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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 by which to manage 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 creating 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 of 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.

Objective A.1: Songbirds

Support healthy populations of forest dwelling migratory songbirds, specifically 500 pairs of Swainson's warblers, and provide suitable habitat for the reestablishment of Cerulean warbler and swallow-tailed kite populations.

Discussion: A wide-range goal for the Lower Mississippi Valley is to establish self-sustaining populations of all forest breeding bird species. This objective supports Source Population Objectives established for this area. A minimum of 13,000 acres of core forest (20,000 acres of forest habitat that is ≥ 1 km from agriculture or other non-forested land use) is needed to support 500 breeding pairs of Swainson's warblers. This would also allow for recolonization of the area by Cerulean warblers and swallow-tailed kites (pers. comm., Hunter).

Present refuge data suggest densities for the 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).

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 11 and Appendix D).

Strategies:

- Survey the refuge and determine baseline populations for forest-breeding non-game birds.
- Establish point count stations to determine population size changes over time.
- 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.

Figure 11. 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 :					
	Extremely 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	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 9-12/100 acres Prothonotary Warbler		Hooded Warbler 14-18/100 acres	
Ground	Swainson's Warbler (forage)	American Woodcock (winter) 7-11/100 acres Wood Thrush (forage)			

- Manage beaver, muskrat, raccoon, and feral hog populations to protect and target forest-breeding bird species, including the use of such techniques as trapping.

Objective A.2: Black Bear

Assist in maintaining viable populations of those species of fish, wildlife, and plants endemic to bottomland hardwoods of the area, including the 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 adapt to the present landscape and move from one management area to the next.

The Service is monitoring bear movement to determine if the refuge might 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.

Strategies:

- 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 programs.
- 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.
- Encourage refuge visitors, as well as surrounding landowners, to report bear sightings or suspected bear activity.
- Assist others with all phases of black bear management and nuisance control in Concordia Parish.
- Provide habitat that supports the recovery of the Louisiana black bear.



Shorebirds
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Objective A.3: Waterfowl and Shorebirds

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

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 requirements during their southward migrations. The refuge should support about 12,000 southbound migrating shorebirds.

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:

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

Objective A. 4: Resident and Other Species

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 that is 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 indicate an annual harvest of 250-300 deer or approximately 1 deer harvested per 54 acres of hunted

area. The harvest (per acre) will occasionally fluctuate due to weather and habitat conditions. 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 turkeys, wood ducks, 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 foxes, coyotes, 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 are key species by which biologists evaluate the environmental health of the ecosystem. Knowledge of which species occur on the refuge is fundamental to understanding the biological diversity of the area.

Strategies:

- Monitor the population status of key indicator species, white-tailed deer, and turkey.
- Manage white-tailed deer population at current levels (average harvest range is between 250-300/10,000 acres).
- Integrate population objectives for resident species into habitat management plans.
- Establish hunting regulations for resident wildlife to maintain population health and stability and habitat relationships. Coordinate with neighbors.
- 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.
- Designate raccoons as an incidental take species.
- Prepare and conduct biological/monitoring plan which includes establishing baseline information on reptile/amphibian occurrence and habitat utilization.
- Develop population estimates for the American alligator and monitor effects on other trust species.

Objective A.5: Integrated Pest Management

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

Discussion: Water hyacinth and hydrilla are two exotic species found in refuge lakes and sloughs. These plants form dense mats that impede water flow and recreational use and retard the growth of desirable submerged aquatic plants. Also found in recently reforested

management units and moist-soil management areas are pest plants such as Johnsongrass, alligatorweed, cocklebur, and coffeebean. 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, disking, burning, flooding, and/or herbicide application.

Feral hogs are major non-native animal pests 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:

- 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.
- 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.
- Inventory feral hog numbers and monitor effects on natural habitats and crop depredations.
- Provide hunter take provisions for feral hogs by including them as a miscellaneous species during any established refuge hunt.
- 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.
- Coordinate with the Aquatic Plants Division of the Louisiana Department of Wildlife and Fisheries to implement control programs.
- Coordinate results of information concerning success/failure of control treatments within and outside the agency, especially in regard to hydrilla.

Goal B: Habitats

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.

Objective B.1: Contiguous Forest

Assemble, at a minimum, 13,000 acres of core forest habitat consisting 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.)



