DRAFT COMPREHENSIVE CONSERVATION PLAN
AND ENVIRONMENTAL ASSESSMENT

WHITE RIVER NATIONAL WILDLIFE REFUGE

Desha, Monroe, Arkansas, and Phillips Counties, Arkansas

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SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

I. Background

INTRODUCTION

This Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for White River National Wildlife Refuge (NWR) was prepared to guide management actions and direction for the refuge. Fish and wildlife conservation will receive first priority in refuge management; wildlife-dependent recreation will be allowed and encouraged as long as it is compatible with, and does not detract from, the mission of the refuge or the purposes for which it was established.

A planning team comprised of Fish and Wildlife Service (Service) and state wildlife agency personnel, non-governmental organizations, and others developed a range of alternatives to refuge management that the Service could reasonably undertake to achieve the goals and fulfill the purpose for White River NWR. This Draft CCP/EA describes the proposed plan, as well as other alternatives considered and their effects on the environment. Each alternative consisted of different sets of goals and objectives for management of the refuge.

The Draft CCP/EA will be made available to state and federal government agencies, conservation partners, and the general public for review and comment. Comments from each entity will be considered in the development of the final CCP.

PURPOSE AND NEED FOR THE PLAN

The purpose of the Draft CCP/EA is to develop a proposed action that best achieves the purposes of the refuge, attains the vision and goals developed for the refuge, ensures that the refuge contributes to the National Wildlife Refuge System's mission, and addresses key problems, issues and relevant mandates, consistent with sound principals of fish and wildlife management.

Specifically, the Draft CCP/EA is needed to:

- provide a clear statement of management direction for 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 and education programs, are consistent with the mandates of the National Wildlife Refuge System;
- ensure that refuge management is consistent with the purpose for which the refuge was established;
- ensure that refuge management is consistent with federal, state, and local plans and contributes to the mission of the ecosystem in which it is located; and
- provide a basis for the development of budget requests for operations, maintenance, and capital improvement needs.

U.S. FISH AND WILDLIFE SERVICE

The Service traces its roots to 1871 and the establishment of the Commission of Fisheries involved with research and fish culture. The once-independent commission was renamed the Bureau of Fisheries and placed in the Department of Commerce and Labor in 1903.

The Service also traces its roots to 1886 and the establishment of a Division of Economic Ornithology and Mammalogy in the Department of Agriculture. Research on the relationship of birds and animals to agriculture shifted to delineation of the range of plants and animals so the name was changed to the Division of the Biological Survey in 1896.

The Department of Commerce, Bureau of Fisheries, was combined with the Department of Agriculture, Bureau of Biological Survey, on June 30, 1940, and transferred to the Department of Interior as the Fish and Wildlife Service. The name was changed to the Bureau of Sport Fisheries and Wildlife in 1956 and finally back to the U.S. Fish and Wildlife Service in 1974.

The Service is responsible for conserving, enhancing, and protecting fish and wildlife and their habitats for the continuing benefit of people through federal programs relating to wild birds, endangered species, certain marine mammals, inland sport fisheries, and specific fishery and wildlife research activities (142 DM 1.1).

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

NATIONAL WILDLIFE REFUGE SYSTEM

The mission of the National Wildlife Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997, is:

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

The National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife Refuge System (Refuge System). Actions were initiated in 1997 to comply with 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. Consistent with the Improvlement Act, approved plans will serve as the guidelines for refuge management for the next 15 years. The Improvement Act states that each refuge shall be managed to:

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes 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; and
- 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.

The following are just a few examples of your national network of conservation lands. Pelican Island NWR, the first refuge, was established in 1903 for the protection of colonial nesting birds in Florida such as the snowy egret and the brown pelican. Western refuges were established for American bison (1906), elk (1912), prong-horned antelope (1931), and desert bighorn sheep (1936) after over-hunting, competition with cattle, and natural disasters decimated once abundant herds. The drought conditions of the 1930s Dust Bowl severely depleted breeding populations of ducks and geese. Refuges established during the Great Depression focused on waterfowl production areas (i.e., protection of prairie wetlands in America's heartland). The emphasis on waterfowl continues today but also includes protection of wintering habitat in response to a dramatic loss of bottomland hardwoods. By 1973, the Service began to focus on establishing refuges for endangered species.

National wildlife refuges connect visitors to their natural resource heritage and provide them with an understanding and appreciation of fish and wildlife ecology to help them understand their role in the environment. Wildlife-dependent recreation on refuges also generates economic benefits to local communities. According to the report, *Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation,* approximately 34.8 million people visited national wildlife refuges in Fiscal Year 2006, generating almost $1.7 billion in total economic activity and creating almost 27,000 private sector jobs producing about $542.8 million in employment income (Carver and Caudill 2007). Additionally, recreational spending on refuges generated nearly $185.3 million in tax revenue at the local, county, and state, and federal levels (Carver and Caudill 2007). As the number of visitors grows, significant economic benefits are realized by local communities. In 2006, nearly 71 million people, 16 years and older, fished, hunted, or observed wildlife spending $45.7 billion and generating $122.6 billion (Leonard 2008).

Volunteers continue to be a major contributor to the success of the Refuge System. In 2005, approximately 38,000 refuge volunteers donated more than 1.4 million hours. The value of their service was more than $25 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 and growth must be strategic; and that the Refuge System serves as a model for habitat management with broad participation from others.

The Improvement Act stipulates that comprehensive conservation plans be prepared in consultation with adjoining federal, state, and private landowners and that the Service develop and implement a process to ensure an opportunity for active public involvement in the preparation and revision (every 15 years) of the plans.

All lands of the Refuge System will be managed in accordance with an approved comprehensive conservation plan that will guide management decisions and set forth strategies for achieving refuge unit purposes. The plan will be consistent with sound resource management principles, practices, and legal mandates including Service compatibility standards, and other Service policies, guidelines, and planning documents (602 FW 1.1).

LEGAL POLICY CONTEXT

LEGAL MANDATES, ADMINISTRATIVE AND POLICY GUIDELINES, AND OTHER SPECIAL CONSIDERATIONS

The mission and goals of the Refuge System, congressional legislation, presidential executive orders, and international treaties guide administration of national wildlife refuges. Policies for management options of refuges are defined in 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 are guided by a refuge's establishing authorities, Public Law 104, Stat. 2957 (§108, H.R. 3338), and the Improvement Act (see Appendix C for more information on legal and policy guidance for the operation of national wildlife refuges). Key guidance and direction can be found in:

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

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research and recreation on refuge lands; and provide a framework for cooperation between White River NWR and its partners. Examples of partners include the Arkansas Game and Fish Commission (AGFC), The Nature Conservancy (TNC), Ducks Unlimited, Friends of White River NWR, and private landowners.

Lands within the Refuge System are closed to public use unless specifically and legally opened. No refuge use may be allowed unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge. All programs and uses must be evaluated based on mandates set forth in the 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; and
- Ensure that visitor activities are compatible with refuge purposes.

The Improvement Act further identifies six priority wildlife-dependent recreational uses: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. As priority public uses of the Refuge System, they receive priority consideration over other public uses in planning and management.

BIOLOGICAL INTEGRITY, DIVERSITY, AND ENVIRONMENTAL HEALTH POLICY

The Improvement Act directs the Service to ensure that the biological integrity, diversity, and environmental health of the Refuge System are "…maintained for the benefit of present and future generations of Americans…" The policy is an additional directive for refuge managers to follow while achieving refuge purpose(s) and Refuge System mission. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems. When evaluating the appropriate management direction for refuges, refuge managers will use sound professional judgment to determine their refuges' contributions to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of refuge resources, the refuge's role within an ecosystem, applicable laws, and best available science including consultation with others both inside and outside the Service.

NATIONAL AND INTERNATIONAL CONSERVATION PRIORITIES AND INITIATIVES

Multiple partnerships have been developed among government and private entities to address the environmental problems affecting regions. There is a large amount of conservation and protection information that defines the role of the refuge at the local, national, international, and ecosystem levels. Conservation initiatives include broad-scale planning and cooperation between affected parties to address declining trends of natural, physical, social, and economic environments. The conservation guidance described below, along with issues, problems, and trends, was reviewed and integrated where appropriate into this Draft CCP/EA.

