals. Game species include white-tailed deer, grey and fox squirrels, and swamp and cotton-tailed rabbits. Furbearers include beaver, nutria, otter, striped skunk, coyote, grey and red fox, mink, and bobcat. Present deer populations are at carrying capacity, and hunting is designed to maintain this level. Population levels have improved dramatically since Service acquisition, as have herd health indicators. Average body weights are improving and mature bucks may weigh in excess of 250 pounds live weight. Future deer populations will be a reflection of both forest management and deer harvest.

Raccoon populations are monitored to ensure compatible levels with other species. Negative impacts from excessive population numbers include depredation on turkey, neotropical birds, and wading bird nests.

Feral hogs compete with resident wildlife for food and can cause crop damage to neighboring farms. Hunting and removal programs should bring these animals under control.

Alligator
USFWS

Amphibians and Reptiles

Although frequently observed, much is still unknown about reptile and amphibian population levels on the refuge. At least thirty species of reptiles and amphibians and a variety of native and non-native aquatic species are known to be found on the refuge. The diverse group of amphibians including salamanders, toads, and frogs are well adapted to the aquatic and terrestrial environments, and moisture is typically important for their survival. Reptiles including turtles, alligators, lizards, skinks, and snakes are common.

Aquatic Species

These species are most commonly observed along the main stem of Bayou Cocodrie. Although limited, the refuge does provide an important fishery resource for local fishermen. Most of the aquatic habitat consists of beaver ponds, oxbow lakes such as Wallace and Little Wallace lakes, and Cross Bayou streams which support commercial fishing of catfish, buffalo, alligator gar, and freshwater drum. Sport fishing populations of crappie, bass, and bream are also found in these lakes, although the populations are low due to periodic water quality problems, particularly high turbidity. Access to the lakes is very limited.

Mussels

A comprehensive mussel survey has not been completed for the refuge, however, a survey was conducted at St. Catherine Creek National Wildlife Refuge which is located 20 miles to the southeast. This survey indicated the possibility of the following mussels occurring on the refuge: fat pocketbook, mapleleaf, flat floater, paper pondshell, giant floater, Texas liliput, pond mussel, yellow sandshell, papershell, pink papershell, and southern mapleleaf.

Old Growth

Old growth is a vanishing native habitat in the Lower Mississippi Valley and considered extremely important, if not one of the greatest ecological assets of the refuge. This rare and vanishing hardwood plant community has outstanding ecological value, especially for forest interior-breeding songbirds. While there is no formal initiative in place that outlines a specific technical approach for managing the old growth area, the Service will monitor the quality and condition of this site and propose it for Research Natural Area designation. Due to its significance, it will be afforded special protection and will be used as a model for study on which to base future management direction of the refuge.

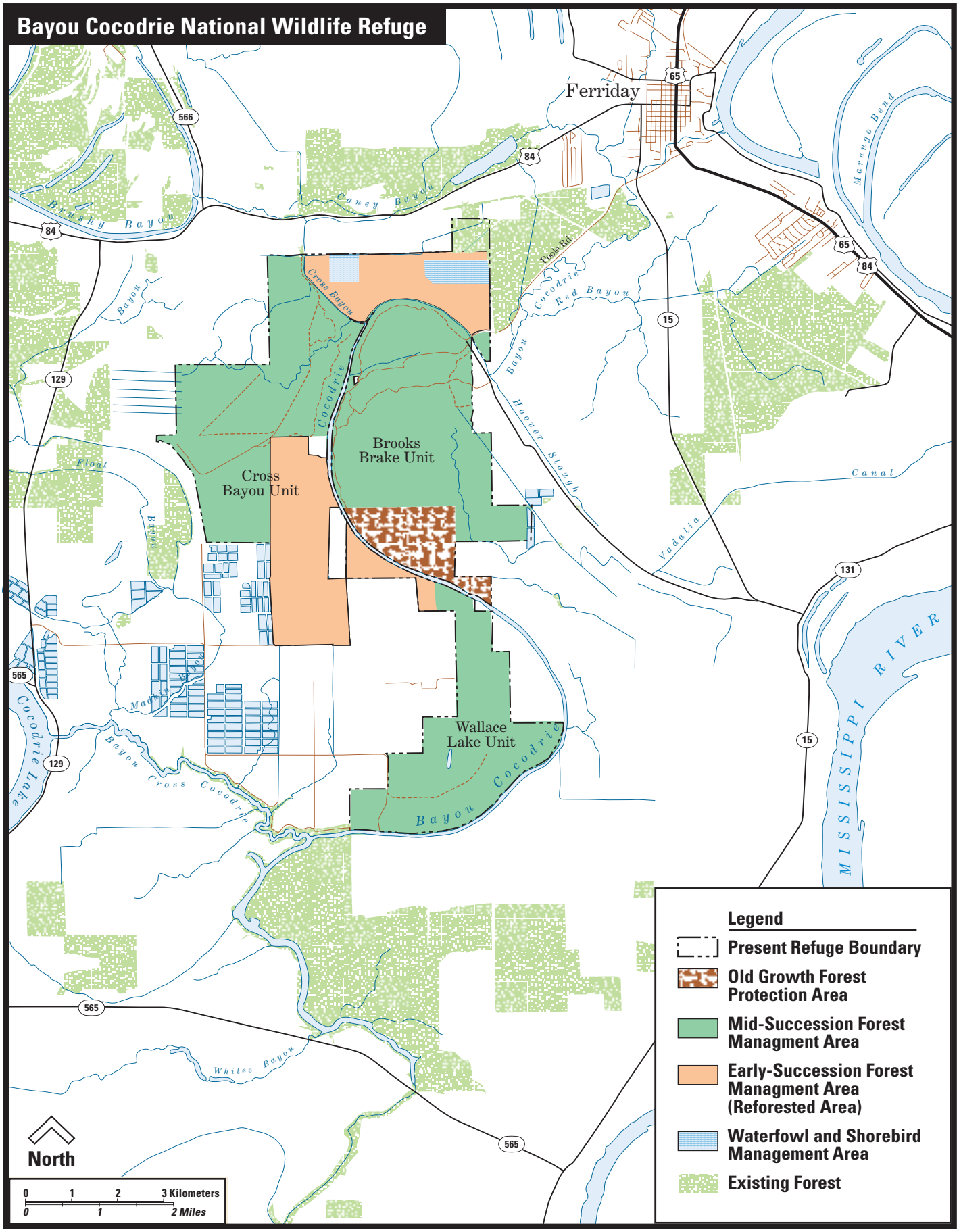
Invasive Species

Also known as exotic or non-native species, invasive species are becoming an increasing concern of refuge staff. Feral hogs and Chinese tallow pose a threat to the biological diversity of the refuge. Feral hogs degrade wildlife habitat, and being omnivores, prey on young livestock as well as fawns and ground nesting birds. Feral hog habitat preferences include moist bottomlands and dense vegetation along rivers and streams. Upland habitats where oak mast is found also attract these scavengers. Feral hogs are prolific reproducers. Control methods commonly used on the refuge to reduce the populations include hunting and trapping. Chinese tallow (Sapium sebiferum) is a small to medium-sized tree that is reported in small numbers on the refuge. The plant is highly invasive, and could quickly out-compete native plant species.

Habitats

The bottomland hardwood forests of the refuge are important for the long-term survival of many plant and wildlife species, most notably conservation of old growth trees, migratory songbirds, and black bear (Figure 7). About 10,600 acres of bottomland hardwood forest are within the refuge boundary. The existing forests exhibit poor canopy, midstory, and understory structure to support sustainable populations of priority bird species, including the swallow-tailed kite, Cerulean warbler, Swainson's warbler and American woodcock. The swallow-tailed kite and Cerulean warbler are extirpated from the refuge, but historical records suggest that the refuge was once included in the breeding range of these species (Cooke 1904, Beyer 1900, Oberholser 1938). See Figure 5 for more information on breeding birds that presently exist on the refuge.

Figure 7. Existing Habitat Management



Wallace lake
USFWS

The refuge was established to protect the exemplary 750-acre old growth forest noted for its outstanding wildlife habitat value. This area supports a variety of sensitive species, including nesting songbirds. Natural communities include bottomland hardwood forests, marsh or herbaceous wetlands, swamps, streams, and lakes/deep-water habitat typical of the ridge and swale topography associated with bottomland hardwood forests in this area (Figure 8).

Due to the refuge's location, soils, and annual rainfall, which exceeds 60 inches, much of the vegetation consists of bottomland hardwood communities, with the exception of the recently reforested agricultural portions where weeds and grasses predominate.

Forest plant communities differ with slight elevation changes and the understory is reflective of sunlight conditions caused by the canopy closure. Quick to recover from disturbances, soils are fertile with a high site index and fast tree growth. Forest age ranges from very young to relatively old, depending on the site. Trees range in type from red gum, red oak, and sweet pecan on the ridges, to overcup oak, hackberry, and green ash in the flats, to cypress and bitter pecan in the lowest areas. Examples of dominant vegetation include cypress, cottonwood, black willow, sweet pecan, overcup oak, Nuttall oak, winged elm, and Tupelo gum. Sub-dominant plants include palmetto, switchcane, hawthorns, honey locust, and box elder. Other understory plants include smilax, honeysuckle, blackberry, dewberry, and a host of vines including rattan, muscadine, and poison ivy. Wet site vegetation includes pickeral-weed, day flower, water hyacinth, various sedges, and marsh mallow.

The refuge's aquatic habitat includes bayous, creeks, lakes, beaver ponds, and permanent and seasonal swamps. Bayou Cocodrie is a tributary of the Red River, located west of the Mississippi River in east-central Louisiana. Wetlands and deepwater habitat include small lakes, swamps, ponds, and perennial and intermittent streams. Wallace Lake has permanent water. Seasonal flood water remains in the shallow swales for several months, and in recent years, many shallow swales in both the Brooks Brake and Wallace Lake units held water year-round.

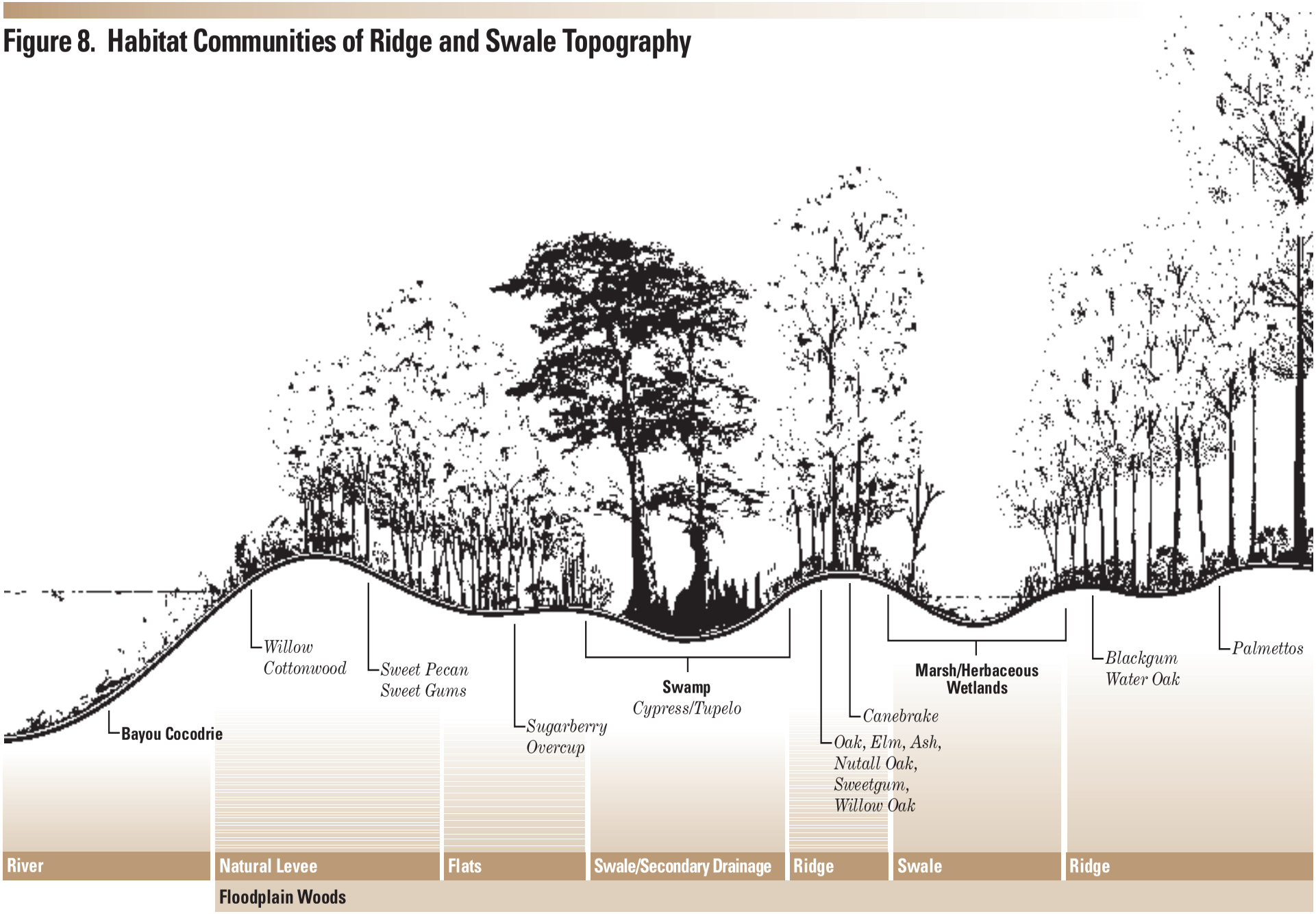
Oldfield
USFWS

Bayou Cocodrie begins at Concordia Lake. This secondary waterway is sluggish due to the flat terrain and management of the downstream weir on Wild Cow Bayou. The backwater flooding is virtually gone because of downstream pumping, resulting in the loss of seasonal flood waters. About 6 miles of this 30-mile river lie within the refuge boundary, and are flanked by natural levees which result in some of the highest ground on the refuge. As it exits the refuge, the bayou flows southward for a distance of 12 miles. Fish habitat diversity is only fair due to the sluggish nature of the stream and the impacts of land use in the watershed.

Old fields where former landowners actively clear-cut and then farmed are scattered along the refuge. Since 1996, managers have been replanting these areas in mixed hardwood seedlings. About 1,100 acres were managed under a lease agreement between the refuge and local landowners to produce millet, buckwheat, and perennial grasses for foraging of wintering waterfowl, but the lease agreements have been discontinued. These lands are scheduled for reforestation over the next two planting seasons.

Reforestation efforts will increase the present forest block size and provide direct benefits to many nesting migratory birds and black bear, as well as many other indigenous species.

Figure 8. Habitat Communities of Ridge and Swale Topography



Education and Visitor Services

Activities oriented toward interaction with and appreciation of wildlife and native habitats are a high priority of the refuge. Wildlife-dependent recreation includes wildlife observation (by hiking and canoeing), hunting, fishing, and photography. Hunting and wildlife observation have been the mainstay of this refuge. The staff also provide environmental education and interpretive programs when requested by local civic and school groups. Currently, there are no interpretive facilities on the refuge.

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

The public has yet to discover the natural beauty and wildlife of this refuge. It is largely undeveloped and in 1999 received about 5,500 visitors. The refuge offers hunting and wildlife observation as the primary recreation activities because of lack of facilities and staff to support other programs. Recreation data is limited. The refuge is open during the hunting season with some fishing access allowed at the south end. Public access to the interior of the refuge is limited to a 13-mile trail system located in the Brooks Brake Unit. This area offers the best access from public roads. About 4 miles of trail are used by all-terrain vehicles for access during the hunting season. A 0.5-mile trail is managed for wheelchair access.