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Discussion: Certain migratory forest songbirds, including forest-breeding birds such as the Swainson's warbler, are in significant decline due to the loss of bottomland hardwood forests. Priority species associated with habitats that support forest songbirds are vulnerable. Additional forested tracts that would form a contiguous block size, containing a minimum of 13,000 acres of core forest, 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:

- 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.
- Restore hydrology where needed and where practical.
- Develop clear biological goals and objectives for management of resident wildlife and ensure that management reflects the contribution of these goals to native biological diversity.
- Inventory and establish deer, raccoon, beaver, and feral hog population parameters and baseline indices.
- Conduct monitoring surveys.
- Develop and maintain geographic information system databases to monitor forest stand management results.
- Limit access through measures such as gating roads and minimizing all terrain vehicle trails.
- 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.
- Incorporate the enhancement/widening of forest corridors that link forested tracts through incentive programs, easements, and/or purchases.
- Minimize logging and construction activities during periods of bear denning.

Objective B.2: Old Growth Forest Protection

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

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 they exhibit 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 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., Hunter, Boykin).

Strategies:

- Establish baseline monitoring.
- Propose designation of the 750 acres as a Research Natural Area.
- Develop a monitoring plan that will standardize data collection, analysis, and reporting.
- Monitor migratory breeding bird habitat conditions and manage for the priority species identified for this refuge.
- 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.
- Coordinate research efforts with scientists and the research community.
- Prohibit logging in 750 acres designated as a Research Natural Area and manage partnerships to monitor migratory songbird populations.
- Restore hydrology where needed and where practical.

Objective B.3: Forest Management

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.

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 on the 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, degradation, and fragmentation. The development and maintenance of a super-emergent canopy will create optimum conditions for area sensitive songbirds.

Strategies:

- Evaluate forest survey requirements needed to plan forest management on this unit.
- Develop a habitat restoration plan that will specify desirable stand conditions.
- Utilize habitat management techniques that will mimic old growth structure and function while allowing the forest to become self-sustaining old growth.
- Inventory and establish deer, raccoon, beaver, and feral hog population parameters and baseline indices.
- Conduct monitoring surveys.
- Develop and maintain a geographic information system.
- Limit access by gating roads and minimizing vehicle/trail access.
- 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.

Objective B.4: Other Forest Management

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.

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. Managing these units with special emphasis on improving forest structure conditions is critical to bird nesting success. Refuge forests have excellent potential to offer high quality breeding habitat for priority songbirds. 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:

- Develop and implement forest and water management programs to provide needed nesting, foraging, and resting habitat.
- 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.
- Where appropriate, manage habitat functions and values to improve conditions altered by beaver activities within the Brooks Brake and Wallace Lake units.

- Develop a habitat management plan that will specify desirable future stand conditions.
- Evaluate forest survey requirements necessary to plan forest management on the refuge.
- Develop an Integrated Pest Management Plan.

Objective B.5: Reforestation

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. Reforestation efforts via partnerships and interagency coordination will target identified high priority areas to maximize increases in core habitat.

Discussion: In addition to the 2,000 acres reforested in 1996, reforesting 5,000 acres would contribute to the 13,000 acre core 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:

- Reforest all refuge lands except those areas identified for waterfowl management, using species appropriate to the site.
- Develop and utilize forest management techniques to establish and maintain vertical and horizontal complexity.
- Seek funding opportunities and partners to assist in reforesting refuge lands and target identified high priority areas for reforestation via partnerships and interagency coordination.

Objective B.6: Wetlands

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

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 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:

- Manage existing impoundments for waterfowl and shorebirds.
- Monitor waterfowl utilization patterns and waterfowl populations.
- Develop and implement a Moist-Soil 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.

Discussion: 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 several 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 over time, 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 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.

Objective C.1: Hunting

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.

Discussion: Currently, an annual harvest average of 1 deer per 50-55 acres hunted will meet this objective. This average may be adjusted as habitat conditions improve and carrying capacities increase. The Service manages hunt programs in pursuit of wildlife and habitat management goals and objectives and to provide a high quality experience for each hunter. A quota hunting system on a broad land base usually yields a higher success rate for the visiting hunter. Research has shown that hunting, under carefully regulated conditions, will not significantly affect 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.

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 when lands are acquired and additional staff becomes 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. By allowing limited hunting, there should be no disturbance to waterfowl using the refuge's moist-soil management units located in the Cross Bayou Unit, where hunting is not allowed. These moist-soil units are designed strictly as resting/breeding areas for waterfowl. Waterfowl hunting in the Brooks Brake Unit will be limited to 3 days per week until noon and expanded when deemed appropriate and compatible.