Conservation priorities for national wildlife refuges in the Lower Mississippi Valley focus on threatened and endangered species, trust species, and species of local concern. Goals and objectives in this Draft CCP/EA are stepped down from the following plans:

- North American Waterfowl Management Plan;
- Partners in Flight Bird Conservation Plan;
- North American Bird Conservation Initiative;
- United States Shorebird Conservation Plan;
- Fisheries Vision for the Future; and
- American Woodcock Management Plan.

NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

The North American Waterfowl Management Plan, signed by the United States and Canadian governments in 1986, undertook an intensive effort to protect and restore North America's waterfowl populations and their habitats. With its update in 1994, Mexico became a signatory to the plan. Restoration of wetlands and associated ecosystems is the main premise of the plan in order to restore waterfowl populations to levels observed in the 1970s.

White River NWR provides important foraging and resting (sanctuary) habitats for waterfowl and serves an integral role in a large, cooperative planning and habitat management effort.

PARTNERS IN FLIGHT BIRD CONSERVATION PLAN

The National Fish and Wildlife Foundation led efforts in the 1990s to form the Partners in Flight program that combines resources and knowledge to protect the natural diversity of our continent. Many partners have made the program successful by joining Working Groups to develop Regional Bird Conservation Plans that set conservation priorities and habitat and population objectives.

White River NWR is located within Physiographic Area 5 and can contribute to the plan's actions for restoration projects to benefit migratory landbirds. Habitats found on the refuge and those associated bird focal species that use them are:

- Bottomland hardwood forests – ivory-billed woodpecker, swallow-tailed kite, Swainson's warbler, cerulean warbler, prothonotary warbler, and northern parula;
- Secondary growth – painted bunting and Bell's vireo; and
- Moist cleared land – shorebirds and waterfowl.

NORTH AMERICAN BIRD CONSERVATION INITIATIVE

This initiative is a broad coalition of governmental, non-governmental, and academic organizations interested in coordinating efforts to conserve bird populations and the landscapes upon which they depend. It evolved in 1998 when conservationists recognized the value of coordinating and integrating planning, implementation, and evaluation efforts of the North American Waterfowl Management Plan, Partners in Flight, U.S. Shorebird Conservation Plan, and colonial waterbirds.

UNITED STATES SHOREBIRD CONSERVATION PLAN

The United States Shorebird Conservation Plan is a partnership involving organizations throughout the United States committed to the conservation of shorebirds. Primary objectives of this plan are to:

- develop a scientifically sound monitoring system to provide practical information to researchers and land managers;
- identify principles upon which management plans can integrate shorebird habitat conservation with multiple species strategies; and
- design a strategy for increasing public awareness and information concerning wetlands and shorebirds.

White River NWR is included in the Lower Mississippi/Western Gulf Coast Shorebird Planning Region. Bird species that should be considered a high priority for the refuge include: piping plover, American golden-plover, marbled godwit, ruddy turnstone, red knot, sanderling, buff-breasted sandpiper, American woodcock, and Wilson's phalarope.

FISHERIES VISION FOR THE FUTURE

In 2001, the Service worked with partners to refocus its Fisheries Program and develop a vision. This vision of the Service and its Fisheries Program "*is working with partners to restore and maintain fish and other aquatic resources at self-sustaining levels and to support Federal mitigation programs for the benefit of the American public.*"

To achieve the vision, the Fisheries Program works with its partners to:

- protect the health of aquatic habitats;
- restore fish and other aquatic resources; and
- provide opportunities to enjoy the benefits of healthy aquatic resources.

AMERICAN WOODCOCK MANAGEMENT PLAN

Developed by the Service in 1990, the American Woodcock Management Plan sets management goals to restore woodcock population to levels consistent with the demands of consumptive and non-consumptive users (U.S. Fish and Wildlife Service 1990). Reliable annual population estimates, harvest estimates, and information on recruitment and distribution are essential for comprehensive woodcock management, as well as conserving and managing habitat. No step-down management plans have been written but the plan provides general guidance for habitat population management at the national level.

RELATIONSHIP TO STATE WILDLIFE AGENCY

A provision of the Improvement Act, 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 diversity of fish and wildlife species in the State of Arkansas.

The Arkansas Game and Fish Commission (AGFC) is the state fish and wildlife agency partnering with the Service. The AGFC plays an important role in keeping “The Natural State” true to its name. Over the past 100 years, AGFC has overseen the protection, conservation, and preservation of various species of fish and wildlife in Arkansas. This is done through habitat management, fish stocking, hunting and fishing regulations, and a host of other programs conducive to helping Arkansas’ wildlife flourish. The AGFC also manages over 280,000 acres of state-owned natural areas and wildlife management areas.

The state’s participation and contribution throughout this planning process provides for ongoing opportunities and open dialogue to improve the ecological health and diversity of fish and wildlife. A vital part of the planning process is integrating common mission objectives, where appropriate.

In 2006, AGFC published the Arkansas Wildlife Action Plan (AWAP), which is built upon a strong foundation of game and nongame conservation. The AWAP exceeds any other conservation effort written for the state in scope and direction and provides a venue for the most innovative collaboration conducted in the state thus far. The main focus of the AWAP is to “develop a living planning tool, rather than a static funding document, that could be useful to professional partners, citizen conservationists and land managers” (Anderson 2006). The AWAP describes seven ecoregions, 396 Species of Greatest Conservation Need (SGCN), 43 terrestrial habitats and 18 “ecobasins.” Within each ecoregion, SGCN, habitats, problems facing species, and actions are described. This Draft CCP/EA for White River NWR was developed with the cooperation of AGFC and incorporates many elements of the AWAP.

II. Refuge Overview

INTRODUCTION

National wildlife refuges provide important habitat for native plants and many species of mammals, birds, fish, amphibians, reptiles, and insects. They also play a vital role in conserving endangered and threatened species. Refuges offer a wide variety of wildlife-dependent recreational opportunities, and many have visitor centers, wildlife trails, and environmental education programs.

This chapter provides an overview of White River NWR's history and purpose, special designations, ecosystem context, ecological threats and problems, physical and biological resources, cultural resources, socioeconomic context, and refuge administration and management.

REFUGE HISTORY AND PURPOSE

Extending along both banks of the lower White River, a tributary of the Mississippi River in southeastern Arkansas (Figure 1), White River Migratory Waterfowl Refuge was established by Executive Order 7173 of President Franklin D. Roosevelt on September 5, 1935. The purpose of the refuge was to protect and conserve migratory birds and other wildlife resources in accordance with the following laws:

- "as a refuge and breeding ground for migratory birds and other wildlife...." (Executive Order 7173);