The refuge serves as a location for wildlife-dependent recreation uses by keeping valuable wildlife habitats in the public trust. Trails are maintained for hunting access, wildlife observation, photography, and hiking. The staff contributes time to local schools and civic groups when requested, and periodically conducts specialized environmental education programs. Forest tracts on private lands throughout Concordia Parish have added value for hunting although much of the land is leased as hunting clubs.

There are other public lands within commuting distance that offer wildlife-dependent recreation experiences. Five national wildlife refuges—Tensas River, Catahoula, Grand Cote, and Lake Ophelia in Louisiana, and St. Catherine Creek south of Natchez, Mississippi—are within a 2-hour drive of Bayou Cocodrie National Wildlife Refuge (Figure 2). Tensas River National Wildlife Refuge offers an ever-expanding interpretive and environmental education program. Catahoula National Wildlife Refuge provides wildlife observation and photography opportunities with its wildlife drive, observation sites, and trails around Catahoula Lake, one of the most popular over-wintering waterfowl sites in the area. Waterfowl hunting as well as big, small, and upland game hunting, using various forms of weaponry, is offered on each refuge.

In Concordia Parish, the Red River/Three Rivers State Wildlife Management Area Complex offers hunting and fishing activities. The Bayou Cocodrie is a state designated scenic river (Louisiana Department of Wildlife and Fisheries, 1998). In 1998, the state offered a total of 3 days of modern gun deer hunting—2 days were managed for take of either doe or buck, and 1 day was managed for buck only. The state allows for the use of both modern and primitive weapons. In addition to deer hunting, the Red River Wildlife Management Area is also open to waterfowl and small game hunting.

The Louisiana Department of Wildlife and Fisheries and the Army Corps of Engineers manage more than 60,000 acres of public lands in Concordia Parish to support hunting and fishing. Other fishing opportunities are available at nearby national wildlife refuges. Facilities found at these refuges include fishing piers, boat ramps, and bank fishing areas. Some refuges offer universally accessible fishing areas.

Refuge Administration

Refuge administration refers to the operation and maintenance of refuge programs and facilities including new construction. The refuge staff consists of six permanent employees. Until 1997, the refuge had two employees and was managed on a custodial basis. The staff coordinates extensively with landowners, conservation organizations, local agencies and civic groups. The Service is concentrating efforts with the Natural Resources Conservation Service to coordinate land conservation projects on private lands. Of particular interest to the Service is the protection of forested tracts near the refuge boundary that will assist in the long-term recovery of the Louisiana black bear.

The staff is focusing efforts on protecting needed lands and developing a systematic approach to manage biological resources. The staff maintains one administrative site, the main headquarters located on Poole Road. The administrative site contains an office, a connecting maintenance shop, and a vehicle storage shed. The facility has limited space for present staff, and lacks a safe fuel-storage building and informational/interpretive displays.

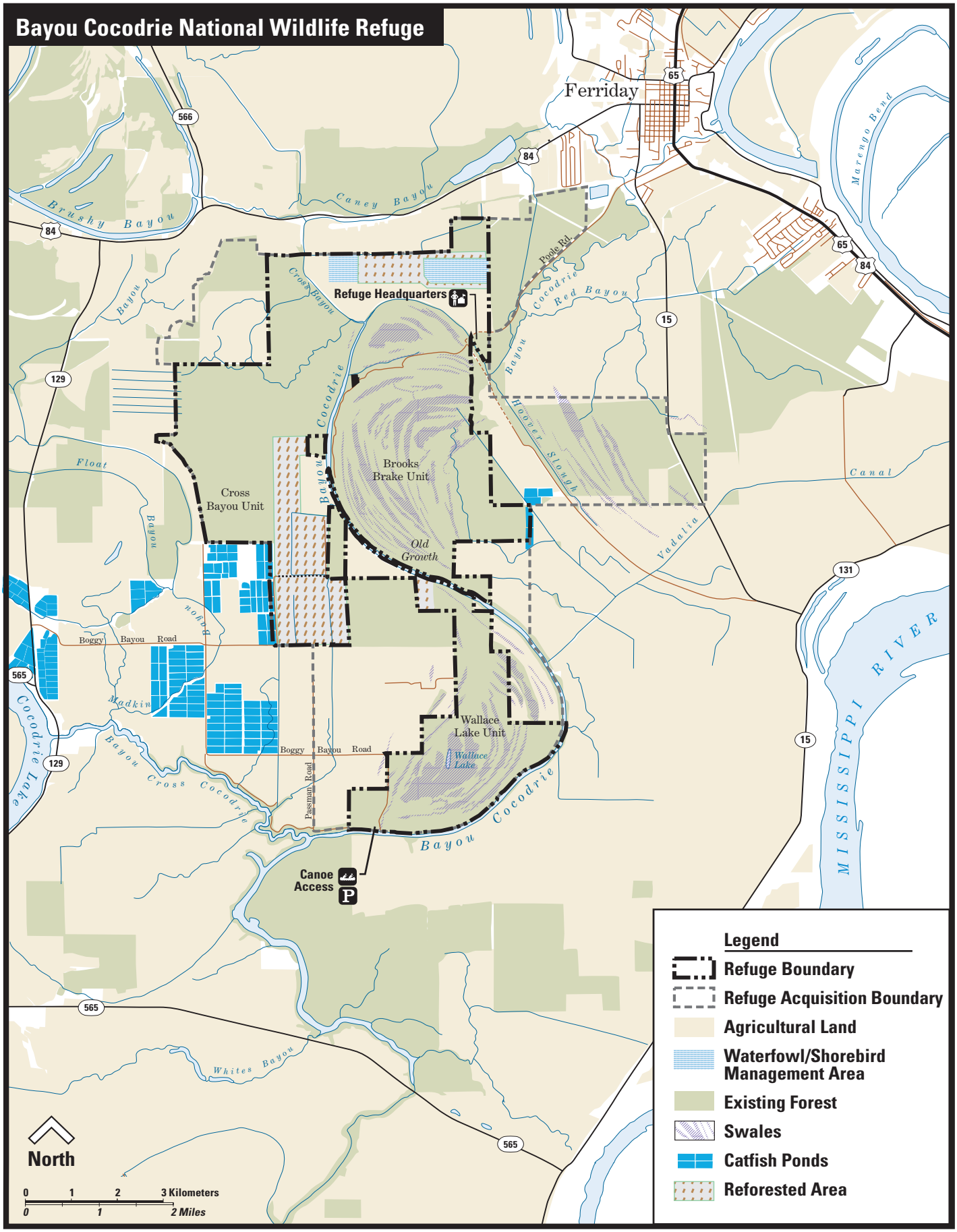
Three management units, Cross-Bayou, Brooks Brake, and Wallace Lake, are entirely accessed by external roads maintained by the parish and the state. At times, refuge trails are impassable due to localized flooding. Maintenance access is via the same trail system used by visitors (Figure 9). Poole Road, which serves as the main access to the refuge, is primarily gravel and once served as the underlying bed for railroad transport. At times, railroad spikes surface and pose problems for motor vehicle traffic. Boggy Bayou Road is located at the southern terminus of the refuge and terminates next to Bayou Cocodrie. Small boats are launched at the terminus of this road and school buses utilize the terminus for a turnaround. This site is noted as an excellent location to develop a trail head for boat/canoe launch purposes. Access to the south end of the Brooks Brake Unit is limited and requires permission from the landowner.

Jerome Ford and palmetto
USFWS

The roads and private lands adjoining the refuge have a direct influence on wildlife as they remove habitat in proportion to the areas they occupy. In addition, access provided to wildlife areas has resulted in increased disturbance and poaching in some locations. Several species, including nesting songbirds, avoid roads, trails, and roadside areas thereby reducing availability of habitat (pers. comm., Hunter). Refuge trails are maintained biannually to help provide habitat for birds and other wildlife that utilize edges.

The Federal Highway Administration is planning improvements for Highway 84, the major road to the north of the refuge. Refuge staff are coordinating the development of road improvements with the Federal Highway Administration as part of the overall environmental compliance requirements.

Figure 9. Refuge Land Use Features



Research Natural Area

Research Natural Areas are designated by federal land management agencies to preserve plant and animal communities in a natural state for research purposes. These areas protect and manage vanishing native habitats that exhibit outstanding ecological value by preventing unnatural encroachments and activities which directly or indirectly modify ecological processes.

House Report 3338-4 describes the need for designating a Research Natural Area as: "In managing the refuge, the Secretary shall manage an amount of refuge woodlands as a contiguous mature forest sufficient to benefit the species of passerine birds that occupy this type of habitat. The Secretary shall give special consideration to accomplishing this objective through the use of his current authority, including his authority to establish Research Natural Areas within the refuge."

A major feature associated with the refuge is the unique old growth site in the south Brooks Brake Unit. When Congress established the refuge in 1990, it directed the Service to protect the old growth area and evaluate it to be managed as a Research Natural Area. This designation is important because the site will serve as a comparison model for scientists to learn more about land management and to utilize techniques on other sites of the refuge and within the Lower Mississippi Valley. Biologists will gain first-hand knowledge of the values of old growth and coordinate new management approaches to solving habitat issues related to old growth functions.

Archaeological or Historical Resources

No detailed archaeological or historical site investigations have been documented for the refuge. The majority of past cultural resource investigations focused along sites at Brushy Bayou, Cross-Bayou, and Cocodrie Lake (Ford 1936; Keller and Campbell 1983; Servello 1976; Lower Mississippi Valley Survey 1964; Cusick and McMakin 1994; Cusick et al., 1995; and State of Louisiana Site Files). Many of these investigations focused on the archaeological manifestations of early Native American groups, (i.e., Marksville, Natchez and Tunica) which have resulted in the identification of several major single mounds and mound groups (16Co9, 16Co14,16Co15, 16Co80, 16Co92, 16Co99, and 16Co102). Occupations of

Fallen old growth tree
USFWS

these sites date from Poverty Point through the Coles Creek Periods [ca. 2000 B.C. - 1250 A.D.] (Neuman 1984; Jeter et al., 1989). Cusick and McMakin 1994, and Cusick et al., 1995, recorded several late 19th and early 20th century tenant farm sites and the early 20th century sharecropper community of Frogmore (16Co159). The latter is located on Brushy Bayou just north of the refuge. Frogmore centered around a cotton gin, a store, and a post office. Levee and road construction and agricultural activities have adversely impacted the archaeological deposits associated with many of these sites. However, oral history interviews and documentary research could provide a wealth of information regarding the refuge and the parish.

Lands Protection and Conservation

Of the total refuge acquisition boundary of 22,269 acres, the Service has acquired 13,168 acres thus far, leaving a balance of 9,101 acres in private ownership. The acquisition boundary includes a 5,000-acre expansion based on recommendations contained in the Louisiana Black Bear Habitat Protection Plan approved on September 28, 1999 (Figure 6).

The refuge staff is focusing on land acquisition within the refuge acquisition boundary by coordinating priorities identified by the Lower Mississippi River Ecosystem Team. Land protection goals set for the refuge will support strategic growth in areas where there is greatest concern, namely lands identified for migratory songbirds and black bear.

Property taxes are not paid by the Federal Government, but payments are made to local communities to offset taxes on those properties removed from the tax rolls. The refuge is exempt from land-based tax rolls but contributes to the local parish through the use of the Refuge Revenue Sharing Act of 1964. The local government is provided with a share of revenues from refuge receipts in lieu of taxes it normally receives from properties in private ownership. In 1999, Concordia Parish received $49,813 as its share of these funds.

Private lands in Concordia Parish enrolled in conservation programs contribute significantly to wildlife conservation. The Service has an active partnership with several agencies and organizations to enroll private lands in these programs. Approximately 1,600 acres adjacent to the refuge are enrolled in the Wetlands Reserve Program administered by the Natural Resources Conservation Service. Private land enrollment in conservation programs will continue to be encouraged to augment Service program and mission requirements. Concordia Parish topography is 5 percent lakes, rivers and bayous; 63 percent cultivated crop lands; and 32 percent forests. The topography is characterized by undulating lands or lands locally referred to as ridges and swales. The swales are old river scars. The average ridge elevation fluctuates to about 3 feet in grade and ridge width varies between 120 to 350 feet. The swales or depressions vary from 50 to 300 feet wide. Surface gradient is 1 to 2 percent and drainage is localized. Natural levees along present waterways generally range from 3 to 5 feet.

The refuge geology is underlain with Pleistocene deposits of the Mississippi River which extend and dip toward the coast. A Pleistocene-age eroded subsurface exists at 50 to 150 feet below the surface, with Tertiary age sedimentary deposits beneath this subsurface (Saucier 1994). Faulting is common, related to sediment loading and deep-seated salt movement. These faults may provide conduits for potential cross-formation groundwater flow.

Virtually all of the soils are Alligator-Tensas-Dundee-Sharkey-Tunica, and Sharkey-Alligator-Tensas. These soils are clay or loam and have clay and loam subsoils. The soils are fine textured and poorly drained with low permeability. Standing water is common during rainy periods of the year. These soil types are highly restrictive for urban and agricultural uses because of their high shrink-swell characteristics and low bearing strength.

Bayou Cocodrie
USFWS

Hydrology and water management influences the function of habitats on the refuge. Bayou Cocodrie is a meandering tributary of the Red River. Historically, when the Red River reached flood stage, backwater flooding was common within the watershed. Since the development of flood control structures, Bayou Cocodrie's natural overflow is restricted to large flood events. The natural sediment supplies at the refuge are threatened by flood control and agricultural operations, including the operation of the Wild Cow Bayou weir that prevents the natural back flow of flood waters.

Previously built and nearby, levees, irrigation channels, and pumps have influenced the change of riparian systems to water development projects to support agriculture. Natural flooding assists in maintaining healthy bottomland hardwood forest habitat by recharging the forest with sediment and nutrients.

The refuge is within the 582-square-mile Tensas-Concordia Levee area. The levee system borders the Red, Black, and Tensas rivers and was built for flood control protection. For the most part, the historic backwater flooding is impeded because of the ring levee and pump systems operated on the Wild Cow Bayou in western Concordia Parish. Bayou Cocodrie functions more like a lake than a free-flowing stream due to the weir on Wild Cow Bayou (Corps of Engineers 1990 and Soil Conservation Service 1968).

The subtropical climate is characterized by high humidity, an absence of extreme temperatures, and abundant rainfall distributed evenly throughout the year. The climate is controlled by warm, moist air from the Gulf of Mexico, and cooler, drier air from the central plains. Extended hot, sultry summers and moderately cool winters are normal. The summers have about 85 days with highs greater than 90 degrees Fahrenheit. The winters are marked by brief cool periods with average winter highs in the mid-50s. Annual rainfall is 55 inches and the growing season is approximately 220 days in duration. The average annual runoff occurs from December to April. Evaporation exceeds precipitation in the summer.

Contaminants are not well studied on the refuge. The Service completed site contaminant inspections (Level 1) on properties prior to purchase from 1993 through 1995. A preliminary Environmental Site Assessment of the refuge, prior to Service acquisition, reported that the potential for environmental contamination was low. Beginning in October 1997, the Department of Toxicology of North Carolina State University initiated a study to assess potential biological impacts and hazards resulting from contaminant exposure and the importance of this exposure relative to other biological impacts, such as habitat alteration. The final report is pending. An integrated pest management plan is scheduled to be developed in 2004.

The rural character and sparse population are characteristic of east-central Louisiana. Census data from 1990 indicate that the parish had a population of 20,828 people, which is a decline of 9 percent since the 1980 census. The parish seat, Vidalia, had a decline in population from 6,000 in 1980, to some 4,953 in 1990. Ferriday had a 1980 population of 5,500 and a 1990 population of 4,111. Population shifts in Concordia Parish, as a whole, are largely attributable to a decline in the farming, oil, and gas sectors of the economy since the early 1980s.