Strategies:

- Monitor deer populations via browse surveys, harvest data, and periodic health checks.
- Manage hunt program to achieve population management and wildlife habitat objectives.
- Increase hunting area to include reforested habitat for small and big game hunting as land is acquired and managers become available to manage additional hunters.
- Expand hunting program to include a quota modern gun hunt for white-tailed deer, and to provide waterfowl hunting opportunities.
- Improve refuge access by extending trails and providing additional entry/check points.
- Revise the 1994 Hunt Plan in coordination with Louisiana Department of Wildlife and Fisheries to assist in achieving balanced and healthy game populations.
- Evaluate potential impacts of hunting on other refuge activities and programs.
- Develop additional trails and parking areas as appropriate and compatible.

Objective C.2: Fishing

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

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.

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:

- Inventory and evaluate fishery resource potential using Service's Fisheries Division.
- In consultation with county, state, and federal partners, develop and implement a Sport Fishing Management Plan to provide a quality fishing experience.
- Evaluate the costs, logistics, and safety considerations in creating suitable sites for fishing.
- 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).
- Develop bank fishing access on existing properties including Bayou Cocodrie, Cross Bayou, and Wallace Lake.

Objective C.3: Wildlife Observation and Photography

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

Discussion: The Red River/Three Rivers Wildlife Management Area Complex provides for wildlife viewing in Concordia Parish. Louisiana's Wildlife Worth Watching guide to viewing wildlife lists the Sand Levee Trail on Three Rivers Wildlife Management Area for vehicle parking, hiking, and primitive camping, and the Yakey Waterfowl Impoundment on the Red River Wildlife Management Area for vehicle parking and viewing of wildlife. 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 forest 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.



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Strategies:

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

Objective C.4: Environmental Education

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 forest 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 implement 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:

- Develop a volunteer based Instructor Corps Program to provide for environmental education and interpretive programs, and for facilities development.

- Develop teaching materials and host annual teacher workshops to promote environmental education based curriculum in local schools.
- Encourage the development of a refuge friends group as well as a volunteer program to support environmental education programs.
- Monitor and survey recreation and education uses throughout the refuge as an ongoing program.
- Develop a visitor education center and an outdoor classroom along Poole Road.
- Increase involvement in and update local public (i.e., Police Jury, School Board, Chamber of Commerce) on refuge activities.

Objective C.5: Interpretation

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: Ecotourism 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 key roles in assisting refuge management to 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:

- Coordinate with staff of St. Catherine Creek National Wildlife Refuge to develop an interpretive display at the Louisiana Hydroelectric Visitor Center.
- 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.

- Increase local awareness of the Lower Mississippi River ecosystem and the importance of bottomland hardwood forests.
- Offer educational classes on wildlife observation opportunities and unique features of the refuge to local community and events coordinators.
- Promote ecotourism opportunities in conjunction with local partnerships, businesses, and civic groups. Such opportunities may include birding tours, festivals, and other special events.
- In conjunction with St. Catherine Creek National Wildlife Refuge, promote opportunities and partnerships with local civic groups such as the Natchez Visitor Center.
- Develop an exhibit for the Natchez Visitor Center featuring both Bayou Cocodrie and St. Catherine Creek Refuges.

Objective C.6: Recreation Facilities

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

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. 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 within the watershed. The refuge has the potential to offer excellent wildlife and nature viewing but has limited parking facilities. Access to the Bayou Cocodrie River is limited due to the lack of public boat launching facilities and due to land use and 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.

Strategies:

- Prepare an Education and Visitor Services Management Plan.
- Develop and implement a Sign Plan.
- Develop gated parking facilities with interpretation/information signs.
- Maintain the existing Wallace Lake trail for foot access.
- Develop a headquarters/visitor center facility.
- Develop a refuge friends/support group.
- 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.

Objective D.1: Staff and New Facilities

Add five 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:

- Expand refuge office and maintenance facilities near the present facilities, off Poole Road, to support biological program objectives and comply with safety standards.
- Increase professional staff positions to include a law enforcement officer, forestry technician, biologist, biology technician, and outdoor recreation planner.
- Increase refuge funding to support additional operation and maintenance activities, including the purchase of computer equipment and software, inventorying and monitoring equipment (geographic information system), and heavy equipment.
- Promote partnerships and seek challenge cost-share grants for construction of recreation facilities.
- Develop secured storage for petroleum and chemical products.
- Develop a radio communication system responsive to law enforcement and other field operations.