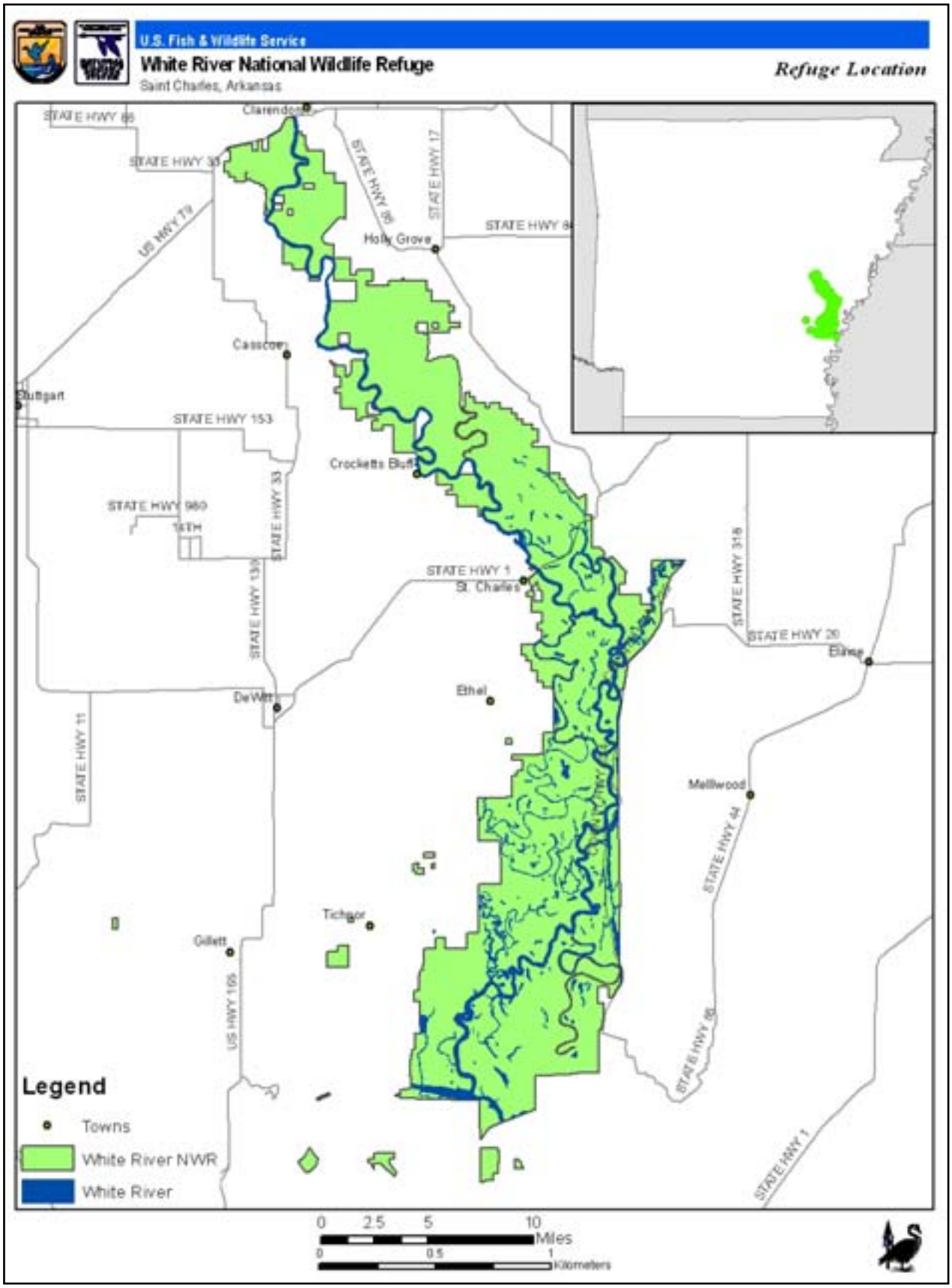
- "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act);

- "shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements...and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon...(Fish and Wildlife Coordination Act);

- "suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..", 16 U.S.C., 460k-1; "... the Secretary...may accept and use ...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors...", 16 U.S.C. , 460k-2 (Refuge Recreation Act [16 U.S.C. , 460k-460k-4], as amended);

Executive Order 7173 authorized the fee-title acquisition of approximately 110,000 acres, which was completed immediately thereafter. Many parcels were purchased with a timber reservation, much of which was selectively cut in the 1940s. Minor adjustments were made over the years with various land exchanges and a few purchases. Prior to the Arkansas-Idaho Land Exchange Act of 1992, White River NWR's total acreage was 112,771 acres. Of this total, approximately 9,000 acres are located north of Arkansas Highway 1, and are therefore considered a part of the Northern Unit for public use regulations (USFWS 2008a).

Figure 1. White River NWR location map



Thus, with the exception of a very small acreage of inholdings obtained later, acquisition of the entire Southern Unit of the White River NWR was completed in the late 1930s. The few legal encumbrances to these lands include the rights-of-way for State Highway 1 and U.S. Highway 79, underground oil and gas pipelines, above ground power transmission lines, the Arkansas Post Canal, the White River Levee and associated Graham-Burke Pump Station, and the White River channel maintenance authority of the Army Corps of Engineers (COE). In conjunction with the latter activities, a special use permit to deposit dredged material on 184 acres of land located near the south end of the refuge has been granted to the COE. The United States owns and the Service controls management of the White River levee on the east side of the refuge, and has a right-of-way permit with the White River Drainage District, which in turn maintains the levee. Finally, the Arkansas Natural Heritage Commission (ANHC) holds a conservation easement on the 30-acre Striplin Woods State Natural Area. This easement restricts development and other land management practices in this old-growth forest area.

Except for the approximately 9,000-acre tract of the original White River NWR, which is located north of Arkansas Highway 1, most of the remaining 40,749 acres of land in the Northern Unit was transferred to the Service from the Potlatch Corporation in January 1993, as a result of the Arkansas-Idaho Land Exchange Act of 1992. The United States retains all rights to these lands, with the following exceptions: (1) undivided one-half interest on 20 acres; (2) lifetime reservation of hunting and fishing rights on 160 acres; and, (3) perpetual hunting and fishing rights on 1,156 acres. Navigation on the White River, and associated maintenance activities, also occurs along the length of the refuge. There are also several inholdings to which limited rights of access have been provided to private landowners. Several former inholdings have been acquired through Timber-for-Land Exchanges (USFWS 2008a).

In 1989, the public lands included in the three state-run wildlife management areas and two national wildlife refuges in this ecosystem, collectively designated as the "Cache/Lower White Rivers Joint Venture Area," were dedicated as "Wetlands of International Importance" under the auspices of the "Convention on Wetlands of International Importance Especially as Waterfowl Habitat," commonly referred to as the Ramsar Convention. At that time, 147,079 acres were included in the designation. (Only lands under management control by conservation agencies qualify for designation.) The Ramsar Convention criteria under which these lands qualified as the eighth U.S. Wetlands of International Importance were: (1) Volume of use by migratory and resident waterfowl, especially mallards; (2) outstanding example of a wetland community characteristic of its biogeographic region; (3) endangered species; (4) species diversity; (5) research value; and, (6) practicality of conservation and management (USFWS 2008a)

Ongoing federal and state acquisition programs resulted in significant acreages of land being added to public ownership between 1989 and 1993. Therefore, Amendment 1 was filed with the Ramsar Convention Office (Gland, Switzerland) in 1993, and 53,999 acres were added to the original designation. Thus, the designated Wetlands of International Importance within this ecosystem currently total 201,178 acres. Periodic amendments will continue to add wetlands to the designation as the state and federal areas are expanded in the future.