Per-capita income recorded for Louisiana in 1998 was $22,206 (USDA, ERS 1998). Overall, Louisiana ranks among the one of the poorest states. Oil and gas production and agriculture have long been the main economic base in Concordia Parish and regionally. Some of the major private employers in Concordia Parish include Wal-Mart, Aluminum Company of America, D&D Petroleum, Rogers Lumber International, Inc., and Ferriday Market. Other major employers include the Concordia Parish Schools, Riverland Medical Center, and Concordia Electric Cooperative (Fish and Wildlife Service et al., 1998 Appraisal Report).

Lands adjacent to the refuge are privately owned and managed for farmland, catfish, and timber. Concordia Parish consists of about 479,000 acres, of which 63 percent is cultivated cropland, and 32 percent is woodland. The surrounding farmland primarily is farmed for soybean, cotton, corn, and catfish. Scattered forests surrounding the refuge are valued as private hunting clubs. There are approximately 1,050 farms (averaging in size of 586 acres) in Concordia Parish with more than 700 receiving some form of payment from the U.S. Department of Agriculture. Farm commodity prices, in general, have decreased since the mid-80s and more dramatically since the passage of the 1996 Farm Bill. Poor farm production, drought, and low commodity prices in the last three seasons have encouraged many producers to sell their farms and/or enroll them in some type of conservation program. Income derived from land sales and enrollment in conservation programs (including restoration for waterfowl and black bear habitat) is very important to the local economies (pers. comm., Natural Resources Conservation Service 1999). Due to poor yields in 1998, Concordia Parish claimed the largest Conservation Reserve Program enrollment in the state. In 1999, the Wetlands Reserve Program reported more than 8,000 acres enrolled with a total of more than $5 million invested in Concordia Parish. Within the refuge boundaries, most of the commercially owned timberlands were partially or totally harvested from the 1920s to the 1940s, with final sales recorded in the 1970s and 1980s.

Refuge Related Problems

In 1990, Congress established the refuge to protect and restore bottomland hardwood forests for a diversity of wildlife with special emphasis on migratory birds and the Louisiana black bear. To date, the 13,168 acres which make up the refuge are considered a significant shortfall and insufficient to fully implement the purposes legislated by Congress (Figure 6).

The key biological value of the refuge is the bottomland hardwood forest communities, particularly the rare old growth plant community. Many migratory land birds depend upon the forest habitats for a portion of their life cycle. Of the 186 species of birds and a host of other mammals, reptiles, amphibians, and fish that utilize the refuge, 4 species have been federally listed as either threatened or as species of management concern. The Louisiana black bear has long been a focus of management efforts at Bayou Cocodrie Refuge.

Road development, forest fragmentation, loss of older-aged forests, recreational use, and rural development on lands surrounding the refuge represent the land status trends in Concordia Parish. The surrounding development has led to declining wildlife populations, habitat degradation, wildlife/people conflicts, pesticide accumulation in the water, pest management problems and a need for increased law enforcement to administer hunting programs.

Many of the refuge's significant resource problems and management challenges are also reflected on a larger scale within the Lower Mississippi Valley. These problems, both individually and cumulatively, play a significant role in determining future conditions on this refuge as well as in this draft comprehensive conservation plan. For the sake of clarity, these resource problems and management challenges, detailed in the following sections, are briefly summarized in the following paragraphs.

Forest Fragmentation

The greatest challenge to meeting refuge objectives is forest fragmentation within a landscape scale. Although the refuge is mostly forested it is considered fragmented because it is within a mostly agricultural landscape. The present configuration and size of the refuge is not sufficient to support or contribute to populations of area sensitive, mature forest birds, such as the Swainson's warbler. The refuge must secure and restore more lands to manage a contiguous forest of sufficient size to meet refuge objectives.

Forest Conditions

Present forest conditions found on the refuge (with the notable exception of the proposed Research Natural Area) are marginal in quality as they relate to being able to support mature forest bird species. Forest stands on the refuge, with the exception noted above, are mid-successional and exhibit classic mid-successional forest characteristics, that is, heavy stocking, closed canopies, and little vertical structure. In order to provide conditions suitable for many mature forest species, the refuge must manage its mid-successional forest stands to provide mature forest conditions, i.e., structure.

Lack of Inventory Information

The development of baseline data is a task expected to take years for present staff to accomplish. National Wildlife Refuge System policy requires inventories of plants, fish, wildlife and habitats. Monitoring of critical parameters and trends of selected species and species groups, and the subsequent basing of management on sound data, continue to be a problem due to staffing constraints. No standard inventory and monitoring method has been established. Fish, reptile, and amphibian conservation is overlooked because of the lack of information and funding to manage these resources.

Low Operation and Maintenance Funds

The refuge is faced with the challenge of contributing substantially to off-refuge ecosystem objectives, such as migratory bird and game species management. These ever-increasing responsibilities, coupled with the current low levels of funding, make it difficult to meet the demand for biological services on and off the refuge. The refuge staff is also facing the challenge of managing an active and increasing visitor services program. The Red River and Three Rivers Wildlife Management Areas, managed by the Louisiana Department of Wildlife and Fisheries, are the only other public hunting and fishing areas in Concordia Parish. The refuge provides

Yellow-billed cuckoo
L Page Brown - Cornell Lab of Ornithology

hunting opportunities, but the demand for this activity makes it difficult to develop other wildlife-dependent recreation opportunities such as fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Access to the refuge is very limited due to terrain conditions and lack of roads and trails.

Conservation Priorities

Priorities identified for Bayou Cocodrie National Wildlife Refuge include a stronger management emphasis on migratory songbirds. Focal species are managed according to refuge size and location which, in part, contributes to the overall health of the ecosystem. Identified migratory bird and black bear protection areas typically overlay public and private lands. The public land portions of these conservation zones may not contain sufficient amounts or the kind of wildlife habitat (e.g., mature stand structure) to support high priority species. As a result, the Service and partners work collectively with landowners to achieve common goals and form conservation partnerships. One such conservation partnership involves the Natural Resources Conservation Service. Landowner participation in its Wetlands Reserve Program may assist the Fish and Wildlife Service in meeting wildlife objectives through the acquisition and restoration of 1,400 acres directly adjacent to the refuge.

A forest bird conservation zone of roughly 55,000 acres is identified for the refuge and nearby private lands to support declining songbird populations that once were abundant in this area. Also, reforestation to remove carbon from the atmosphere on refuges and other lands in the Lower Mississippi Valley is a long-term goal.

The following land birds either currently breed, or have historically bred on the refuge and are ranked as high priority on which to focus management efforts: swallow-tailed kite, Cerulean warbler, and Swainson's warbler; high priority: red-headed woodpecker, northern parula, yellow-billed cuckoo, wood thrush, prothonotary warbler, white-eyed vireo, American woodcock, and wood thrush. These species are "focal species" that are assumed to be sensitive to habitat changes and represent the needs of a larger group of migrant species (Figure 5).

The recovery of the Louisiana black bear includes 5,000 acres of lands for an expansion as identified in the Louisiana Black Bear Habitat Protection Plan. These lands are now within the approved acquisition boundary.

Long-term goals for the Louisiana black bear will be accomplished when there are at least two viable bear populations that have genetic interchange (joining Atchafalaya population with Tensas River population). The black bear protection areas overlay the forest bird conservation zones from the Tensas River National Wildlife Refuge in Madison and Tensas Parishes, Louisiana, to the Bayou Cocodrie National Wildlife Refuge and the Red River Wildlife Management/Three Rivers Areas in Concordia Parish, and the Atchafalaya Basin (Figures 1 and 4).

Staff discussing issues
USFWS

III. Plan Development

Overview

Early in the process of developing this draft plan and after public scoping meetings, the planning team identified a list of issues and concerns that were likely to be associated with the conservation management of the refuge.

Issues and Concerns:

Staff discussing issues
USFWS

Issue identification is a major factor in determining management goals and objectives. To ensure that future management of the refuge is reflective of the issues and concerns, a series of meetings and interviews were conducted to guide the planning effort. The planning process was coordinated with federal, state, and local agencies; organizations; and surrounding communities. This coordination is essential to ensure support for the plan and projects identified for the refuge.

Issues and concerns were generated based upon contact with citizens and public agencies, as well as on resource needs identified by staff. A Service planning team was assembled to evaluate and identify steps to rectify these issues and resource needs, and to measure the impact of plan implementation. Afterwards, the team developed a list of goals, objectives, and strategies to shape the management of the refuge for the next 15 years.

Issue identification provided the basis for initiating the development of management objectives and strategies. These issues play a role in determining future conditions of the refuge and will be considered in the long-term management plan. The issues and concerns described in the following pages were generated by the public and Service staff.

Fish and Wildlife Populations

- Migratory songbird diversity and populations are declining significantly.
- Neighbors expressed a concern that Service management activities on the refuge could attract fish eating birds that may feed on nearby catfish ponds.
- Some wildlife species including deer, beaver, feral hogs, and raccoon are damaging or altering forest conditions to the detriment of other wildlife species and habitat (e.g., affecting songbird habitat).
- There is a lack of information about Service plans for management of the Louisiana black bear. Sightings are rare. Refuge neighbors are concerned about the effects that bears might have on people and property when and if they do return to the refuge.
- There is no management emphasis on certain wildlife species, including fish, bats, shorebirds, reptiles, and amphibians.

Habitats

- The refuge forest boundaries are heavily fragmented—forest conditions and proportions are of poor habitat value to breeding birds.
- There is a lack of surveys and studies conducted on the refuge.
- There is a concern that the remaining old growth trees might be harvested or overly managed by the Service.
- The existing forests have received little management attention by the Service.

Education and Visitor Services

■Current access to the refuge headquarters and throughout the refuge is difficult for both staff and visitors. Service employees and visitors must rely on parish road conditions, while the conditions of internal trails dictate use.
■The refuge offers limited opportunities to view and photograph wildlife. The trails are impassable during high rainfall and prolonged flooding.
■There are limited hunting and fishing opportunities on the refuge.
■There are no educational/interpretive facilities or programs available to local and regional schools, conservation clubs, and the community at large.
■There is a lack of information about the purpose of the refuge and available visitor opportunities.

Refuge Administration

■The lack of staff to manage refuge biological programs and forestry management is a fundamental issue.
■The refuge entrance road (Poole Road) is at times unsafe because of surface conditions.
■The refuge office has inadequate space to support existing staff, volunteers, and the visiting public.
■There are few parking facilities and signs. There was a concern that providing additional access or improved access might impact forest habitats and fish and wildlife populations.
■Since most of the refuge boundary has not been surveyed, it is difficult to enforce game violations and protect wildlife and habitat near refuge boundaries.

Land Protection and Conservation

■There is a concern about sedimentation, erosion, and turbidity resulting from land use activities off the refuge and the effects within the watershed.

IV. Management Direction

Introduction

The Service manages fish and wildlife habitats considering the needs of all resources in decision-making. 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 refuges. The refuge is a vital link in the overall function of the ecosystem. Refuges in the Lower Mississippi Valley include managed bottomland hardwood forests and moist-soil areas. To offset the historic and continuing loss of these habitats within the ecosystem, the refuge and other public lands provide the biological "safety-net" for migratory non-game birds and waterfowl, threatened and endangered species, and resident species.

Vision

The refuge's abundant wildlife and biological communities form the basis for future management of the refuge. The vision of land conservation for the refuge describes the desired future conditions and management standards developed collaboratively by the public and refuge staff. The planning team, in conjunction with information gathered from the public, formulated the following vision as a guide to future management of the refuge:

Bayou Cocodrie National Wildlife Refuge will be transformed into one of the finest examples of bottomland hardwood forest complexes, striving to protect the habitats of fish and wildlife and to create new opportunities for visitors to enjoy its unique biological resources.

Goals, Objectives, and Strategies

The goals, objectives, and strategies addressed below are the Service's response to the issues, concerns, and needs expressed by the planning team, refuge staff, and public. These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997, the mission of the National Wildlife Refuge System, the North American Waterfowl Management Plan, and the purpose and vision for Bayou Cocodrie National Wildlife Refuge. Depending upon the availability of funds and staff, the Service intends to accomplish these goals, objectives, and strategies during the next 15 years.

Goal A:
Fish and Wildlife Populations

Contribute to the wildlife population goals and objectives established in nationally and internationally significant management plans, including Partners-in-Flight Plan; Louisiana Black Bear Protection Plan; North American Waterfowl Management Plan; American Woodcock Management Plan, and other plans for the Lower Mississippi Valley.

A. 1 Songbirds

Objective:

Support healthy populations of forest-dwelling migratory songbirds, specifically 500 pairs of Swainson's warblers, and reestablish populations of Cerulean warblers and swallow-tailed kites (Figure 5 and Appendix IV).

Cerulean warbler
Bill Dyer - Cornell Lab of Ornithology

Swainson's warbler
USFWS

Discussion:

A wide-range goal for the Lower Mississippi Valley is to establish self-sustaining populations for all of the forest breeding bird species. This objective supports Bird Conservation Areas previously established for this area (Figures 11 and 5). A minimum 20,000-acre target of managed bottomland hardwood forest is needed to support 500 breeding pairs of Swainson's warbler. This would also allow for recolonization of the area by Cerulean warblers and swallow-tailed kites (pers. comm., Hunter).

Present data for the refuge suggest densities for Swainson's warbler are now about 6 pairs per 100 acres, in optimal habitat, and indicate this figure is lower than that found at Tensas River and Atchafalaya National Wildlife Refuges in comparable habitat (Ouchley unpub. data, per observations). The Service adopted a minimum effective population of 500 breeding pairs per 20,000-acre forest patch (pers. comm., Hunter).

Strategies:

(1) Survey the refuge and determine baseline populations for forest-breeding non-game birds.
(2) Establish point count stations to determine population size changes over time.
(3) Conduct nest productivity studies, including predator disturbance during the nesting season, both in existing forests and in areas undergoing reforestation to determine actual population health for as many species as possible. If population objectives are not met, then reevaluate management actions and other possible causes and assess findings to determine appropriate corrective measures.
(4) Manage beaver, muskrat, raccoons, and feral hogs to protect and target forest breeding bird species, including the use of such techniques as trapping.

Black bear & cubs
Don Anderson, Tensas River National Wildlife Refuge

A.2 Black Bear

Objective:

Assist in maintaining viable populations of those species of fish, wildlife, and plants endemic to bottomland hardwoods of this area, including the federally listed threatened Louisiana black bear.

Discussion:

The Louisiana black bear is listed as a threatened species under the Endangered Species Act. The Service and partnering agencies and organizations have identified two viable sub-populations in need of recovery. These separated populations, one each in the Atchafalaya and Tensas river basins, have potential open space to support immigration and emigration corridors between them. The refuge is located between the Red River/Three Rivers Wildlife Management Area Complex and the Tensas River National Wildlife Refuge, making it ideally situated to help link these two sub-populations. Management of the Louisiana black bear is dependent upon providing sufficient habitat, including forested sites on both public and private lands. Biologists are studying the present landscape, land uses, and black bear behavior to determine how well bears can adapt to the present landscape and move from one management area to the next. Boundary expansions and reforestation of the refuge will expedite recovery.

The Service is monitoring bear movement to determine if the refuge may serve as a site for bear reintroduction. Adding forest areas aligned along the identified corridor and adjacent to state and federal wildlife areas, as well as enrolling private lands in conservation programs, will be essential

to the recovery of the black bear. The addition of a wildlife movement corridor will result in connecting forest blocks where numerous forest interior species, including black bear, move between the large forest areas of natural vegetation. Meeting this goal is considered sufficient to support viable populations of black bear for long-term survival. Refer to Figure 4 for black bear information.