Objective D.2: Operations and Maintenance

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

Strategies:

- 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.
- Add additional equipment to support habitat and wildlife management activities.
- Promote partnerships and seek challenge cost-share grants and other funding sources for maintenance of recreation facilities.

Goal E. Cultural 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: (1) each agency should inventory "historic sites" and assess their eligibility for the National Register of Historic Places; (2) consideration should be given to cultural resource impacts during the agency's management activities; (3) protection of cultural resources from looting and vandalism should be provided; and (4) consultation with groups such as Native American tribes and African American communities is needed to address how management activities might impact their archaeological sites.

Objective E.1: Survey/Investigation

By 2005, conduct a refuge-wide archaeological survey.

Strategies:

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

Objective E.2: Archaeological Resources

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

Strategy:

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

Objective E.3: Cooperative Management

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



USFWS Photo

Strategies:

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

Objective E.4: Visitor Awareness

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

Strategy:

- 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.

Objective F.1: Land Acquisition

Seek to acquire and/or protect additional 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 permanently protected block of bottomland hardwood forest can be achieved through a combination of fee title and conservation easements/cooperative agreements within identified focus areas.

The protection of these lands is subject to how the lands contribute to the biological needs of the refuge and meet funding priorities nationwide. Land acquisition within the approved acquisition boundary 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. Expanding refuge ownership of lands within the approved acquisition boundary, coupled with intensive partnering with both public and private entities to protect privately owned lands in the identified priority areas, will assist in overall efforts to establish Source Population Objectives of migratory songbirds and black bear, as well as provide additional wildlife-dependent recreation and environmental education benefits.

Strategies:

- Achieve protection and conservation through acquisition of lands within the current refuge acquisition boundary and through

conservation partnerships with landowners on lands within the identified priority areas.

- Ensure that lands are purchased or cooperatively protected based on the greatest habitat value to species life cycle needs and ecosystem representation. Establish acquisition priority based upon habitat values and/or possible threats to existing resources.
- Initiate and continue contact with all landowners within the acquisition boundary in order to determine landowner interest and participation.
- Develop a coordinated approach with partners to appropriately locate areas of greatest conservation concern.
- Seek additional partnerships with conservation organizations and others to complete acquisitions.

Objective F.2: Private Lands Technical Assistance

Provide technical assistance (i.e., information) utilizing 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 bottom-land hardwood forests or riparian habitats. The Service can also provide land protection and conservation assistance in concert with other private, state, or federal agencies. Providing management assistance to private landowners is critical to the Service's accomplishment of landscape habitat initiatives in the Lower Mississippi Valley.

Strategies:

- Coordinate land conservation activities with private, local, state, and federal organizations that participate in conservation incentive programs for local landowners, with special emphasis on identified priority areas.
- Conduct an annual seminar for local land managers (private and public) on habitat management, current research and monitoring, and watershed issues.
- Develop and distribute a newsletter describing conservation programs that are available to private landowners.
- Communicate with adjacent and key landowners and other community organizations and participate in local Chamber of Commerce to promote outreach and cooperation in managing the refuge.
- Develop and employ outreach strategies to enroll private landowners in the most appropriate conservation program.
- Where appropriate, protect the remaining private lands within the refuge acquisition boundary.

Objective F.3: Private Land Enrollment in Conservation Programs

Seek to enroll about 12,000 acres of appropriate habitat in private land conservation programs outside the approved acquisition boundary to establish migration corridors between the Three Rivers/Red River Wildlife Management Areas and Tensas National Wildlife Refuge.

Discussion: The Service is working with the Natural Resources Conservation Service, the Louisiana Department of Wildlife and Fisheries, Black Bear Conservation Committee, and universities 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 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, the Louisiana Department of Wildlife and Fisheries, the Natural Resources Conservation Service, and many others to achieve bear conservation goals in Louisiana.

Strategies:

- Coordinate Louisiana black bear recovery activities with other Fish and Wildlife Service offices, state agencies, Black Bear Conservation Committee, and local landowners.
- In conjunction with state and federal agencies, develop and implement education programs within local communities.
- Identify and prioritize potential private lands for enrollment in private lands conservation programs that are in partnership with the Service.
- Inform landowners of available private lands conservation programs.
- Enroll private lands in incentive programs.