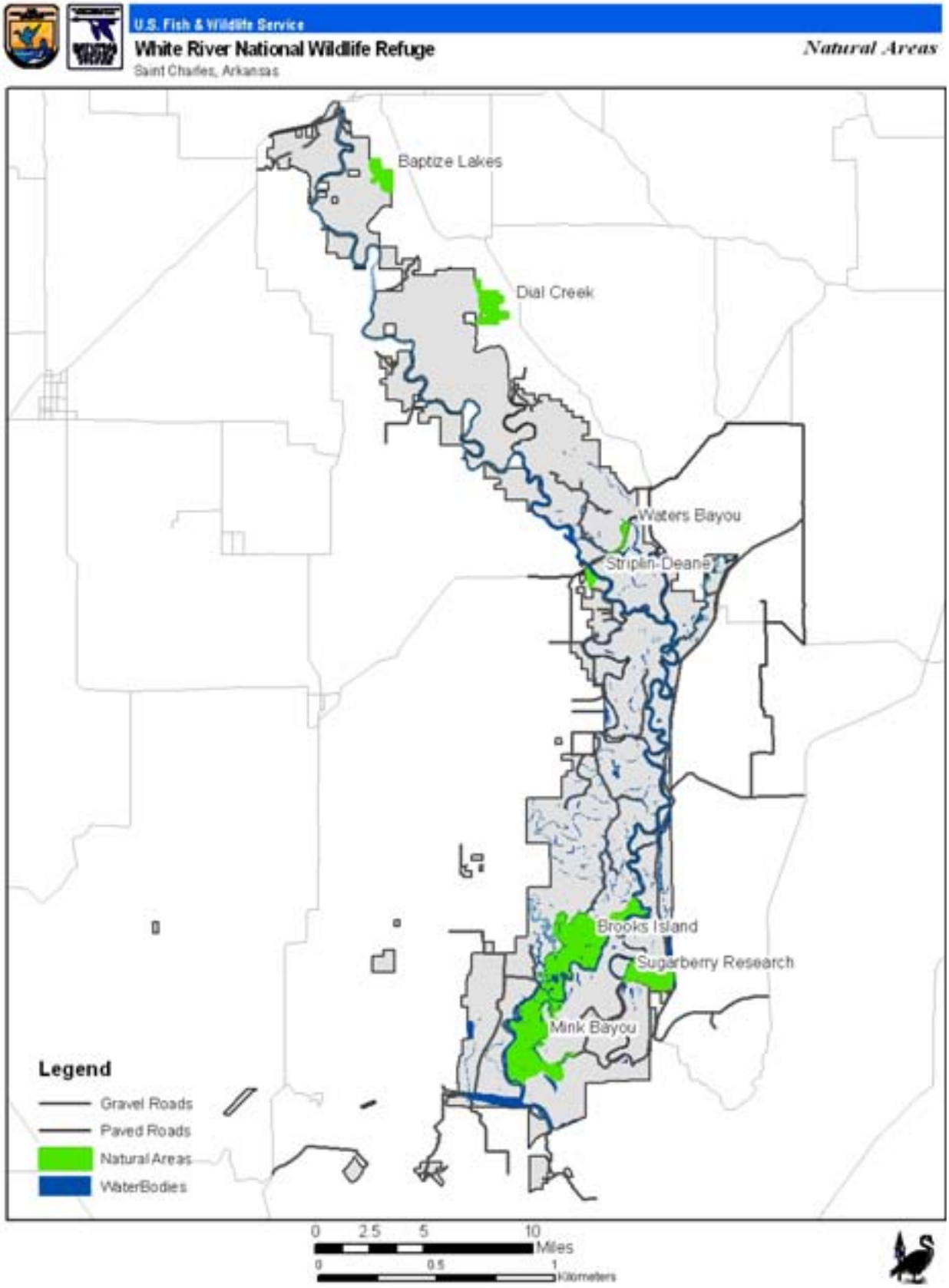
SPECIAL DESIGNATIONS

White River NWR has several natural areas of special significance (USFWS 2008a), as described in the following sections and shown in Figure 2.

SUGARBERRY RESEARCH NATURAL AREA

Sugarberry Research Natural Area (RNA) is located in the southeastern portion of the refuge, between the White River Levee and White River, almost entirely surrounded by Scrubgrass Bayou (Figure 2). The site is approximately 1,000 acres (officially listed as 973 acres) of bottomland hardwood forest and

Figure 2. Location of designated natural areas at White River NWR



cypress swamp. Dominant tree species include sugarberry, overcup oak, sweet pecan, green ash, and Nuttall oak. Topography is ridge/swale and low flats, with high ridges along the bank of Scrubgrass Bayou. The forest is considered to be in an “old growth” condition, where large gaps are created by wind-throw, ice damage or some other natural disturbance common with secondary succession. Present gaps are of various ages and size and represent many points along the successionary continuum. Average diameter at breast height (dbh) is approximately 24 inches or 2 feet, with larger diameter trees (greater than 50 inches dbh) scattered throughout the area. Gaps are prevalent and species and structural diversity are high, creating suitable habitat for a wide variety of wildlife species.

Sugarberry RNA is one of the few remaining old growth bottomland sites in the south. It contains individual sites recognized by the Arkansas Natural Heritage Commission as outstanding examples of overcup oak forest and willow oak "flats." The area has not been logged since acquisition in the mid-1930s, if ever. Because it is nearly surrounded by Scrubgrass Bayou, which was used by steamships as a shortcut between the White River and the Mississippi Rivers in the 1800s, it is possible that ships passing through obtained wood for fuel and other uses from this area.

Sugarberry RNA was designated a natural area by the Service in the 1940s and formally declared an RNA by the Service Director in 1967. This area was later designated as a National Registry of Natural Landmarks site in 1975.

MINK BAYOU NATURAL AREA

Formerly referred to as the Administratively Removed Natural Area, this 3,300-acre natural area is between White River and Parish and East Moon Lakes (Figure 2). It is bounded on the north by Mossy Lake and on the south by Car Body Road and Six Mile Bayou to East Moon Campground. Dominant tree species include overcup oak, bitter pecan, sugarberry, honeylocust, black willow, and Nuttall oak. Topography is mostly low flats, with a few ridge-swales and higher ridges along the bank of White River.

Most of this area is thought to have been cut by timber reservations in the late 1930s. Maps also show the persimmon was sold in 1967 on a diameter limit basis. Otherwise, no logging has occurred in most of this area for over 60 years. The Overcup oak - Bitter pecan forest type provides moderately good waterfowl habitat with the generally single canopy layer of overstory and good stand of wetland grasses on the ground layer.

BROOKS ISLAND NATURAL AREA

White River and Brooks Bayou surround this 4,400-acre tract (Figure 2). Dominant tree species include overcup oak, bitter pecan, Nuttall oak, sugarberry, and ash. Topography is mostly low flats, with a few ridge-swales and higher ridges along the banks of White River and Brooks Bayou.

The refuge selectively thinned this area in the 1970s, with access via a barge converted into a bridge across Brooks Bayou just past Wolf Lake. The bridge-barge has since washed off the pilings, severely limiting vehicle access to the island. The island has been a “No Motorized Vehicles” area since the early 1990s. Roads have subsequently re-vegetated with shrubs and trees.

STRIPLIN-DEANE NATURAL AREA

This 130-acre tract is located just south of St. Charles on the west bank of White River (Figure 2). It includes the 30-acre Striplin Woods that is said to have not been logged. Also included are 13.6 acres northerly of the Striplin Tract up to Arkansas Highway 1. Most of the parcel south of the Striplin Tract between White River and the county road that was purchased from the Deane family in the late

1990s is part of this area. A small portion of the old refuge is included in this area, using a natural slough for the boundary of this natural area.

Relatively easy access to a forest in an “old growth” condition is rare in the southeast. The Striplin Woods portion was dedicated as a state natural area by the Arkansas Natural Heritage Commission in 1979. It exhibits signs of active gap phase dynamics, where tree fall gaps that are created by wind, disease, or other natural causes are occupied by replacement trees on both the upland and bottomland hardwoods. Forest type ranges from wet bottomland forest to dry bottomland forest.

WATERS BAYOU NATURAL AREA

This 100-acre tract is on the north and west side of Arkansas Highway 1 and south and east of Waters Bayou, east of the Swan Lake Road (Figure 2). In time, this area can provide a representative area of only protective management with relatively easy access, right off the highway.

DIAL CREEK NATURAL AREA

This 900-acre area is interlaced by tupelo-cypress lined creeks and brakes with high ridges of cherrybark red oak. It is the area of the refuge east of Walker Cypress Creek southeasterly from the refuge boundary at the northwest corner of the east half of the southwest quarter of Section 34, Township 1 South, Range 2 West, in Monroe County (Figure 2).

The intermingling of a variety of habitats provides diversity. By using protective management only, this area can serve as an example of these habitats without manipulation by forest management that can assist in evaluating the effectiveness of refuge management programs.

BAPTIZE LAKES NATURAL AREA

Located in the northeast corner of the refuge (Figure 2), this 500-acre area is interlaced by tupelo-cypress lined creeks and brakes with high ridges. The intermingling of a variety of habitats furnishes diversity. By using protective management only, this area can serve as an example of these habitats without manipulation by forest management that can assist in evaluating the effectiveness of refuge management programs. In other words, it can serve as an environmental baseline.

OTHER DESIGNATIONS

The American Bird Conservancy designated the refuge a Globally Important Bird Area 2001, and Audubon Arkansas has recognized it as an Arkansas Important Birding Area. White River NWR is part of The Nature Conservancy’s Big Woods Project. The refuge currently has the Arkansas State Champion Bald Cypress Tree, as certified by the Arkansas Forestry Commission, and several others are under consideration – Nuttall oak, sycamore, and tupelo (for national status).

No designated national wilderness areas are set aside on White River NWR. This issue was originally reviewed in 1972 when the White River NWR Wilderness Study was completed. In the wilderness proposal, two areas were believed to qualify as wilderness areas:

- Area A - Scrubgrass Bayou (Sugarberry RNA) 1,000 acres.
- Area B - Parrish Lake, East Moon area 4,000 acres.

It was believed that by combining these two sites, they would meet the required 5,000-acre minimum required to be designated by Congress as a national wilderness area under the Wilderness Act of 1964. At a public meeting to consider wilderness designation held in DeWitt on May 25, 1972, a majority of the 78 attendees was not in favor of the wilderness proposal because of the perceived restrictions limiting motorized access for hunting and fishing opportunities.