Strategies:

(1) Coordinate with neighbors, the Black Bear Conservation Committee, Louisiana Department of Wildlife and Fisheries, and other agencies/ organizations in Concordia Parish to facilitate bear conservation and research program.
(2) Conduct outreach efforts involving neighbors, local residents, schools, and businesses on bear biology and conservation and the effect bears will have on activities of neighboring landowners.
(3) Encourage refuge visitors, as well as surrounding landowners, to report bear sightings or suspected bear activity.
(4) Assist others with all phases of black bear management and nuisance control in Concordia Parish.
(5) Provide habitat that supports the recovery of the Louisiana black bear.

Shorebirds
Tensas River National Wildlife Refuge

A.3 Waterfowl and Shorebirds

Objective:

Provide habitat to support approximately 10,000 migrating waterfowl, 12,000 migrating shorebirds and other important associated migratory bird populations, including woodcock. (Figures 10 and 11).

Discussion:

Since food is a limiting factor for southbound migrating shorebirds and wintering waterfowl, adequate shallow water foraging habitat must be available to meet shorebird foraging requirements during their southward migrations. The refuge should support about 12,000 southbound migrating shorebirds.

Coot
Tensas River National Wildlife Refuge

For transient shorebirds, typically mudflat foraging habitat is abundant in the Lower Mississippi Valley during the spring northward migration. In early spring, agricultural fields are bare and winter flood water is receding; in late spring, rice fields are flooded. During southward migration in late summer and fall, fields of maturing crops are dry. Therefore, the period from July 15 to September 30 is the period when foraging habitat for shorebirds is least available. Food is also a limiting factor for wintering waterfowl populations. About 300 acres of foraging habitat are needed on the refuge to support the wintering waterfowl population goals within the Lower Mississippi Valley.

Strategies:

(1) Conduct shorebird and other waterbird counts using International Shorebird Survey protocol on 10-day intervals during migration and wintering periods. Conduct mid-winter waterfowl surveys.
(2) Assess food quality and quantity on the refuge during peak periods of shorebird movement.
(3) Assess food quality and quantity on and off the refuge during peak periods of waterfowl use.
(4) Develop impoundment units with a moist soil component to support waterfowl and shorebird use.
(5) Assess wintering and foraging habitat on and off refuge during peak periods of woodcock use.

Figure 10. Alternative B (Service's Proposed Action) Short-Term Projection

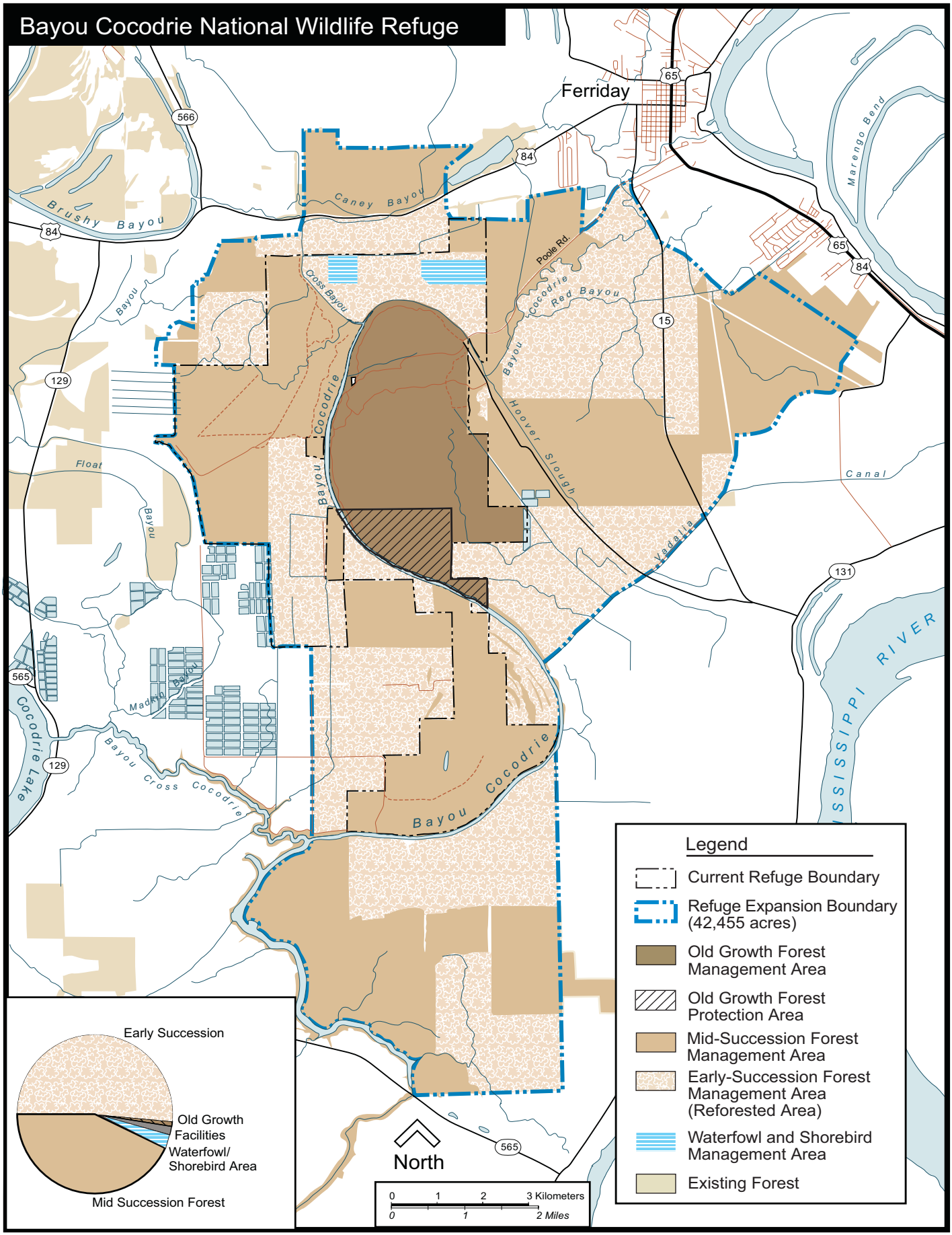
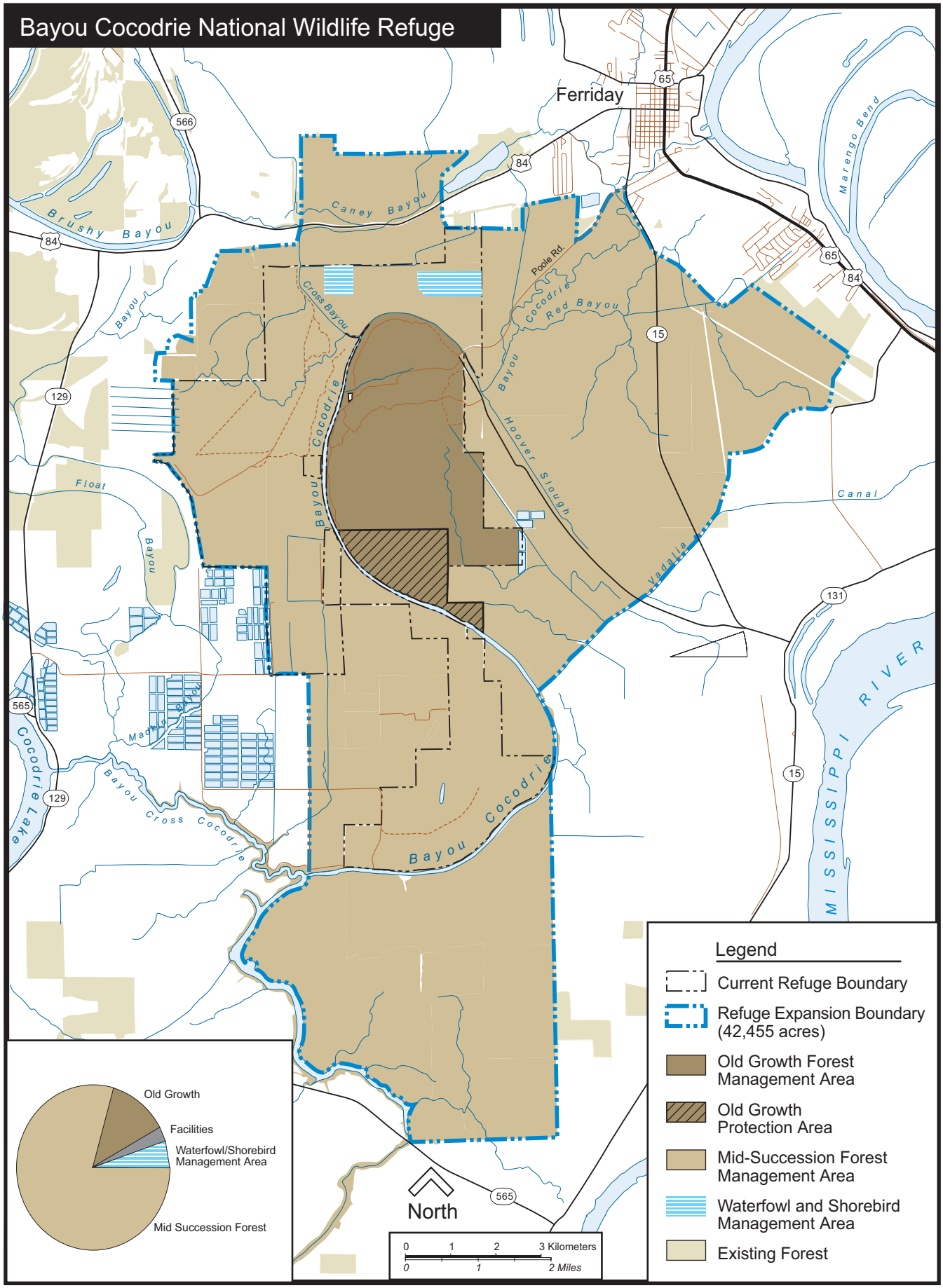


Figure 11. Alternative B (Service's Proposed Action) Long-Term Projection



A. 4 Resident and Other Species

Objective:

Manage to maintain healthy, viable resident populations, including white-tailed deer (average harvest range 250-300 deer), turkey, and other resident species.

Discussion:

The refuge will be managed to ensure healthy, viable resident populations consistent with sound biological principles and other objectives of this plan.

White-tailed deer have the potential to adversely affect habitats unless their numbers are kept at a level at or slightly below carrying capacity. The refuge hunt program is designed to maintain the herd at this level while offering quality hunting opportunities to the public. Current harvest data indicates an annual harvest of 250-300 deer or approximately 1 deer harvested per 54 acres of hunted area. The harvest (per acre) will be maintained with occasional fluctuations due to weather and habitat conditions expected. Population level indicators will include browse surveys, harvest data, and periodic health checks.

Raccoons may also have an adverse impact on other species in the event of over-population. Nest predation on turkey, wood duck, and songbirds may become so great as to limit the reproductive success of those species. Over-populations may also facilitate the spread of canine distemper, a common close contact type disease, to other species such as fox, coyote, and domestic canids. In an effort to prevent raccoon over-populations, the species is considered an incidental harvest species and may be taken during any open hunting season.

Wild turkey populations are currently low on the refuge. This species will benefit from increased management emphasis. Additional hunting opportunities may become available as the turkey population reaches a point where it can support such activities.

Reptiles and amphibians are abundant on the refuge and key species to help biologists evaluate the environmental health of the ecosystem. Knowledge of which species occur on the refuge is fundamental to an understanding of the biological diversity of the area.

Strategies:

(1) Monitor the population status of key indicator species, white-tailed deer, and turkey.
(2) Manage white-tailed deer population at current levels (average harvest range is between 250-300/10,000 acres).
(3) Integrate population objectives for resident species into habitat management plans.
(4) Establish hunting regulations for resident wildlife to maintain population health and stability and habitat relationships. Coordinate with neighbors.
(5) Identify thresholds of disturbance and develop associated standards and mitigation techniques that can be applied, where appropriate, to reduce conflicts and achieve balance between the public and wildlife.
(6) Designate raccoons as an incidental take species.
(7) Prepare and conduct biological/monitoring plan which includes establishing baseline information on reptile/amphibian occurrence and habitat utilization.
(8) Develop population estimates for American alligator and monitor their effect on other trust species.

Old growth forest
USFWS

A. 5 Integrated Pest Management

Objective:

Reduce and/or eliminate invasive, exotic, and pest plant and animal populations to minimize negative effects to native flora and fauna.

Discussion:

Water hyacinth and hydrilla are two exotic species found in refuge lakes and sloughs. These plants form dense mats which impede water flow and recreational use and retard the growth of desirable submersed aquatic plants.

Johnsongrass, alligatorweed, cockelbur, and coffeebean are pest plants also found in refuge management units recently reforested and in moist soil management areas. Where they occur, these plants often form thick monotypic stands that crowd out other desirable plants. Control of these weeds can be achieved by timing water draw downs, discing, burning, flooding, and/or herbicide application.

Feral hogs are a major non-native animal pest found throughout the refuge and on adjoining properties. Feral hogs have an adverse effect on habitat and productivity of most native wildlife. Since they are omnivores, feral hogs use virtually every component of the habitat, resulting in direct competition with native wildlife, reductions in carrying capacities, and adverse impacts to reproduction and recruitment. In addition, feral hogs serve as a source for many diseases that affect wildlife as well as domestic livestock.

Strategies:

(1) Inventory and map the distribution of invasive and exotic plant species, and develop an Integrated Pest Management Plan consistent with a Nuisance Animal Control Plan.
(2) Use integrated pest management techniques to reduce water hyacinth and hydrilla infestations to levels that do not negatively affect trust resources or impede recreational use of water bodies.
(3) Inventory feral hog numbers and monitor effects on natural habitats and crop depredations.
(4) Provide hunter take provisions for feral hogs by including them as a miscellaneous species during any established refuge hunt.
(5) Use refuge staff and contracted animal damage control experts to maintain feral hogs at acceptable population levels in closed areas and other parts of the refuge as needed.
(6) Coordinate with the Aquatic Plants Division of the Louisiana Department of Wildlife and Fisheries to implement control programs.
(7) Coordinate results of information concerning success/failure of control treatments within and outside the agency, especially in regard to hydrilla.

Goal B:

Habitat Management

Conserve, manage, and restore the values and functions of the refuge's bottomland hardwoods to sustain the biological diversity characteristic of the ridge and swale topography of the Lower Mississippi Valley.

B.1 Contiguous Forest

Objective:

Assemble, at a minimum, a 20,000-acre-block of mixed-age bottomland hardwood forests for a diversity of species, with special emphasis on migratory breeding songbirds and the threatened Louisiana black bear. (Refer to Objective A.1 Songbirds, and Figures 10 and 11).

Discussion:

Certain migratory forest songbirds, including forest-breeding birds such as Swainson's warbler, are in significant decline due to the loss of bottomland

Old growth area (Brooks Brake Unit)
USFWS

hardwood forests. Priority species associated with habitats that support forest songbirds are vulnerable. Additional forested tracts that would form a contiguous block size of a minimum of 20,000 acres would also support prothonotary warbler populations.

One of the purposes of this refuge is to provide, to the extent possible, habitat for those fish, wildlife, and plants characteristic of mature bottomland hardwood forests of the Lower Mississippi Valley. Most of the current refuge is a mosaic of 0- to 70-year timber age classes, intermixed with seasonal swales, beaver ponds, and former agricultural lands.

Strategies:

(1) Develop and implement a forest habitat management plan designed to maintain a diversity of forest cover types, tree species compositions, and tree age class distributions.
(2) Restore hydrology where needed and where practical.
(3) Develop clear biological goals and objectives for management of resident wildlife and assure that management reflects the contribution of these goals to native biological diversity.
(4) Inventory and establish deer, raccoon, beaver, and feral hog population parameters and baseline indices.
(5) Conduct monitoring surveys.
(6) Develop and maintain geographic information system databases to monitor forest stand management results.
(7) Limit access through measures such as gating roads and minimizing all-terrain vehicle trails.
(8) Incorporate timber management practices that enhance bear habitat such as protection of potential den trees, allowing light to penetrate the forest floor for soft mast production, and managing for hard mast trees.
(9) Incorporate the enhancement/widening of forest corridors that link forested tracks through incentive programs, easements, and/or purchase.
(10) Minimize logging and construction activities during periods of bear denning.

B.2 Old Growth Forest Protection

Objective:

Protect the existing 750 acres of old growth forest to support interior breeding forest songbirds and manage this area as a Research Natural Area (Figures 10 and 11).

Discussion:

The avian and old growth habitat relationships exhibit relatively self-sustaining and preferred habitat characteristics that support priority songbird species found in the Lower Mississippi Valley. Old growth habitat supports priority songbird species such as the Cerulean warbler.

A 750-acre remnant patch of old growth timber is located in the south section of the Brooks Break Unit. The structure and conditions of this site are unlike any other forested site found in the Lower Mississippi Valley in that it exhibits a complex canopy layer with super-emergent trees. The super-emergent trees, such as willow oak and pecan, exceed 120 years of age. Another tree canopy layer contains tree age classes of at least 70 years of age. This complex canopy layer is considered optimum habitat for certain area specific songbirds, including the Cerulean warbler. The Swainson's warbler is associated with very dense understory and bare ground which may develop from either a large tree fall gap or from a regeneration clear cut. The former is characteristic of old growth stands, where species such as the Cerulean warbler may also occur. The latter results in even-aged management that will not support Cerulean warblers and other canopy dependent species in the same stands (pers. comm.,

Old growth cypress
USFWS

Hunter, Boykin).

Strategies:

(1) Establish baseline monitoring.
(2) Propose designation of the 750 acres as a Research Natural Area.
(3) Develop a monitoring plan that will standardize data collection, analysis, and reporting.
(4) Monitor migratory breeding bird habitat conditions and manage for the priority species group identified for this refuge.
(5) Contact landowners about providing limited and/or seasonal public access to the site and, if possible, provide a gated and improved road over private lands to old growth site.
(6) Coordinate research efforts with scientists and the research community.
(7) Prohibit logging in 750 acres designated as a Research Natural Area and manage partnerships to monitor migratory songbird populations.
(8) Restore hydrology where needed and where practical.

Wallace lake unit
USFWS

B.3 Forest Management

Objective:

Manage and enhance approximately 3,200 acres of the Brooks Brake Unit (outside the protected old growth area) to move toward old growth conditions for interior breeding forest songbird populations (Figures 10 and 11).

Discussion:

The Brooks Brake Unit is composed of 3,200 acres of even-aged mature forest and the 750 acre old growth forest. Its present condition in the mature, even-aged stands supports marginal habitat for priority forest breeding bird species. Managing to exhibit the features, functions, and processes characteristic of old growth communities may yield the highest benefit for these songbirds. Forest management approaches that result in the maintenance and development to support songbirds of stand components will be emphasized. The area outside the existing old growth site in the Brooks Brake Unit will be managed to mimic or mirror conditions of old growth and should be monitored to determine management success.

The nesting habitat at Brooks Brake Unit can support an important source population that adds large numbers of potential breeders to the Lower Mississippi Valley population, especially in years when other nesting areas fail due to the effects of forest loss elsewhere, degradation, and fragmentation. The development and maintenance of a super-emergent canopy will create optimum conditions for area sensitive songbirds.

Strategies:

(1) Evaluate forest survey requirements needed to plan forest management on this unit.
(2) Develop a habitat restoration plan that will specify desirable stand conditions.
(3) Utilize habitat management techniques that will mimic old growth structure and function while allowing the forest to become self-sustaining old growth.
(4) Inventory and establish deer, raccoon, beaver, and feral hog population parameters and baseline indices.
(5) Conduct monitoring surveys.
(6) Develop and maintain a geographic information system.
(7) Limit access by gating roads and minimizing vehicle/ trail access.
(8) Incorporate timber management practices that enhance bear habitat such as protection of potential den trees, allowing light to penetrate forest floor for soft mast production, and managing for hard mast trees.

B.4 Other Forest Management

Objective:

Manage, at a minimum, 10,000 acres of existing mid-succession forests in the Wallace Lake and Cross Bayou Management units to support migratory songbirds and resident species (Figures 10 and 11).

Discussion:

To support bird nesting success, improvements in stand conditions in the Wallace Lake and Cross Bayou Management units should be undertaken. These units comprise approximately 10,000 acres of forest. Management to meet the needs of a variety of plants and animals with special emphasis on improving forest structure conditions is an overriding need to increase forest breeding bird nesting success. Refuge forests have excellent potential to offer high quality breeding habitat for priority songbirds, such as the Swainson's warbler. About 10,000 acres of stand improvements are needed in or next to the Cross Bayou and Wallace Lake units to offset the present marginal conditions.

Strategies:

(1) Develop and implement forest and water management programs to provide needed nesting, foraging, and resting habitat.
(2) Implement forest management approaches that result in the development and maintenance of under-story, mid-story, and over-story stand components (*i.e.*, complex forest stand structure) to meet the needs of forest-dwelling non-game birds. This may be accomplished by commercial operators or with existing staff.
(3) Where appropriate, manage habitat functions and values to improve conditions altered by beaver activities within the Brooks Brake and Wallace Lake units.
(4) Develop a habitat management plan that will specify desirable future stand conditions.
(5) Evaluate forest survey requirements necessary to plan forest management on the refuge.
(6) Develop an Integrated Pest Management Plan.

B.5 Reforestation

Objective:

Reforest, at a minimum, 7,000 acres of open areas and manage forest conditions to achieve structurally complex mid-succession forest conditions and decrease effects of fragmentation (Figures 10 and 11).

Discussion:

In addition to the 2,000 acres reforested in 1996, reforesting 5,000 acres would contribute to the 20,000-acre forest block objective. This, in turn, would assist in supporting the conditions for area sensitive species that need large forest tracts. All potential sites for reforestation activities are outside the current refuge boundary, and would have to be acquired or placed in a land protection program.

Strategies:

(1) Reforest all refuge lands except those areas identified for waterfowl management, using appropriate species to the site.
(2) Develop and utilize forest management techniques to establish and maintain vertical and horizontal complexity.

(3) Seek funding opportunities and partners to assist in reforesting refuge lands.

B.6 Wetlands

Objective:

Restore and enhance 440 acres of seasonal wetlands to provide high-quality migration and foraging habitat for waterfowl and shorebirds (Figures 10 and 11).

Discussion:

Waterfowl objectives established as part of the North American Waterfowl Management Plan would support foraging and resting habitat. Shorebird objectives as identified by Service biologists include 120 acres of the refuge's 360-acre moist soil site which will be managed for fall migrants and will be used by wintering waterfowl.

The refuge contains a 440-acre site that has been managed specifically for waterfowl and shorebirds. Its agricultural state and hydrological features make water management viable.

Other wetlands in the form of beaver sloughs or dead timber areas will be seasonally managed for roosts, brood habitat, and winter habitat. These areas will require beaver dam removal in late spring. Permanent woodland lakes provide additional habitat which require minimal management.

Strategies:

(1) Manage existing impoundments for waterfowl and shorebirds.
(2) Monitor waterfowl utilization patterns and waterfowl populations.
(3) Develop and implement a Moist Soils Management Plan.

Goal C

Education and Visitor Services

Develop a balanced wildlife-dependent recreation program that will benefit refuge visitors and be consistent with the National Wildlife Refuge System Improvement Act of 1997.

Consistent with provisions outlined in the Act, the Service will provide wildlife-dependent recreation opportunities that provide educational awareness and an appreciation of the unique qualities and features offered on national wildlife refuges. The refuge is contributing to the National Wildlife Refuge System mission by providing exceptional wildlife-dependent recreation programs. These programs provide the public with an opportunity to learn about, enjoy, and appreciate natural resources. These activities will increase visitor use, but not at the expense of the natural environment. In order to implement a comprehensive visitor service program, additional staff will be needed including a law enforcement officer and an outdoor recreation planner. In order to provide environmental education opportunities, new facilities will need to be located at primary access points.

As identified in the National Wildlife Refuge System Improvement Act, the six high priority, wildlife-dependent recreation activities allowed on national wildlife refuges are hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. These priority uses and any other uses must be considered appropriate and compatible with the refuge purpose and the mission of the National Wildlife Refuge System. Fundamental and supreme to the provision of these uses are viable and diverse fish and wildlife populations and the habitats upon which they depend (Figure 12).

C.1 Hunting

Objective:

Where appropriate, increase white-tailed deer hunting opportunities and manage deer populations at or slightly below carrying capacity and provide small game and waterfowl hunting opportunities.

Deer hunter
Tensas River National Wildlife Refuge

Discussion:

Currently, an annual harvest average of 1 deer per 50-55 acres hunted will meet this objective. That average may be adjusted as habitat conditions improve and carrying capacity increases. The Service manages hunt programs in pursuit of wildlife and habitat management goals and objectives and to provide a high quality experience to each hunter. Using a quota hunting system on a broad land base usually yields a higher success rate for the visiting hunter. There is a direct correlation between a healthy deer population and a quality hunting experience. Research has also shown that hunting, under carefully regulated conditions, will not significantly impact populations; will enable land managers to control population levels; will make use of a renewable resource; and will provide opportunities for high quality wildlife-dependent recreation. Safety standards set for hunting recommend that in hunts where modern weapons are used that the ratio of hunter to acres hunted be 1:100 (pers. comm., Chandler).

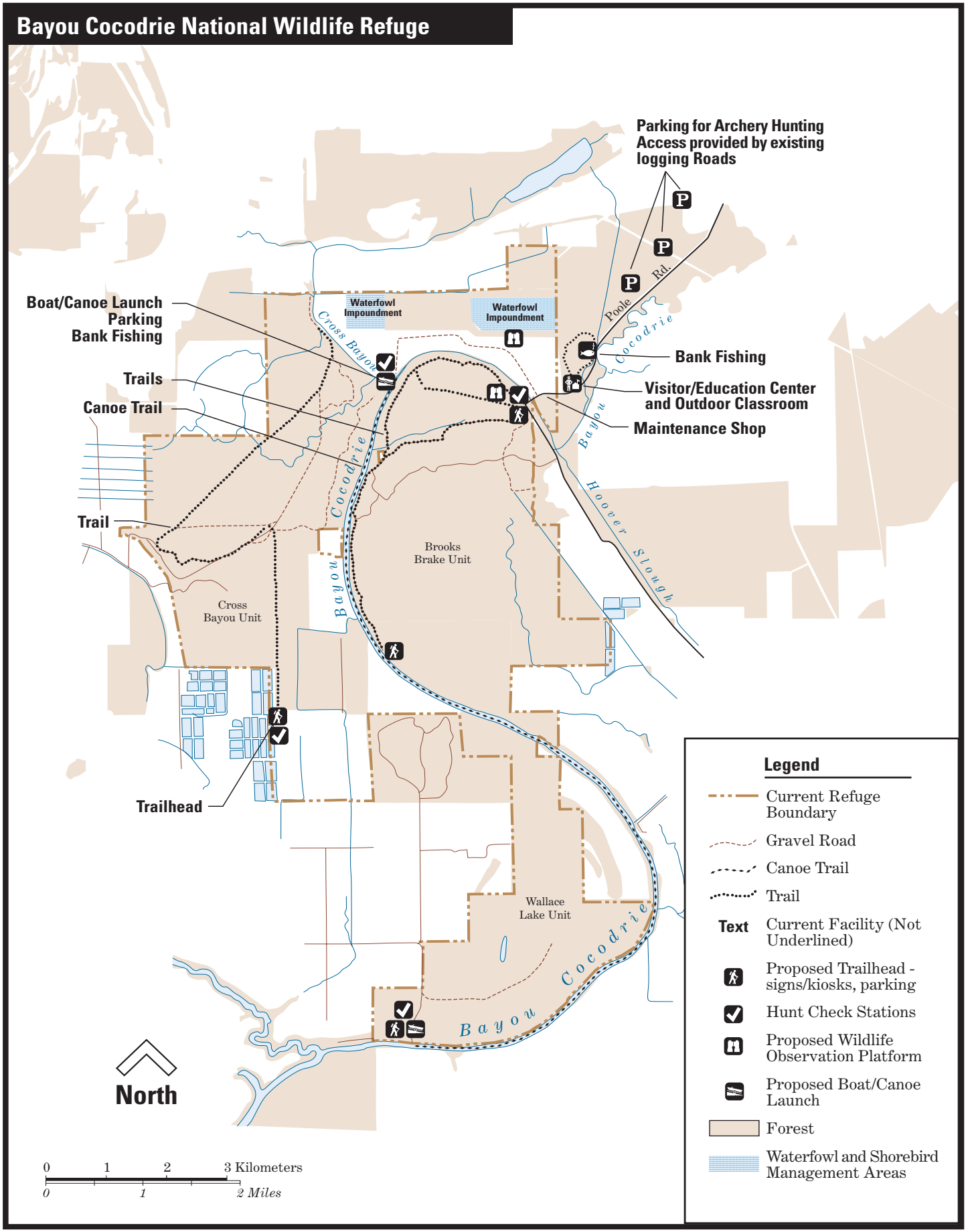
The refuge supports a wide variety of resident game species such as white-tailed deer, turkey, squirrel, raccoon, and waterfowl. Management of these species remains a collaborative effort with the Louisiana Department of Wildlife and Fisheries. Achievement of habitat and population management objectives is primary in establishing hunting opportunities. In 1994, the Service adopted a hunt plan to assist in population management of white-tailed deer and small game. This plan is modified annually and as new land acquisitions and additional staff become available. The Endangered Species Act requires that hunting activities be managed to protect the threatened Louisiana black bear.

Flooded sloughs and backwater areas of the Brooks Brake Unit provide an excellent opportunity to allow limited waterfowl hunting without causing disturbance to waterfowl using the refuge's moist soil management units located in the Cross Bayou Unit. Waterfowl hunting will be limited to 3 days per week until noon and expanded when deemed appropriate and compatible.

Strategies:

(1) Monitor deer populations via browse surveys, harvest data, and periodic health checks.
(2) Manage hunt program to achieve population management and wildlife habitat objectives.
(3) Increase hunting area to include reforested habitat for small game and big game hunting as lands are acquired and managers are available to manage additional hunters.
(4) Expand hunting program to include a quota modern gun hunt for white-tailed deer, and to provide waterfowl hunting opportunities.
(5) Improve refuge access by extending trails and providing additional

Figure 12. Current and Proposed Visitor Facilities



entry/check points.
(6) Revise 1994 Refuge Hunt Plan in coordination with Louisiana Department of Wildlife and Fisheries to assist in achieving balanced and healthy game populations.
(7) Evaluate potential impacts of hunting on other refuge activities and programs.
(8) As forest lands are acquired, develop parking and trail access for archery, gun, and muzzle loader hunting.

C.2 Fishing

Objective:

Improve areas for limited parking, canoe/small skiff launching, and for bank fishing at two existing locations near Bayou Cocodrie (Figure 12).

Discussion:

The refuge must first assess the fishery resource to assure that the ecological integrity of native fish populations supports sport fishery opportunities. Additionally, the most accessible section of the Bayou Cocodrie River is located on the Cross Bayou channel west of the refuge headquarters (referred to as the cut-through). This section can only be reached from Poole Road which is maintained by the parish.

Canoe launch area
USFWS

Fish conservation has not been a primary objective of this refuge. Game fish such as catfish, crappie, bass, and bream are known to occur in Wallace and Little Wallace lakes. Where the Bayou Cocodrie River meanders next to the refuge, it is known to offer moderate quality fishing opportunities. Some interest exists to provide access for fishing on refuge lands.