ECOSYSTEM CONTEXT

OVERVIEW

The Service is increasing its efforts to adopt collaborative resource partnerships with private landowners and local communities, as well as state and federal governments within ecosystems. The purpose is to reduce the declining trend of fish and wildlife populations and biological diversity, to establish conservation priorities, to clarify goals, and to solve common threats and problems associated with fish and wildlife resources. The synergy of 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.

White River NWR is situated in the northwestern part of the Lower Mississippi River Ecosystem (LMRE) (Figure 3) and is also located in the Mississippi Alluvial Valley (MAV) Bird Conservation Region. The refuge is a member and active participant of the Service's LMRE Team. The LMRE is the primary wintering habitat for mid-continent waterfowl populations. It is also important breeding and migration habitat for songbirds returning from Central and South America, and it provides high-quality habitat for resident wildlife species.

The refuge is a component of many regional and ecosystem conservation planning initiatives, and has the opportunity to contribute to several such plans. Refuge management has utilized an integrated, multi-species approach that focuses on habitat and wildlife communities rather than on single species. For example, bottomland hardwood forest restoration and management can often benefit neotropical migratory forest birds, wintering waterfowl, and resident land birds (USFWS 2008a).

Waterfowl and many other migratory birds benefit from food, protection, and sanctuary provided by managed croplands and moist-soil units. Outdoor recreation such as hunting, fishing, wildlife observation, and wildlife photography are maintained and enhanced by refuge management programs. Water quality is enhanced by better managing hydrology on refuge wetland and cropland units. Since most of the species-of-concern in this ecosystem are closely associated with aquatic environments, efforts have been directed at improving water quality and approximating more historic hydrologic processes that benefit all of these sensitive species.

Figure 3. Service-designated ecosystems in the conterminous U.S. with Lower Mississippi River Ecosystem highlighted

LOWER MISSISSIPPI RIVER ECOSYSTEM PRIORITIES

The goals of the LMRE Plan are to:

1. Conserve, enhance, protect, and monitor migratory bird populations and their habitats in the LMRE.

2. Protect, restore, and manage the wetlands of the LMRE.

3. Protect and/or restore imperiled habitats and viable populations of all endangered, threatened, and candidate species and species of concern in the LMRE.

4. Protect, restore, and manage the fisheries and other aquatic resources historically associated with the wetlands and waters of the LMRE.

5. Restore, manage, and protect national wildlife refuges and national fish hatcheries.

6. Increase public awareness and support for LMRE resources and their management.

7. Enforce natural resource laws.

8. Protect, restore, and enhance water and air quality throughout the LMRE.

REGIONAL CONSERVATION PLANS AND INITIATIVES

THE BIG WOODS OF ARKANSAS

The Nature Conservancy and its partners, including the Service, have protected more than 242,000 acres in the Big Woods of Arkansas, a 550,000-acre corridor of floodplain forest along the Mississippi River. Some of the corridor includes refuge system lands. The Cache River National Wildlife Refuge, just to the north of White River NWR, was established in 1986 when the Conservancy transferred 380 acres to the Service. In 2004, the ivory-billed woodpecker, thought to be extinct, was rediscovered within the corridor. Major restoration and conservation priorities for the Big Woods have been identified. Efforts by Conservancy, the Service, the Arkansas Natural Heritage Commission, the AGFC, and others continue to focus on these ecologically important lands.

ARKANSAS WILDLIFE ACTION PLAN

Each state, including Arkansas, has developed a wildlife action plan to determine comprehensive wildlife conservation strategies for flora and fauna within the state. The AWAP, as noted in Chapter I, was published in 2006. The AWAP identified 18 categories of threats to the wildlife of Arkansas, the condition of the state's wildlife health, and determined associated management actions needed to conserve wildlife and important habitat before they become more rare and costly to protect. Many of these threats are also of concern to the Service, such as hydrological alteration, habitat destruction, contaminants, predation and disease, and resource depletion. The Service and the AGFC work cooperatively on many projects to combat the effects of these threats.

ECOLOGICAL THREATS AND PROBLEMS

National wildlife refuges in the LMV serve as part of the last safety net to support biological diversity – the greatest conservation challenge facing the Service. According to the LMRE Team, the greatest threats to biological diversity within the LMV include:

- the loss of sustainable ecological 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);
- the effects of agricultural and timber harvesting practices;
- the simplification of the remaining wildlife habitats within the ecosystem and gene pools;
- the effects of constructing navigation and water diversion projects; and
- the cumulative habitat effects of land and water resource development activities.

PHYSICAL RESOURCES

CLIMATE

Typically, Arkansas County (location of the St. Charles weather recording station) has hot and humid summers, mild winters, and generally abundant rainfall. Below-freezing periods are brief and sub-zero temperatures rare with snowfall rare as well. Annual precipitation averages around 53 inches per year and in a typical year, the county will have 50-55 thunderstorms. Tornados and/or warnings seem to occur annually, however the Soil Conservation Service of the U.S. Department of Agriculture indicated in the 1961 Soil Survey of Arkansas County that only 35 tornados were observed from 1916 to 1961 (0.78 per year). This number is higher today, no doubt in part to the ability of Doppler radar as well as the developed system of trained storm spotters across the county (USFWS 2008b).

The potential for rapid and lasting climate warming poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of wildlife and fish will also change. Climate warming will be a particular challenge for threatened, endangered, and other "at risk" species (USFWS 2008a).

A changing climate will force change in the stewardship of the Refuge System. Potential challenges posed by a changing climate might include:

- Changing fire regimes;
- Changing patterns of rain and snowfall;
- Changing access to water resources;
- Altered hydrology in rivers and wetlands;
- Increased frequency of extreme weather events;
- Changes in plant community types;
- Changing abundance and distribution of fish, wildlife, and plant species;
- Changes in the timing (phenology) of synchronized, interdependent phenomena, so that they no longer coincide.

Service managers already are seeing evidence of some of these effects in Alaska, where observed warming has been 2-4 times that of global averages and change has been more rapid and visible. Though other Regions of the Service likely will not be confronted with climate change impacts on the same scale or pace as Alaska, climactic changes in the lower 48 states will amplify current

management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Highly specialized or endemic species are likely to be most susceptible to the additional stresses of changing climate.

The Refuge System is considering climate change in its comprehensive conservation plans, which provide a framework for guiding refuge management decisions. The Refuge System is also looking at how projected sea level rise could affect selected coastal refuges and how wildfire could change as the result of a warming climate. This is particularly important since 177 refuges are on the coast.

The Service is currently planning a series of regional forums to help collect information on the potential effects of climate change in coastal areas, mountains, prairies, and other landscapes, and to identify ways we might better prepare for managing our valuable natural resources in the coming decades.

GEOLOGY AND TOPOGRAPHY

Paleozoic bedrock crops out on the western edge of the Mississippi Delta, and dips to the southeast, where it is overlain by more recent alluvial and ioessal strata deposited during alternating inundations and recessions of the Gulf of Mexico. The bedrock below the White River system is from almost 1,000 to over 4,000 feet below sea level. Various overlying strata of gravel and sand support several important and productive aquifers, alternating with confining strata of silts and clays (ASWCC 1988).

The surface strata of the Lower White River basin are all Quaternary deposits of alluvium and loess. Holocene alluvial deposits of the existing major rivers, abandoned meanders, and areas near channels form the current "bottomland" areas. These are the lowest areas in the basin, and are the most likely to be forested and retain other obvious wetland characteristics. Immediately upslope of these most recent deposits are one or more terraces of Pleistocene alluvial deposits. Lands at this and higher elevations have largely been cleared for agricultural production. Older deposits are exposed in only very limited circumstances in the basin. These include an area of dune sand located in Woodruff County between the Cache River and Bayou DeView, and some isolated pockets of exposed silt and sand along Bayou DeView north and east of Jonesboro, Arkansas (USFWS 1994).

The elevation at the north end of the basin at the Missouri state line is approximately 300 feet mean sea level (MSL), compared to 125 feet MSL at the mouth of the White River. This drop in elevation across 185 air miles represents an average slope of only 0.018 percent across the entire basin. Although relatively flat, the topography of the basin can be somewhat complex, with numerous current stream and river channels, old meanders, and oxbow lakes surrounded by one or more terrace levels or bottoms.

The topography is usually one of three basic types: braided-stream terraces which display a characteristic dendritic drainage pattern; meander belts which contain areas of past or present channel migration with numerous parallel, crescent-shaped ridges and swales; and, backswamps which are flat areas that remained peripheral to channel migration and slowly filled with layers of fine sediments.