Strategies:

(1) Inventory and evaluate fishery resource potential using Service's Fisheries Division.
(2) In consultation with county, state, and federal partners, develop and implement a Sport Fishing Management Plan to provide a quality fishing experience.
(3) Evaluate the costs, logistics, and safety considerations in creating suitable sites for fishing.
(4) Coordinate development of parking facility, structures, and activities with the Louisiana Department of Wildlife and Fisheries and other appropriate entities (permits regarding Scenic River status).
(5) Develop bank fishing access on existing properties including Bayou Cocodrie, Cross Bayou, and Wallace Lake.

C.3 Wildlife Observation and Photography

Objective:

Improve access and opportunities for wildlife observation and photography refuge-wide with emphasis on improvements in the Brooks Brake Unit (Figure 12).

Discussion:

There are no public facilities within the parish that support wildlife observation and photography. Public facilities, regionally, are limited and many of these are often closed to protect nesting habitat. There is an excellent potential for viewing and studying bottomland hardwood communities by developing canoe trails, hiking trails, and observation/photo blinds where appropriate and compatible.

Bayou Cocodrie offers significant wildlife viewing opportunities within an expansive mature bottomland hardwood setting. Many opportunities exist for the establishment of hiking trails (both primitive and improved). Canoe access would provide the public with opportunities to utilize this resource with minimal disturbance. Additional canoe access would allow the public to utilize several tributaries and lakes for wildlife observation and photography.

Strategies:

(1) Develop an Education and Visitor Service Management Plan.
(2) Evaluate the potential for and the impacts of siting a trail head for canoe access from the Brooks Brake Unit.
(3) Develop canoe access areas, trail head parking, and foot trail to old growth area along with interpretive panels for wildlife viewing and photography.
(4) Develop a boardwalk trail loop and parking area near the refuge headquarters. Design interpretive panels and accessible trails.
(5) Maintain a seasonal trail to Wallace Lake.
(6) Where appropriate, develop wildlife viewing sites.
(7) Encourage the development of volunteer services to support recreational programs.
(8) Monitor and survey recreational programs.
(9) Develop a wildlife auto tour with interpretive panels designed to highlight refuge management and unique features of the refuge.

C.4 Environmental Education

Objective:

Initiate and develop a community based environmental education program with area schools and local conservation groups to increase awareness of the refuge and management activities.

Discussion:

Emphasis will be placed on the unique features of the refuge, the bottomland hardwood ecosystem, and the effects of human activities on the environment. Programs and opportunities will be offered to enhance public awareness and understanding of the refuge environment, and hopefully solicit a greater appreciation of, and participation in, environmental stewardship. Interpretive opportunities will set apart the unique management features and strengthen the connection between wildlife management and people. Environmental education programs will instill an appreciation of a healthy environment while demonstrating to landowners that human activities and wildlife can successfully co-exist. The refuge can provide quality interpretive and educational programs in an outdoor classroom setting.

Because the refuge is relatively new, the area schools and communities may be unaware of its unique features, values, and management activities. Currently, there is little opportunity to interpret the benefits of these values and management in the surrounding communities.

Current staffing at the refuge is extremely limited with no public use staff. A strong volunteer program will be essential to successfully implementing an education and visitor use program. Volunteers will be recruited and trained to assist staff in developing and implementing environmental education and interpretive programs.

Strategies:

(1) Develop a volunteer based Instructor Corps Program to provide manpower for environmental education and interpretive programs, and facilities development.
(2) Develop teaching materials and host annual teacher workshops to promote environmental education based curriculum in local schools.
(3) Encourage the development of a refuge friends group as well as a volunteer program to support environmental education programs.
(4) Monitor and survey recreation and education uses throughout the refuge as an ongoing program.
(5) Develop a visitor education center on Poole Road and develop an outdoor classroom.
(6) Increase involvement and update local public (i.e., Police Jury, School Board, Chamber of Commerce) on refuge activities.

C.5 Interpretation

Objective:

Develop an interpretive program that will increase awareness of the refuge and its unique features and values, as well as wildlife associated with bottomland hardwood forest communities (i.e., values related to mature forests, migratory birds and the Louisiana black bear).

Discussion:

Eco-tourism opportunities may be developed depending on market response to Service initiatives. For instance, the Service could offer opportunities for special tours to observe waterfowl at St. Catherine Creek National Wildlife Refuge in the winter and songbirds at Bayou Cocodrie National Wildlife Refuge in the fall and spring. Using the Natchez Visitor Center as a central meeting location, special tours could be arranged for both refuges. Education and interpretation often play a key role in helping refuge management staff integrate conservation into the overall mission and purposes of the refuge. Research can be incorporated into educational programs that will allow the Service to build constituencies within the conservation and local communities.

Many opportunities exist for special events and volunteer guided programs, such as night hikes, bird tours, etc. Opportunities to discuss and demonstrate sustainable land use practices exist as do opportunities to teach about and promote water quality improvement practices, community involvement, and environmental stewardship.

Occasionally, the refuge staff and volunteers will conduct guided tours on the refuge. There is an excellent potential to provide outdoor classroom opportunities and take advantage of the unique resources, such as interpretation of the old growth conditions and songbird relationships.

Strategies:

(1) Coordinate with staff of St. Catherine Creek National Wildlife Refuge to develop an interpretive display at the Louisiana Hydroelectric Visitor Center.
(2) Develop a series of interpretive programs and events that incorporate management and research activities. Programs and events will be staged so as not to disrupt nesting birds or when research activities could be disrupted by human disturbance.
(3) Increase local awareness of the Lower Mississippi River ecosystem and the importance of bottomland hardwood forests.
(4) Offer educational classes on wildlife observation opportunities and unique features of the refuge to local community and events coordinators.
(5) Promote eco-tourism opportunities in conjunction with local partnerships, businesses, and civic groups. Such opportunities may include birding tours, festivals, and other special events.
(6) In conjunction with St. Catherine Creek National Wildlife Refuge, promote opportunities and partnerships with local civic groups such as the Natchez Visitor Center.
(7) Develop an exhibit for the Natchez Visitor Center featuring both Bayou Cocodrie and St. Catherine Creek Refuges.

C.6 Recreation Facilities

Objective:

Develop and improve existing visitor facilities throughout the refuge that promote year-round wildlife-dependent recreation, education, interpretation, and viewing opportunities (Figure 12).

Discussion:

Facilities and structures will enhance opportunities for the public and accommodate a range of interests and abilities. Presently, the refuge has 13 miles of existing trails. There are two, all-terrain vehicle trails currently in use on the refuge primarily to provide hunting access. Trails, parking areas, observation decks, signs, and kiosks will provide controlled access to the refuge. Presently, all existing trails leading to water bodies or that provide access to interior sections of management units are minimally maintained and can only be used by the public on a limited basis or by permit. As lands are acquired for the refuge, new trails may be provided where appropriate and compatible.

Support facilities and access are needed to disperse visitors and protect ecologically sensitive areas. Recreational fishing is extremely popular among anglers within the watershed. The refuge has the potential to offer excellent wildlife and nature viewing but has limited parking facilities. Access to Bayou Cocodrie is limited due to the lack of public boat launching facilities and due to land use ownership patterns. Nearly the entire river corridor is privately owned except on the refuge. Programs will focus on refuge management, bottomland hardwood forests, migratory songbirds, and black bear recovery efforts.

Refuge entrance sign
USFWS

Strategies:

(1) Prepare an Education and Visitor Services Management Plan.
(2) Develop and implement a Sign Plan.
(3) Develop gated parking facilities with interpretation/information signs.
(4) Maintain the existing Wallace Lake trail for foot access.
(5) Develop a headquarters/visitor center facility.
(6) Develop a refuge friends/support group.
(7) Institute a refuge volunteer program.

Goal D

Refuge Administration

Develop and implement a comprehensive refuge facility program responsive to management and fish and wildlife needs.

D.1 Staff and New Facilities

Objective:

Add six additional staff positions, develop new facilities and improve existing facilities to support a comprehensive refuge management program.

Discussion:

Cooperative partnerships with local government entities to upgrade some of the parish maintained roads are vital to refuge operations. In order to support biological programs and a growing staff, additional facilities and equipment will be needed to expand and accommodate new offices and maintenance areas. In addition, signs (i.e., direction, safety, and information) are needed to support refuge management activities.

The refuge employs six full-time staff members who primarily focus management activities on tree planting and maintenance, coordinating with landowners and other Service biologists to promote the recovery of the Louisiana black bear, and providing a quality hunting program.

The refuge lacks the staff and facilities to fully respond to the development of refuge programs, such as forest management to improve the conditions for forest breeding birds, and management of a comprehensive biological, recreational, and environmental education program.

Strategies:

(1) Expand refuge office and maintenance facilities near the present facilities, off of Poole Road, to support biological program objectives and comply with safety standards.
(2) Increase professional staff positions to include a law enforcement officer, forester, forestry technician, biologist, biology technician, and outdoor recreation planner (Figure 13).
(3) Increase refuge funding to support addition of operations and maintenance activities, including the purchase of computer equipment and software, inventory and monitoring equipment (Geographic Information System), and heavy equipment.
(4) Promote partnerships and seek challenge cost share grants for construction of recreation facilities.
(5) Develop secured storage for petroleum and chemical products.
(6) Develop a radio communication system responsive to law enforcement and other field operations.

D.2 Operations and Maintenance

Objective:

Improve current operations and maintenance capability to support long-term wildlife, habitat, and visitor service objectives.

Strategies:

(1) Seek support of parish and state transportation officials to fund, develop, and maintain Poole Road, the entrance to refuge visitor service facilities, and other roads used for refuge access.
(2) Add additional equipment to support habitat and wildlife management activities.
(3) Promote partnerships and seek challenge cost share grants and other funding sources for maintenance of recreation facilities.

Goal E

Archaeological and Historic Resources

Protect refuge cultural resources in accordance with federal and state historic preservation legislation and regulations.

Discussion:

Several themes are consistently present in cultural resource and historic preservation laws. They include: (1) each agency should inventory "historic sites" and assess the site's eligibility for the National Register of Historic Places; (2) consideration of impacts to cultural resources during the agency's management activities; (3) protection of cultural resources from looting and vandalism; and (4) consultation with groups such as Native American tribes and African American communities to address how management activities might impact archaeological sites deemed important to those groups.

E.1 Survey/Investigation

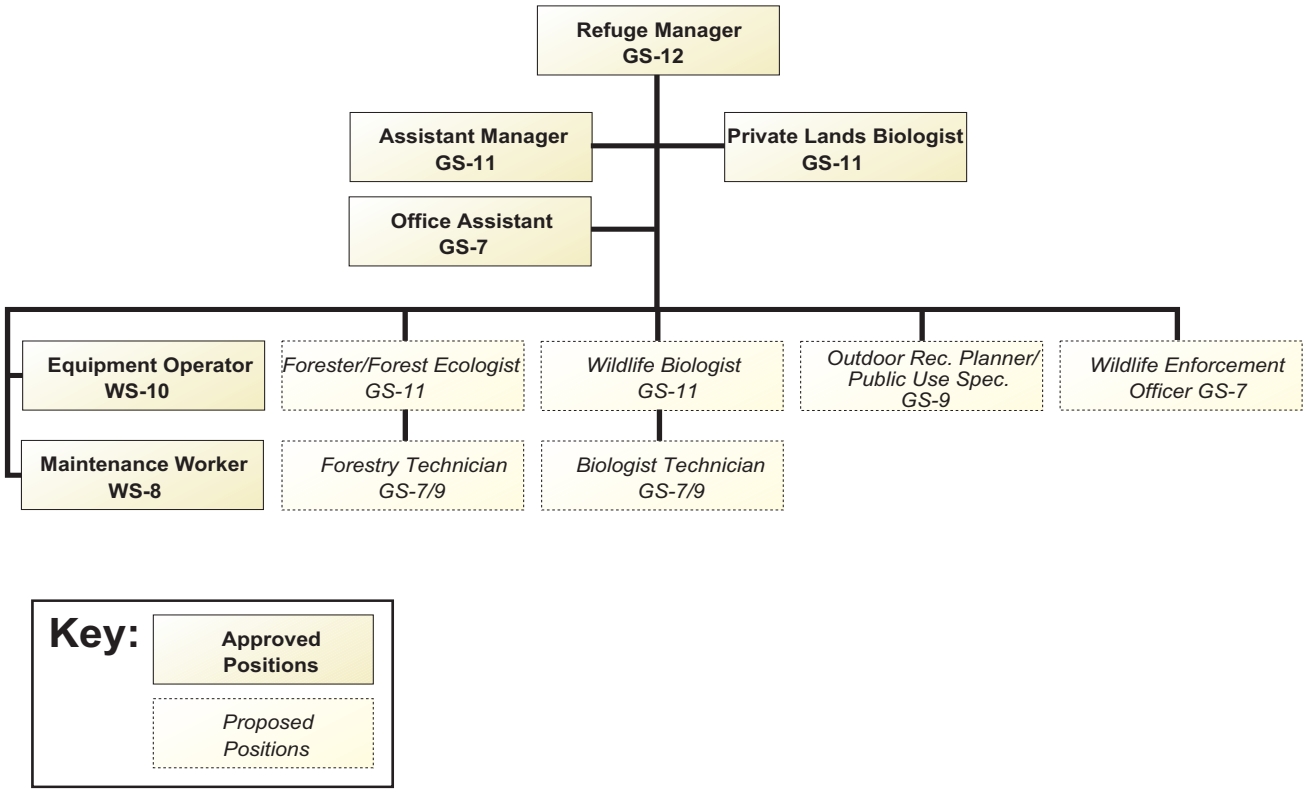
Objective:

By 2005, conduct a refuge-wide archaeological survey.

Strategies:

(1) Secure funding to conduct a comprehensive archaeological survey and geomorphic investigation.
(2) Develop databases for the refuge's archaeological and historic sites.
(3) Procure pertinent scientific reports and articles and produce an annotated bibliography to document the region's history, geomorphology, and the utility of the scientific methodology.

Figure 13. Current and Proposed Organizational Structure



E.2 Archaeological and Historic Resource Protection

Objective:

Develop and implement law enforcement procedures to protect the refuge's cultural resources to diminish site destruction due to looting and vandalism.

Strategy:

(1) Pertinent staff and law enforcement officers will attend Archaeological Resource Protection Act training course and Section 106/Cultural Resources for Managers course.

E.3 Cooperative Management

Objective:

Assist in organizing partnerships to manage cultural resources with pertinent federal and state agencies consistent with the Louisiana Comprehensive Archaeological Plan (1983).

Strategies:

(1) Coordinate agreements with appropriate agencies to enhance law enforcement and facilitate investigations in keeping with the Archaeological Resources Protection Act.
(2) If appropriate, coordinate with Louisiana State University or other entities for the permanent curation of archaeological collections and associated documentation.

E.4 Visitor Awareness

Objective:

Develop and implement an educational program that will provide an understanding and appreciation of the refuge's ecology and the human influence on ecosystems of the Lower Mississippi Valley.

Strategy:

(1) Work with local Native American and African American communities to develop an education program.

Goal F

Land Protection and Conservation

Protect and improve conditions for biological and other natural resource values through the use of current land protection programs (Figure 14 and 15).

F.1 Land Acquisition

Objective:

Seek to acquire and protect a minimum 20,000 acres to achieve the forest habitat requirements in support of species including Swainson's warbler, swallow-tailed kite, Louisiana black bear and white-tailed deer.

Discussion:

The 20,000-acre, permanently protected block of bottomland forest can be achieved through a combination of refuge lands and privately owned lands under perpetual easements (e.g., Wetland Reserve Program administered by the Natural Resources Conservation Service).

The protection of additional lands is subject to how these lands contribute to the biological needs of the refuge and meet funding priorities nationwide. Land acquisition is subject to its contribution to the overall forest configuration, its contribution to wildlife populations and habitat objectives and whether landowners are interested in selling their lands. Refuge expansion of various tracts will assist in overall efforts to establish source populations of migratory songbirds and black bear, as well as provide additional wildlife-dependent recreation and environmental education benefits.

Strategies:

(1) Achieve protection and conservation through a combination of lands within the current refuge acquisition boundary and lands within the proposed expansion areas.
(2) Ensure that lands are purchased or cooperatively protected based on the greatest habitat value to species life cycle needs and ecosystem representation. Establish acquisition priorities based upon habitat values and/or possible threats to existing resources.
(3) Initiate and continue contact with all landowners within the expanded acquisition boundary to determine landowner interest and participation.
(4) Develop a coordinated approach with partners to appropriately locate areas of greatest conservation concern.
(5) Seek partnerships with conservation organizations and others to complete acquisitions.

F.2 Private Lands Technical Assistance

Objective:

Provide technical assistance and, when appropriate, utilize private lands conservation programs to develop partnerships with landowners to achieve wildlife and habitat objectives.

Discussion:

A vast majority of lands within the Lower Mississippi Valley are privately owned but play an integral role in the management of migratory bird and other wildlife populations. Through the Partners for Fish and Wildlife Program, the Service provides technical and financial assistance to private landowners interested in managing for waterfowl or other federal trust resources and in restoring bottomland hardwood or riparian habitats. The Service can also help deliver land protection and conservation assistance in concert with other private, state, or federal agencies. Providing management assistance to private landowners is a critical element inachieving the Service's landscape habitat initiatives in the Lower Mississippi Valley.

Strategies:

(1) Coordinate land conservation activities with private, local, state, and federal organizations that participate in conservation incentive programs for local landowners.
(2) Conduct an annual seminar for local land managers (private and public) on habitat management, current research and monitoring, and watershed issues.
(3) Develop and distribute a newsletter describing conservation programs that are available to private landowners.
(4) Communicate with adjacent and key landowners and other community organizations and participate in local Chamber of Commerce to promote outreach and cooperation in the management of the refuge.
(5) Develop and employ outreach strategies to enroll private landowners in the most appropriate conservation program.
(6) Where appropriate, protect the remaining private lands within the refuge acquisition boundary.
(7) Initiate and continue contact with all landowners within the existing acquisition boundary to determine the status of willing sellers.
(8) Establish acquisition priorities based upon habitat values and/or possible threats to existing resources.
(9) Seek partnerships with conservation organizations and others to complete acquisitions.

F.3 Private Land Enrollment in Conservation Programs

Objective:

Seek to enroll about 12,000 acres of priority habitat in private lands conservation programs outside the proposed refuge boundary to establish migration corridors between the Three Rivers/Red River Wildlife Management Areas and the proposed Glade Woods National Wildlife Refuge.

Discussion:

The Service is working with the Natural Resources Conservation Service, the Louisiana Department of Wildlife and Fisheries, universities, and Black Bear Conservation Committee to develop a series of forest blocks and connecting forested corridors from Tensas River National Wildlife Refuge to the Atchafalaya Basin. The Bayou Cocodrie area, including the refuge, has been designated as an integral forest block in that planning effort. To facilitate movement north and south, it is critical that the refuge and adjacent forested lands be connected to other nearby forest blocks at the proposed Glade Woods National Wildlife Refuge, and the Red River/Three Rivers Wildlife Management Areas via forested corridors.

The Service considers restoring and protecting Louisiana black bear habitat a high priority in the Bayou Cocodrie planning area. The Service coordinates efforts with the Black Bear Conservation Committee, Louisiana Department of Wildlife and Fisheries, the Natural Resources Conservation Service, and many others to achieve bear conservation goals in Louisiana.

Strategies:

(1) Coordinate Louisiana black bear recovery activities with other Service offices, state agencies, Black Bear Conservation Committee and local landowners.
(2) In conjunction with state and federal agencies, develop and implement education programs within local communities.
(3) Develop land protection priorities and inform landowners of available private lands conservation programs.
(4) Identify and prioritize potential private lands conservation programs such as conservation easements managed by the Service.
(5) Enroll private lands in incentive programs.

V. Plan Implementation

Background

Refuge lands are managed as defined under the National Wildlife Refuge System Improvement Act of 1997, Fish and Wildlife Manual, sound biological principles, and up-to-date research. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges, which unlike other public lands, are dedicated to the conservation of the Nation's fish and wildlife resources. Recreational values are accommodated where appropriate and compatible, while still meeting the Congressional mandates of 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.

Proposed Projects

The proposed projects reflect the basic needs identified by Service staff, the public, and planning team members for the management of fish and wildlife populations, habitats, visitor services, general administration, land protection, and conservation. Among these projects is a list of step-down plans to be developed. Step-down plans are individual and specific management plans. The refuge operates under a number of step-down plans which outline proposed actions, as well as the benefits and potential impacts of the proposed actions. Some specific plans may need revisions, while others will need to be developed. The Service will prepare step-down plans in conjunction with the provisions set forth in the National Environmental Policy Act of 1969.

General cost estimates are provided in Figure 14. These figures will be specifically updated and adjusted annually. There are no estimates of potential land purchases, because land values are subject to time of sale and market value at 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 will use this plan to focus attention on funding the operation and maintenance needs of the refuge.

For the purpose of achieving the goals and objectives developed for the refuge, the plan has grouped management strategies into specific projects. This plan describes 42 potential projects for development and management. Additional staff is also listed to implement the projects. Private lands have been identified for land acquisition or possible enrollment in conservation programs offered by the Service or other partnering agencies.

Fish and Wildlife Populations

(1) Fish and Wildlife Management Plan

With the addition of a wildlife biologist, a fish and wildlife management step-down plan would be developed to describe specific wildlife inventory activities and techniques to monitor fish and wildlife populations. The plan would address nuisance animal management, game harvest needs, comprehensive inventory methods, and reporting requirements. It would also describe inventory and water management activities (e.g., stream culverts that block fish movement) as well as identify wetlands and stream restoration projects that would improve habitat conditions for native fish and other aquatic species on the refuge. Monitoring parameters, trends of selected species and groups, and an approach consistent with other refuges in the area would be described.

The existing hunt step down plan would be revised as appropriate and integrated into the Fish and Wildlife Management Plan. It would define species to be hunted, season structures, hunting methods and applicable refuge-specific hunting regulations.

(2) Investigations

Investigations would be conducted to assess invasive species including zebra mussel, beaver, feral hog and water hyacinth to determine population status and biological parameters. Exploratory investigations would be conducted for the Rafinesque's big-eared bat and the fat pocketbook mussel.

(3) Surveys and Assessments

The refuge would complete a comprehensive survey of vertebrates and species diversity. Surveys would include assessing the status of land bird populations and providing baseline data to evaluate the effectiveness of forest management and restoration efforts. This information is critical to implementing programs, formulating habitat management, and correcting deficiencies. White-tailed deer health check surveys and browse surveys would be conducted every 3 years. Annual waterfowl surveys would yield pertinent information that would assist in determining how effectively the refuge moist soil management program is supporting at least 10,000 migrating waterfowl and 12,000 shorebirds.

(4) Geographic Information System

Wildlife use and habitat type would be digitized and used for future analysis and monitoring. Data would be stored and maintained in a Geographic Information System. Additional data would be acquired from partners, while other databases would be developed. Hardware, digitizing equipment, field survey equipment, and aerial surveys and data would be purchased along with a computer, printer, and plotter.

(5) Nest Boxes

Artificial nest box programs would be established to support the needs of prothonotary warblers and wood ducks.

(6) Black Bear Monitoring

Monitoring would include bear movements and activities and capture and radio collaring, as well as assessing and evaluating sites for release. As Highway 84 is improved, the Service, along with appropriate agencies, would consider the effects of wildlife movement across the road expanse which may involve enlarging drainage culvert(s) for wildlife movement under the highway.

American woodcock
Mike Hopiak - Cornell Lab of Ornithology

(7) Avian Monitoring

Scheduled monitoring of non-game birds, including small land birds, shorebirds, raptors, colonial nesting birds, and waterfowl would be ongoing. The refuge would participate in regional and national avian monitoring programs. Refuge-specific assessments of forest songbird communities would assess songbird use, abundance and diversity. By 2002, implementation of detailed monitoring would begin in the old growth stand component. Cerulean and Swainson's warbler nest surveys would be conducted to monitor nesting success, predator disturbance, and nesting parasitism.

Habitat Management

(8) Forest Habitat Management Plan

The Forest Habitat Management step-down plan would describe specifics of the forest management program. An inventory and mapping of refuge habitats would be part of this planning effort. Forest management would be described to maintain and improve forest age, species, and structural class components to benefit forest breeding birds, Louisiana

black bear, and indigenous species. The plan would establish schedules for reforesting open areas and preparation of forest management prescriptions for existing stands. Objectives would be stated in clear and measurable terms and provide an overall framework on which to base plant and wildlife monitoring.

(9) Weeds/Invasive Species Removal

An Integrated Pest Management Plan would be developed in 2002. The refuge may seek assistance from entities including local universities, conservation organizations, and the U.S. Department of Agriculture.

(10) Reforestation

Reforestation with a mix of native hardwoods on most open, heavily fragmented areas in the Bird Conservation Zone is a long-term goal. All new lands acquired, which are in excess of waterfowl needs, would be reforested. With the addition of a forester and forestry technician, about 30 percent of the refuge (including proposed expansion areas), or 6,500 acres of converted wetlands and farmlands, would be replanted in mixed hardwood species. (This represents 1,500 acres previously enrolled on the refuge and 5,000 acres of private lands slated for enrollment in various lands conservation programs.) Replanted sites would provide migratory songbird habitat and increase natural diversity of wildlife. High priority sites first considered for reforestation within the Bird Conservation Zone include refuge lands (former marginal agricultural sites) and neighboring private lands enrolled in Partners for Wildlife or Wetland Reserve programs.

(11) Research Natural Area Administration

The 750-acre old growth area would be proposed as a Research Natural Area with several primary objectives. These are: 1) to remain as the best example of old growth bottomland hardwoods remaining in the Lower Mississippi Valley, which continues to provide for those species dependent on habitat conditions found in old growth bottomland hardwoods; 2) to provide a standard by which to measure management activities within the Brooks Break Unit; 3) to provide research opportunities focused on old growth functions within bottomland hardwood ecosystems; and 4) provide other research opportunities compatible with the first three objectives. The forest would generally be left undisturbed, except for research projects as stated in the objectives. Species occurrences, species habitat relationships, and avian surveys are currently being studied in the old growth area and would continue to be studied. The protected old growth would be used as a standard to manage existing forest stands with objectives of providing old growth functions.

(12) Forest Management - Brooks Brake Unit

Management of this unit would focus on providing habitat for forest interior birds which are dependent on habitat characteristics displayed by old growth bottomland hardwoods (Figure 9). Although management would primarily include thinning and small group selection cutting, other silviculture practices may apply as determined through habitat surveys and the prescription process necessary for this unit to meet its habitat objectives. Management techniques would be designed to: 1) provide old growth characteristics/functions, and 2) allow this unit to become self-sustaining old growth. The proposed Research Natural Area located within this unit would be the standard by which all management within this unit is based. Management applications on target species would be monitored on a continuing basis and subject to change as effects are determined.

(13) Forest Management - Wallace Lake and Cross Bayou Units

A forest stand components' evaluation would be completed for the Wallace Lake and Cross-Bayou units as well as acquired forest lands to determine appropriate management prescriptions needed to meet songbird and black bear objectives. Management applications would be described in the Forest Habitat Management Plan. Initially, forest management may involve thinning and group selection cutting to increase natural diversity

and restore forest habitats to a healthier and more natural distribution of stages, and to encourage a diverse understory of native grasses, shrubs, and hardwoods.

(14) First Order Vegetative Monitoring

Pre- and post-treatment habitat monitoring in the Brooks Brake Unit would be conducted. Annual evaluations would be made wherever there is forest stand management activities to assess the health of forest songbird communities, restore natural diversity to emphasize mature forests, and measure management application success.

(15) Wetland Restoration

Currently, moist soil units have been partially developed by the refuge staff to restore habitat for waterfowl, shorebirds, other waterbirds and raptors. Phased development of these moist soil units, including initial levee construction of two water impoundments, was completed in 1999. Additional water management improvements requiring funding include irrigation wells, pumping units, irrigation pipes, and stoplog structures.

Education and Visitor Services

(16) Visitor Services Plan

Descriptions of specific materials, displays, and themes to promote the six priority public uses adopted by the Service would be addressed in this step-down plan. It would address specific visitor use activities including facility requirements, site design, conceptual themes, and handicapped accessibility.

This plan would also address the specific services (e.g., eco-tourism opportunities such as guided tours) the refuge could provide local communities, as well as the cooperative partnerships to increase awareness of fish and wildlife resources and systematically improve visitor use within the area.

Outreach or the communication of management activities with others is a fundamental tool for successful implementation of refuge programs. This section would describe time lines, methods, and programmatic coordination undertaken by Service staff. A discussion of potential collaborative partnerships would be coordinated and recommended.

(17) Hunting

Hunting opportunities would be expanded as lands are acquired and would initially include a lottery, modern-day gun hunt for white-tailed deer and a limited waterfowl hunt in the Brooks Brake Unit. The addition of a permanent law enforcement officer and radio communication system would improve emergency response and the safety of officers in the field. Additional hunter check stations, hunter safety classes, and annual hunt brochures would be provided.

(18) Sport Fishing Activities Expansion

To improve sport fishing opportunities, additional access for both boat and bank fishing would be developed on the Cross Bayou, which is the most suitable site for access. A road, boat ramp, and parking area would be developed. Bank fishing would be universally accessible.

(19) Wildlife Observation Platform

Wildlife observation and photography near the refuge headquarters would include the construction of an observation platform at the waterfowl/shorebird area, the addition of a 10-car parking area, an informational kiosk and two vault toilets. In addition, informational panels would illustrate waterfowl and shorebird management.

(20) Boardwalk

Located adjacent to the existing refuge office/maintenance area is an excellent stand of bottomland hardwoods. A ½-mile boardwalk would be built under the forest canopy and next to the refuge headquarters providing easy access for a unique experience by visitors. This trail would include a trail head with parking area and interpretive panels along the route describing bottomland hardwood forest communities and their importance.

(21) Boardwalk to Old Growth Area

Construct a 3/4-mile boardwalk leading to the edge of the old growth/ research natural areas which would be open year-round except for the nesting season.

(22) Canoe Trail

Bayou Cocodrie is designated as a Scenic River by the State of Louisiana. It flows through the oldest remaining bottomland hardwood stands left in the area. There is limited access along its length, since much of it flows through private lands. The refuge offers one of the few opportunities for public canoe access. A parking area and canoe launching area would be developed near the refuge headquarters and Poole Road bridge at Cross Bayou and off Boggy Bayou Road. The canoe trail would also offer 2 - 3 designated stops along its route for visitors to get out and walk a short distance into the forest.

(23) Parking/Trail head Development

This area supports the 13-mile trail system located throughout the Brooks Brake Unit. Trails provide access for hunting and wildlife observation and photography. The Brooks Brake Unit is the primary location for recreation opportunities on the refuge, providing access deep into the bottomland hardwood forest community. All trails leading into the Brooks Brake Unit begin from a central parking area. The area is in need of parking improvements, trail head development, and signs. Portions of the trail system would be upgraded to include photo/observation blinds at selected sites.

(24) Visitor Center/Headquarters Complex

Key to the success of providing additional visitor services is having office space for additional staff and an indoor area to conduct environmental education activities. Proposed to be located along Poole Road, this dual administrative and visitor services facility would provide much needed office space for the expanded staff and a central point for visitors to obtain information about the refuge. In addition to offices, it would include an exhibit area, an auditorium for interpretive and education programming and a classroom space for school field trips. In addition to working with local schools, the refuge could also offer education programs for others visiting and living in the area.

(25) Kiosks

Develop and locate at all parking areas and trail heads, a 3-panel kiosk with basic information regarding the Service, the refuge, and recreation opportunities. There would be from four to six of these located throughout the refuge.