Thus, in contrast to the apparent "flatness" of the landscape, the subtle complexity resulting from past and ongoing geologic forces has a dramatic and pronounced effect on the processes which drive this ecosystem and its provision of ecosystem functions, and which in turn dictates the complexity of associated biotic communities which evolved here (USFWS 1994).

SOILS

The soil types in the Lower White River basin for the most part are hydric, and the spatial relationships of the various soil types and associations present further evidence of their fluvial (riverine) origin and influence. By and large, the soils of the basin are rich and fertile. The reason for drainage and clearing of most of the original forests was for agricultural production. Most of the soils have a high clay content, which results in their capability to perch and pond water at the surface but also prevents most areas from contributing to significant groundwater recharge through infiltration. These soil characteristics make cultivation of rice possible over a large percentage of the lands in the basin. Where water retention and flooding characteristics of individual soils are not suitable for rice, the dominant crops are soybeans, winter wheat, and milo, with minor acreages of corn and cotton occurring on the highest, most well-drained sites (USFWS 1994).

HYDROLOGY

Pre-settlement Conditions

The White River ecosystem was a forested wetland habitat complex whose composition, structure, and function were largely determined by the frequency, duration, and depth of inundation. The abundant annual rainfall, flat topographic profile, and other influences resulted in flooding which ranged from frequent, deep, and prolonged adjacent to the major drainages and in the lower portion of the system, to shallow and temporary in the topographically higher areas of the bottoms and in isolated, but often extensive depressions throughout the terrace lands (USFWS 1994).

The annual hydrologic cycle reflected seasonal rainfall patterns, with lowest flows occurring in July through October, and flooding along the river bottoms typically beginning in December or January and peaking in May on the lower White River (ASWCC 1988). The system had an abundance of stream channels, sloughs, oxbow lakes, and scrub/shrub swamps which contained water throughout the year in all but the driest years. Extremely dry periods, during which a significant percentage of the smaller stream channels were exposed, were infrequent but must have occurred every few centuries.

The extreme dynamism of the hydrology within the system, over both the short- and long-term, was one of its most important pre-settlement characteristics. There also was and is a significant degree of spatial variation in the hydrology within the ecosystem. Relatively shallow depressions in the bottomlands and terraces are the first areas to be annually influenced by inundation through a process termed "puddling," when they gradually fill with the onset of fall rains in November. With continuing rains, these areas expand and interconnect, affecting larger and larger acreages. These depressions would also have been among the last seasonally inundated wetlands to dry during late spring with the end of the rainy period.

With the continuation of fall rains, the upper reaches of the streams' floodplains were most affected by “headwater flooding,” which is the relatively rapid flooding of drainage areas due to heavy rainfalls during short periods of time. Heavy rains, in conjunction with the natural constraints of small channels and broad, vegetated floodplains, can exceed the short-term capacity of the system to carry away the rainfall. As this process proceeded with additional winter and spring rains, and major drainages like the White and Mississippi Rivers filled to capacity, gradual filling of larger areas of flats and floodplains were inundated by “backwater flooding” caused by water “backing” into higher areas as a result of flows greatly in excess of stream channel capacities and/or impeded drainage in lower portions of the system by excess water (USFWS 1994).

For example, high flows on the Mississippi River greatly affect the hydrology of the lower half of the White River NWR by reducing the ability of the White River to discharge into it. Conversely, high flows of the White River may carry away floodwaters relatively easily if the Mississippi River is low. The same situation exists at the confluence of the Cache and White Rivers at Clarendon, and at other tributary confluences at a smaller scale. Thus, under the pre-settlement conditions that prevailed for thousands of years, there were complex hydrologic interrelationships between the tributaries and primary rivers within the ecosystem, and between the lower White River and the Mississippi and Arkansas Rivers.

Hydrologic Modifications

Pre-settlement hydrologic patterns and relationships and their effects on other functions of the White River ecosystem have been incrementally but significantly altered since Euro-American settlement. It is helpful to view the hydrologic alteration of the White River watershed within the perspective of historic flood control and drainage policies of the MAV as a whole (Baxter and Sunderland 1985). During initial settlement in the late 1800s and early 1900s, there were many uncoordinated, local flood control and drainage projects. Although these early projects may have had a significant cumulative impact on the terrace lands within the ecosystem, they had less effect on natural headwater and backwater flooding of the major drainages (USFWS 1994).

However, after the major Mississippi River flood of 1927, when much of the Arkansas Delta was inundated, a comprehensive federal flood control program was begun. This resulted in the construction of the Mainstem Mississippi River levees, as well as levee projects on major tributaries like the White River. The White River is enclosed by a levee system and/or uplands beginning approximately 8 miles from its mouth at the Mississippi River northward for approximately 50 river miles. These projects constricted the floodplains of the Mississippi and its tributaries such that lower flows now result in higher elevations of flooding than was the case under pre-settlement hydrology.

A related hydrologic alteration was the construction of the Kerr/McClellan Navigation Project on the Arkansas River. To expedite barge traffic between the Arkansas and Mississippi Rivers, a shipping canal was excavated to connect mile I0 on the White River to the Arkansas River. The most obvious effect of these major levee and navigation projects on the Lower White system is that the south end of the White River NWR is now subject to more extensive, prolonged, and deeper inundation than that in which the biotic components of the system evolved.

Conversely, of increasingly obvious importance is the modification of the hydrology of the Mississippi River. Entrainment of the Mississippi into an unnaturally narrow channel by wing dams constructed for the purpose of providing a navigation channel has caused it to flow at lower elevations during moderate- to low-flow periods. Thus, during low-flow conditions it is likely that the lower White River and its tributaries are being unnaturally drained. This is manifesting itself in down-cutting, bank scouring, and an increasing need for White River dredging to maintain navigation. Over the long term, it may cause changes in wetland vegetative communities along the lower White River and tributaries (USFWS 1994).

Another byproduct of the era of major flood control projects was the extensive conversion of bottomland hardwoods to agricultural production, much of it occurring in the Cache River/Lower White River basin from the 1940s through the mid-1970s. Farmers quickly cleared land now protected from flooding by the major levee systems and brought it into agricultural production. The federal Flood Control Acts of 1944 and 1965 contained a policy of bottomland hardwood conversion, and the 1965 Act included as a part of its justification the induced clearing of 4.9-million acres in the MAV (Baxter and Sunderland 1985). Much of this took place in the Cache River/Lower White River basin. With

this federal policy in place, many local drainage and flood control projects, now coordinated to some extent by the COE, continued up the tributaries through the mid-1980s.

Flows on the White River have been controlled to some extent since 1943 by a system of dams situated on the upper White River and two of its tributaries in the Ozark Highlands. Beaver, Table Rock, Bull Shoals, and Norfork Lakes are located on the White River, with Greers Ferry Lake on the Little Red River in north-central Arkansas and Clearwater Lake in southeast Missouri on the upper Black River. One of the primary purposes for construction and operation of this impoundment system is flood control for agricultural areas along the upper and middle White River. This system can provide a significant degree of flow regulation on the White River, being characterized as "appreciable" at Clarendon (confluence of the White and Cache Rivers), although the level of control decreases with distance down the system (USGS 1986). Management of this system by the COE is guided by an operating plan developed in cooperation with several state and federal agencies, and representatives from the agricultural, hydropower, and recreational industries.

The principal flood control objective of the operating plan is to "desynchronize" flow conditions, that is, to store flood water and distribute its release over the year, but in a highly artificial pattern. COE data illustrate that the net effect of this operating objective has been to decrease peak flows during winter and late spring, and to increase average flows during summer, in comparison with pre-project estimates and pre-settlement conditions. For example, the 7-day, 10-year low flow has increased from 4,090 cubic feet per second (cfs) for the period 1928-81 to 6,020 cfs during the later 1958-81 period (USFWS 1994).

In addition to their influence on the timing and quantity of river flows, operation of the dams has also affected other parameters such as downstream water temperatures. The collective result of over a century of flood control activities has been: (1) The drainage and clearing of the vast majority of the terrace lands and driest portions of the forested wetland habitats of the entire system but especially within the Cache River/Bayou DeView basin where clearing to the riverbanks has occurred in many areas; (2) constriction of the floodplain of the lower White River with levees, and the clearing of lands protected by those levees; and (3) the modification of the natural hydrologic patterns (timing, frequency, flow rates, etc.) throughout the Lower White ecosystem.