(26) Environmental Education Materials and Equipment

There are a number of elements required for successful administration of a new interpretive/environmental education program. Many of these elements have annual operating expenses related to materials for program participants. The addition of one permanent Outdoor Recreation Planner would provide services at the refuge, as well as at Lake Ophelia and St. Catherine Creek National Wildlife Refuges. Other costs associated with program development would include brochures, teacher activity

guides, curriculum development, education program equipment (e.g., microscopes, dip nets, sampling kits, etc.), projection equipment, and various guides/manuals.

(27) Outreach Materials and Exhibits

Outreach to local constituencies and beyond is becoming a valuable tool for refuge managers. Communicating with the public regarding the refuge's role in management and protection of natural resources results in direct support of refuge programs. Making use of other local facilities and developing an eco-tourism program, portable exhibits, and special issue fact sheets are just a few of the items that can be useful outreach tools. Outreach programs are supported with the use of reference materials, portable exhibits, and off-site permanent exhibits.

Refuge Administration

(28) Base Operations and Existing Staff

The refuge is currently managed with six full time staff members. In its current operation, with minimal staff and low funding, the refuge conducts essential activities such as law enforcement and outreach. To achieve full potential of contributing to wildlife goals and objectives is totally dependent upon receiving adequate funding and staffing as identified in this plan.

(29) Wildlife Enforcement Officer

Protecting refuge resources and the safety of visitors is a fundamental responsibility of refuge management. Game is commonly taken out of season and night poaching is a continual enforcement problem. The illegal sale of white perch from the Bayou Cocodrie has resulted in prosecution. With proposed land expansion and the proposed increase in public hunting opportunities, a full-time law enforcement officer is required.

(30) Forester/Forest Ecologist

About 20,000 acres of the refuge would be reforested or restored. This work would require a Forester and Forestry Technician. These positions would also support forest management programs at St. Catherine Creek and Lake Ophelia National Wildlife Refuges, as well as provide technical expertise to private landowners enrolled in conservation programs that involve forest improvements or forest restoration projects.

(31) Forestry Technician

(Same as Forester description.)

(32) Wildlife Biologist

One full-time Wildlife Biologist is needed to develop plans, baseline studies, and biological assessments; monitor and evaluate management programs; manage black bear; and develop, with the aid of the Forester, a forest management program.

(33) Outdoor Recreation Planner/Public Use Specialist

As the refuge staff become increasingly involved in community partnerships and in providing recreation and environmental education to local schools and civic organizations and on the refuge, it would be necessary to add a full-time position to serve these needs. The Outdoor Recreation Planner/Public Use Specialist would also contribute to building recreation and environmental education programs as St. Catherine Creek and Lake Ophelia National Wildlife Refuges. The recreational and environmental education opportunities developed by the refuge staff would provide an economic benefit to the local community. Local merchants who sell outdoor recreation equipment, and businesses that provide food, lodging, and other commercial services to visitors and tourists, would benefit from this outreach program.

(34) Equipment Shed Construction

Currently, 75 percent of refuge equipment is unprotected and exposed to heat and moisture throughout the year. Because of this, routine replacement is expensive and constant exposure to the elements is causing deterioration to hydraulic lines, tires, and other soft coverings. This deterioration could also become a safety factor as an unexpected rupture of hydraulic lines could lead to serious burns. The addition of an equipment shed would reduce maintenance costs and extend the longevity of the equipment.

(35) Oil Storage Facility

Currently, the refuge lacks a storage facility for small engine tools, antifreeze, fuels, petroleum, and paints. As a result, items are purchased on an as needed basis which is disruptive to management activities. The installation of a prefabricated oil storage facility is an immediate need.

Lofton water control structure
Tensas River National Wildlife Refuge

(36) Radio Communication System

The staff are provided with cellular telephones for communication in the field. These phones operate well in open areas, but are ineffective over most of the refuge due to operating limitations under a thick forest canopy. As a result, communication is often interrupted and could place staff at serious risk. With the addition of a radio communication system, services would be shared with local police enforcement and St. Catherine Creek National Wildlife Refuge.

(37) Vehicle and Heavy Equipment Fleet

Four of the six vehicles in the refuge fleet require replacement. They are aged and in very poor condition with many recorded hours of operation. Other equipment replacement needs include: 1 4-wheeled backhoe, 2 tractors, 1 pressure washer, 1 motor-grader, 1 bat-wing mower, and 2 pickup trucks. The purchase of heavy equipment for erosion control is an important need. A priority whenever agricultural land is acquired is to eliminate topsoil runoff. Another priority is to restore 700 acres of interior forest damaged by beaver activity. A 4-wheeled backhoe would be used for multiple purposes including beaver dam removal and installation of pipe drops in the agricultural field bordering the Bayou Cocodrie River. The pipes would eliminate and prevent future soil erosion. A motor-grader and batwing mower are needed to maintain refuge facilities and properties including impoundment levees, refuge access roads, trails, and parking areas.

(38) Poole Road and South Boggy Bayou Rehabilitation

There is a need to rehabilitate approximately 3 miles of Poole Road from the refuge boundary, east to Highway 15. Poole Road is the only access to the refuge headquarters and would serve as the only access to planned visitor and education facilities. Boggy Bayou Road provides the only access to the south end of the refuge and is in need of major repairs. Both are parish roads, and, as such, partnerships would be developed with the Concordia Parish Police Jury and funding sought from the Federal Highway Administration.

(39) Refuge Road Improvements

An existing dirt road would be overlain with a 610 road base, culverts, and drains to provide access for maintenance of waterfowl impoundments and for the public to reach the proposed headquarters/visitor center, canoe launch, and wildlife observation platform.

(40) Survey and Sign Exterior Boundary

Thirty-one miles of mostly remote property boundary are not posted. As a result, repeated game violations occur near refuge borders. Posting Service boundary signs would aid the refuge in prosecuting game violators and providing clear delineation of refuge lands where fish and wildlife are fully protected.

Archaeological and Historic Resources

(41) Archaeological and Historic Resource Investigations

The comprehensive inventory and procurement of information of historic sites, and the site's eligibility for the National Register of Historic Places will occur as appropriate. The refuge will procure pertinent scientific reports and articles and produce an annotated bibliography to document the region's history, geomorphology, and the utility of the scientific methodology. Native American tribes and African American communities will be consulted to address how management activities might impact archaeological sites deemed important to those groups.

Land Protection and Conservation

(42) Land Acquisition

The Service would seek to acquire lands within a potential expansion area of up to 20,000 acres. This is in addition to high priority in-holdings (9,101 acres) within the current acquisition boundary to support resident populations. Land acquisition methods may include fee title acquisitions, conservation easements, leases, and cooperative agreements. The success of meeting wildlife and habitat management objectives identified in this plan is closely tied to the Service having management capability on both current refuge lands and proposed expansion areas.

(43) Private Lands Coordination and Enrollment in Conservation Programs

In order for the refuge to restore and connect forests to serve as wildlife corridors, the staff must coordinate with landowners and agencies within Concordia, Tensas, and Catahoula parishes. The Service would accelerate joint planning at the watershed, landscape, and eco-region level with the U.S. Department of Agriculture and Louisiana Department of Wildlife and Fisheries. Further, the Service would coordinate with other agencies and organizations the enrollment of up to 12,000 acres of private lands in other private lands conservation programs. The Natural Resources Conservation Service and Farm Service Agency have been instrumental in implementing conservation measures to improve conditions for black bear by enrolling lands in the Wetlands Reserve Program and the Conservation Reserve Program. The Service would continue to provide technical assistance and support to enroll farm lands in these programs.

Black bear recovery success would depend upon landowner participation in various conservation programs coordinated with private, local, state and federal organizations. Priority lands evaluated for enrollment would consider black bear movement and administrative access for monitoring.

Figure 14. Project/Staff Cost Summary for 2000-2015

CCP Project Description	*RONS/MMS*	*Estimated Cost (1999)*	
No. Project	*Project No.*	*One-time*	*Annual*
Fish and Wildlife Populations			
1. Fish and Wildlife Management Plan	RONS 00004	*	
2. Investigations	RONS 00001, 00004	100,000	10,000
3. Surveys and Assessments	RONS 00001,00004	*	
4. Geographic Information System	RONS 00003	$10,000	$3,000
5. Nest boxes	Proposed	5,000	2,500
6. Black bear monitoring	RONS 00004, 00006	*	90,000
7. Avian monitoring	RONS 00007, 00005	* --	--
Subtotal		*115,000*	*105,500*
Habitats			
8. Forest Habitat Management Plan	RONS 00001, 00002	*	
9. Weeds/Invasive species	Proposed	100,000	10,000(c)
10. Reforestation	RONS 00001, 00002	7,500.(c)	
11. Research Natural Area	Proposed	*	
12. Brooks Brake Unit Forest Management	RONS 00001, 00002, 00004	*	
13. Other Units Management	RONS 00001, 00004	*	
14. First Order Vegetative Monitoring	RONS 00001, 00004	*	
15. Wetland Restoration	RONS 00008, 00023	125,000	5,000
Subtotal		*225,000*	*12,500*
Education and Visitor Services			
16. Visitor Services Plan	Proposed	*	
17. Hunting	Proposed	$28,000	7,000
18. Sport Fishing	Proposed	20,000	5,000
19. Wildlife Observation Platform	RONS 00009	90,000	5,000
20. Boardwalk (Headquarters)	RONS 00011	18,000	5,000
21. Boardwalk (to Old Growth)	RONS 00010	20,000	5,000
22. Canoe Trail	RONS 00010	10,000	5,000
23. Parking/Trailhead Development	Proposed	50,000	5,000
24. Visitor Center Headquarters/Complex	MMS 00001	2,000,000	50,000
25. Kiosks	Proposed	40,000	10,000
26. Environmental Education	Proposed	25,000	20,000
27. Outreach	Proposed	25,000	10,000
Subtotal		*3,688,000*	*120,000*

CCP Project Description RONS/MMS Estimated Cost (1999)

No. Project	*Project No.*	*One-time*	*Annual*
Refuge Administration			
28. Base Operations & Existing Staff	NA		316,000
Subtotal			*316,000*
Salary/ Benefits			
29. Wildlife Enforcement Officer		100,000	100,000
30. Forester/Forest Ecologist		100,000	100,000
31. Forestry Technician		80,000	80,000
32. Wildlife Biologist	Proposed	100,000	
33. ORP/Public Use Specialist	Proposed	80,000	
Subtotal			*460,000*
34. Equipment Shed Construction	Proposed	150,000	5,000
35. Oil Storage Facility	RONS 00007	53,000	3,000
36. Radio Comm. System	RONS 00013	23,000	3,000
37. Vehicle & Heavy Equipment Fleet	RONS 00016, 00014	250,000	5,000
38. Entrance Road Rehab. (Poole Rd.)	MMS 00003, 00004	945,000 **	20,000
39. Refuge Road Improvements	MMS 00003, 00004	234,500	
40. Survey & boundary signs	Proposed	150,000	5,000
Subtotal		*970,000*	*30,000*
41. Archaeological and Historic Resource Investigations***			
42. Land Acquisition***			
43. Private Lands Coordination and Enrollment in Conservation Programs***			

Key: * Project cost is part of proposed staff cost
** Project cost primarily supported by partners
***Project cost is undetermined
(c) Project primarily completed by Contracted Services

Step-down Management Plans

Refuge policy (Refuge Manual, Part 4, Chapter 3) requires that specific management plans be developed for each refuge. Some plans require annual revisions and others are on a 5- to 10-year revision schedule. The Hunting and Fishing Plans are currently being revised. The following is a list of management plans needed for the refuge:

Figure 15. Step-Down Plans

Step-down Plans Required	*Completion Date*
Sign Plan	FY03
Public Use Plan	FY03
Water Management Plan	FY03
Forest Management Plan	FY02
Wildlife Inventory Plan	FY04
Predator Control Plan	FY04
Fire Management Plan	FY05
Law Enforcement Plan	FY05
Integrated Pest Management Plan	FY05
Education and Visitor Service Management Plan	FY06

Plan Performance

Specific survey, inventory, and monitoring protocols will be adopted for the refuge. Before doing so, a detailed biological assessment will be conducted. A Geographic Information System will be used to store and analyze information.

The National Wildlife Refuge System Improvement Act requires that the Service monitor fish, wildlife, and plants on refuges in order to establish status and trends of both resident and migratory wildlife. Monitoring is an essential component of this plan, and specific strategies have been integrated into the previously described goals and objectives. All habitat management activities will be monitored to assess whether the desired effect on wildlife and habitat components has been achieved. Monitoring the number of breeding pairs and the reproductive parameters of the priority suite of songbird species will follow established statewide protocols, at a minimum. Baseline surveys will be established for other species of wildlife for which existing or historical numbers are not well known. It also will be important to begin studies to monitor the response of wildlife to increased visitor use.

Management of projects is dependent on monitoring and evaluation to sustain the function and dynamics of forests, maintaining biological diversity, protecting target species, and providing a variety of wildlife-dependent recreation and education experiences of value to visitors. Information derived from monitoring and evaluation will enable managers to adjust and test the management objectives outlined in this plan.

This plan would be reviewed annually to determine the need for revision and adjust and set priorities. A revision would occur if significant information were to become available such as a change in ecological conditions, a major refuge expansion, or if new step-down plans were to be developed. The final plan would be augmented by detailed step-down plans to address completion of specific strategies in support of refuge goals and objectives. Revisions to the plan would be subject to National Environmental Policy Act review, as well as public review. Management performance is documented in annual narratives. A new plan is required after 15 years.

Partnership Opportunities

Public outreach entails a variety of services and support that refuges provide to the public, special groups, other government agencies and individuals. It includes technical assistance to state agencies on special problems and publications and presentations to local civic groups and schools.

Many biologists and private citizens, as well as environmental organizations, scientific organizations and other agencies, have expressed a great interest in the management of the refuge. Maintaining and developing partnerships will enable the refuge to achieve its goals and objectives, minimize costs, share funding and bridge relationships with others. To maintain and enhance wildlife outside of the refuge, the Service will focus its efforts on continuing to develop partnerships with landowners, the Louisiana Department of Wildlife and Fisheries, The Nature Conservancy, the Natural Resources Conservation Service and the Farm Service Agency. Although the Service does not have management responsibilities for those lands outside the refuge, it is important to articulate the wildlife resource needs area wide. Collaboration with colleges and universities and with conservation organizations will enable the refuge to carry on its extensive plans for research, monitoring, and education. To create awareness and expand environmental education efforts in the community, partnerships will be established with organizations and school systems. A list of partnering sources and potential uses can be found in Section C.

Monitoring and Evaluation

Wildlife population monitoring, (i.e., involving primarily breeding birds, black bear, white-tailed deer, and invasive species), and habitat monitoring will be emphasized. Wildlife monitoring will include surveys during the hunting and breeding seasons, brood surveys, collar observations, species richness measurements, and relative abundance figures. Habitat monitoring will primarily involve the amount and distribution of forested wetland habitats, vegetation and water quality surveys, community composition and structure, and representative components and habitat parameters addressed in plan objectives.

Adaptive management is a flexible approach to long-term management of biotic resources which is directed over time by the results of ongoing monitoring activities and other information.

Adaptive management is a process in which projects are implemented within a framework of scientifically driven experiments to test predictions and assumptions as outlined in this plan. The biological programs are systematically evaluated to determine management effects on wildlife populations. This information is used to refine approaches and to determine how effectively goals and objectives are being accomplished. Evaluations will be conducted on a regular basis to provide feedback to stakeholders and partners. If monitoring and evaluation yield undesirable effects for target and non-target species and/or communities, management projects will be altered and the comprehensive conservation plan will be revised.

Yellow-throated warbler
Wison Bloomer - Cornell Lab of Ornithology