It is noteworthy that from the biological perspective that these alterations have occurred within a single generation of trees. Approximately 85 percent of the basin has been cleared of its hardwoods, and most of these lands were forested wetlands.

A relatively recent and continuing hydrologic modification is the increasing withdrawal of surface water from essentially all available streams for agricultural irrigation. These withdrawals occur at the farm level, are individually relatively small, and are scattered throughout the basin. There is no available estimate of current withdrawal rates, but they are known to be collectively substantial. The recent average stream flow of the White River at Clarendon has decreased slightly, and this has been speculated to be the result of surface withdrawals for irrigation. Several large-scale inter-basin transfer irrigation projects for the Arkansas Delta have been proposed and aggressively pursued by the ASWCC, Soil Conservation Service (SCS), and COE, with White River being the primary source for all of them (USFWS 1994). One of these projects, the Grand Prairie irrigation project is currently under construction with a water intake pumping station on the White River near DeValls Bluff, Arkansas.

Current Hydrologic Status

Historically, the lowest river flows occurred July through October while the highest flows peaked in April and May. Due to the construction of the large reservoirs mentioned above, upstream from the refuge, all of the historical flood dates have been slightly altered and have moved these peak flows (particularly spring flows) later into the spring (USFWS 2008a).

The lower White River is somewhat unusual in that flooding in the system can be influenced by the Mississippi River, White River, Arkansas River, and even local rainfall patterns. All of these influences can determine flooding depths and duration both independently or collectively and to varying degrees.

According to the flood classification, the refuge and the Lower White River System typically receive only one type of flooding called Slow-Onset Flooding, but within that classification is the flooding caused by "backwater and headwater." The most common phrase used is "backing and stacking." This is a process by which water begins backing up the White River from the Mississippi River, essentially slowing or stopping the flow of water moving downstream. As this happens, water moving downstream meets the backing water causing it to rise, thus the term "backing and stacking."

Essentially this entire process is influenced by the Mississippi and White Rivers, and to a lesser degree, the Arkansas River. Local rainfall patterns provide additional influence by starting the process of puddling. As noted above, puddling begins as the numerous small depressions scattered throughout the bottoms begin filling during winter rains and over time puddles begin interconnecting, gradually increasing the acreage of flooded forest land in the bottoms. As the main stem of the rivers, bayous, and other water courses rise over the stream banks, then the entire river bottom becomes one body of water.

<u>Headwater flooding</u> occurs when large rains upstream of the refuge fill the channel and send large amounts of water downstream. These Rapid-Onset Floods (headwater) can create flash flood situations in the upper segments of the watershed (> 100 river miles above the refuge); however, as this large volume of water reaches the lower White River the high water is slowed as it spreads. Large torrential rains upstream on the White River (Batesville area) may take up to two weeks to reach the refuge due to the distance and the widening floodplain.

<u>Backwater flooding</u> can develop when the Mississippi River reaches full capacity and blocks or slows water exiting the White River. During winter months large rains create headwater flooding particularly in the upper sections of watershed that are generally in conjunction with the timing of the main stem of the White River filling to capacity (USFWS 2008a).

The entire process hinges on the level of the Mississippi River. If the Mississippi River is low then water from the White River exits quickly and without hindrance. However, as the Mississippi River rises, the exiting flow from the White River is slowed. This can also be restricted by the Arkansas River; however, to a lesser degree.

These complex processes have occurred over the millennium and are the driving force determining forest composition and associated plant communities across the bottoms. These processes also influence fish species assemblages in the hundreds of lakes, sloughs, and bayous. Also, many species of birds, such as the prothonotary warbler, are dependent on flooding which can influence the success and failure of nesting efforts.

Today some portions of the White River have been modified with construction of bank armoring, but the greatest impact to the hydrology of the Lower White River was the construction of the White River Levee in 1939. This levee, along with hundreds of miles of other levees throughout the MAV, was erected in response to the catastrophic flood of 1927 that inundated a large portion of the Arkansas Delta. As noted above, within 10 years, numerous flood control projects were initiated in an effort to prevent this extensive damage (USFWS 2008a).

Even though the basic processes of puddling and headwater and backwater flooding still operate within the basin today, these hydrologic functions have been profoundly modified both quantitatively and qualitatively. The overall hydrologic effects on the system can be described as occurring at both ends of the spectrum: drier in most areas, wetter in some. The many local efforts directed at drainage associated with agricultural production and transportation (e.g., road ditches) have significantly reduced the area affected by, and amount of water which could be held as a result of puddling. These areas were most easily drained, and now contribute virtually none of their original hydrologic function to the system, immediately discharging excess rainfall as runoff to the watercourses (USFWS 1994).

When the acreage influenced by flood control projects intended to reduce the impacts of headwater flooding are added to the above areas, the vast majority of the ecosystem is now included. This area no longer holds temporary water as it did historically, and now relatively rapidly discharges runoff to the rivers. Thus, these areas, comprising most of the higher elevations of the ecosystem, are drier than they were historically, being inundated much less frequently and for much shorter durations.

However, as a direct result of the increased rate of drainage from most of the basin, the lower elevations and those areas nearest the Cache River, Bayou DeView, and White River now receive all this water more rapidly and in quantities more frequently exceeding the capacity of the system to carry and discharge into the Mississippi River. Moreover, the discharge capacities of the White River into the Mississippi River and Cache River into the White River are often reduced from historic conditions due to the effects of the levee projects mentioned above.

Thus, the areas immediately adjoining the upper and middle Cache River and Bayou DeView, being subject to unregulated flows, can be characterized as being subject to more frequent flooding at greater depth but for shorter durations than in the natural ecosystem. The stochastic dynamics of the natural system have in many ways been exaggerated by hydrologic modifications. On the other hand, the lowest portions of the Cache and lower White Rivers now seem to be subjected to more frequent flooding, at greater depth, and for longer durations than was the historic tendency, with this effect being greatest in the southern half of the White River NWR. In this case, the hydrologic dynamics of the natural ecosystem may have been stabilized around a more hydric state relative to pre-settlement conditions (USFWS 1994).

Hydrologic Connectivity

All refuge lakes and bayous are intricately connected with the White River as well as adjacent streams and ephemeral channels, a concept referred to as connectivity. Distance to the river does not determine connection either temporally or spatially. Rather, these connections are determined not only by the river and adjacent bayous but more importantly the geomorphology that has created the ridge and swell topography. It is the minor changes that provide flood water courses that only become visible as the river and other streams begin flowing through the bottoms. An example is a small portion of the refuge where six lakes and four bayous are affected by flood waters. Each of these is dependent on flows from the White River, yet each system is somewhat independent with its

own unique geomorphology and in some cases fish assemblages. This example of complex connections can be extended to all of the refuge's 356 lakes.

When the White River gauge at St. Charles reaches 21 feet, the river enters Little Moon Entry Point where the channel makes an arch to the east. Here it meets Little Moon Lake and continues through the lake where it intersects with Waters Bayou that parallels Highway 1 and ultimately joins Indian Bay. This example is an easy-to-follow and discernable chute flow feed system with the exception of where it hits the Brown Shanty Road located at the east end of Little Moon Lake. This road fill was installed sometime during the late 1940s by refuge staff to allow traffic access to the North Unit. Water crosses the road when the St. Charles gauge reaches 22.8 feet. Throughout the year the "connection channel" remains dry.

In close proximity and north of Little Moon is Swan Lake which is fed by yet another channel from Lambert Bayou. This bayou has its entry point further upstream where it connects with the river. Throughout a majority of the year, Lambert Bayou becomes a stagnant pool until it reconnects with the river. The connectivity of Lambert Bayou is slightly higher than Little Moon.

To the east of Swan is Hog Thief Lake, which is connected to an unidentified channel or basically an offshoot of Indian Bayou located further to the east. Hog Thief Lake will remain connected when White River is 18.5 to 19 feet while Goose Lake located to the west will not connect until White River is over 20 feet. All excess water from Hog Thief runs south into Indian Bay via a channel that intersects Waters Bayou. Indian Bayou receives all of its flow from Maddox Bay located to the north.

Buck Lake is slightly higher in elevation and does not receive any excess water from these systems until the river is above 23 feet and co-receives water with Crows Foot Lake which is "refilled" via an ephemeral channel running from Waters Bayou slightly east of Little Moon Lake.

From the standpoint of the fisheries and biotic resources, each lake has distinctive species assemblages which are directly tied to the connectivity and this connectivity also varies slightly between direct and indirect connections with the river, ephemeral channels, and bayous resulting from flooding.

Flood control lakes on the Upper White River and tributaries affect the hydro-period on the refuge. Bull Shoals on the White, Norfork on the Norfork River, Clearwater Reservoir on a tributary to the Black River, and Greer's Ferry on the Little Red River all influence the stage and flow of the White River at Clarendon and St. Charles. Analysis of gauge readings indicate that floods are less flashy, with clipped peaks, but with longer durations. About every 7 or 8 years, extensive spring rains in the watershed results in the flood control reservoirs being very high through summer. During these events the COE releases water at levels that limits summer flooding to row crops downstream from the dams. However, the volume of water keeps river levels from falling well down in the banks in June, July, and August. Subsequently, forested areas remain flooded due to direct or indirect connection to the river level. Some areas are directly connected in that ephemeral channels will still have river water standing that connects to low forests, keeping these areas flooded or saturated in the root zone. Other areas are indirectly connected in that with higher river levels, groundwater levels remain high and connected to surface water in low forests. With soil saturation in the root zone throughout summer, tree roots and other organisms drown, resulting in loss of root viability. These damaged trees easily succumb to droughts in subsequent years.

Groundwater Hydrology

Although often not directly considered in relation to fish and wildlife resources, groundwater conditions in the basin are crucial to the success of ecosystem conservation. The surrounding agricultural community, which depends on groundwater, is an important partner in achieving this. Because of shrinking profit margins, farmers increasingly consider irrigation as necessary for crop production. If available and accessible, surface water is the farmers' choice due to its lower relative cost. However, many farmers do not have access to surface water and therefore have become increasingly reliant on groundwater for irrigation.

The two principal aquifers used for irrigation in the basin are the Quaternary alluvial aquifer, used primarily in the Cache River/Bayou DeView region, and the area west of the lower White River, and the Sparta Sand aquifer available primarily in the eastern lower White River area. These aquifers have in the past yielded relatively good quality and quantities of groundwater. However, the extensive development of wells and pumping conducted at levels significantly exceeding recharge rates during the last 50 years has had significant effects on water tables over extensive areas. Average water table declines in the Alluvial aquifer in the east half of the Cache River-Bayou DeView basin vary from 20-50 feet, while average declines in the Alluvial and Sparta Sand aquifers west of the lower White River are from 20-80 feet and 80-200 feet, respectively (Bryant et al. 1985). The dropping water table is increasing pumping costs for farmers, and current rates of withdrawal have been recognized as being both unsustainable and insufficient to meet future irrigation requirements (ASWCC 1988).

Further, excessive withdrawals have also caused groundwater quality problems in northeast Monroe County and southern Woodruff County by allowing intrusion of saline water into the alluvial aquifer from deeper strata, rendering the contaminated water unusable for irrigation (Bryant et al. 1985). While these groundwater problems do not have a significant direct impact on wildlife and wetland resources in the basin, they do result in greater pressure being placed on surface water for irrigation, which of course, does have a significant effect on wetland-dependent wildlife resources.

Connections between the surface and groundwater resources are not extensive in the Delta or Cache/Lower White Rivers basin. The preponderance of tight clay soils prevents any significant widespread recharge of the aquifers from surface waters. The southeastward-sloping geological strata of the Delta result in most of the recharge to the aquifer underlying the basin coming from the north and west, where the aquifers' bearing strata intersect the surface. However, an important exception is that the areas in the immediate vicinity of the Cache River and east of the lower White River are rated by the U.S. Geological Survey (USGS) to have moderate recharge potential for the alluvial aquifer (Bryant et al. 1985), although a study at Black Swamp WMA indicates that there is sufficient head in the groundwater for a portion of the Cache River to be a discharge area much of the year (Kleiss 1993).

The conditions of the groundwater in the basin and elsewhere in the Arkansas Delta have resulted in multiple proposals for significant withdrawals of water from the White River to be conveyed via both constructed and stream channels throughout the Delta. One of these projects, the Grand Prairie is currently under construction and planning continues for up to three additional irrigation projects that would withdraw water from the White River. These activities will further increase the complexity of hydrologic alteration and management of the ecosystem. Thus, although the technical aspects of the groundwater/surface water relationships have not been thoroughly evaluated, the indirect importance of the groundwater resources to the surface hydrology and biotic resources of the system is evident and manifested through their direct relationship to agricultural irrigation requirements (USFWS 1994).

WATER QUALITY

Historical data on water quality parameters for the system are largely absent. Water quality in pre-settlement times, as in most areas, would be expected to have been good. Water throughout this extensive wetland system, with little erosion except for bank erosion along rivers, would have been anticipated to be relatively clear. In fact, some current long-time residents at the Cache River describe it as being clear as recently as 50 years ago. However, it is apparent that the byproducts of land clearing and subsequent agricultural production, which expose soils to erosion from runoff during storm events, on most of the basin's surface area are now driving water quality parameters. A 1984 study by the USGS cited potential pollution of groundwater and accumulation of pesticides in bottom sediments as a major concern, although it indicated that potential effects were yet to be quantified in eastern Arkansas (USGS 1984). Another 1985 USGS study further characterized the lower White River as degraded by nutrients, pesticides, and silt resulting from agricultural activities (USGS 1986).

Since about 1975, water quality monitoring programs of agencies such as the U.S. Environmental Protection Agency (EPA), USGS, and the Arkansas Department of Pollution Control and Ecology have resulted in a relative abundance of data (approximately 13 monitoring stations) for the Cache/Lower White Rivers ecosystem. A USGS trends analysis (Petersen 1990) provides some summary information on some aspects of water quality trends in the basin up to 1990 in relation to other areas in eastern Arkansas.

The main channel of the White River exhibited relatively low concentrations of major dissolved constituents, nutrients, and bacteria. Middle and lower White River water quality apparently benefits to some extent from its relatively high quality as it leaves the Ozarks, essentially as a point source entering the Delta, and by virtue of the related dilution factor of “Delta water” by “Ozark water.” Most of the water quality problems of the system are associated directly or indirectly with erosion of sediments from agricultural lands into the streams. Many chemical contaminants are bound to and carried by sediment particles.

There are several possible sources for contaminants on the refuge:

- Commercial barge traffic – This occurs on both the Arkansas River (canal) and White River. The 445-mile long McCellan-Kerr Arkansas River Navigation System uses a portion of the White River as its route to access the Mississippi River. At this time the two locks (#1 and # 2) which are located on the refuge currently average 15 tows per day throughout the year while the White River (above the confluence of the canal), which is currently serviced by one tow company, averages two trips per week from December through April. Commercial traffic on the White River is totally dependent on river levels at St. Charles remaining at or above 12 feet on the river gauge.

  At this time White River barge traffic are exclusively grain shipments, with the only potential for contaminants being fuel/lubricant spills. The Arkansas River shipments consist of gasoline, oil, asphalt, rock, and a wide range of material, all of which could potentially contaminate the refuge.

- Union Pacific Rail Road – Contamination would occur through normal spillage and catastrophic failure of rails and bridges dumping excessive quantities chemicals into White River, Old River Lake, Passmore Bayou, and Roc Roe Bayou.

  U.S. Highway 79 – Normal spillage and possibility of truck hauling fuel or other hazardous chemicals wrecking and/or dropping fuel.

- Ark Highway 1 – Although not designated as a route for oversize and hazardous material shipments, Highway 1 is chosen as a truck route because of the road quality and low traffic volume. Arkansas DOT is in charge of monitoring HAZMAT loads moving on this route.

- Clear Lake – The Lake was at the end of a ditch running from Clarendon when a plant in town chrome plated grocery carts. As a result the site has excessive Chromium on the bottom of the lake. The lake located on the northeast side of the refuge is not in possession of the refuge but was set up as mitigation by the Arkansas Department of Transportation for construction of the Highway 79 Bridge.

- Gas Pipe lines – Two interstate gas pipe lines currently cross the refuge, resulting in the possibility of a leak that could contaminate the refuge.

Other sources of contaminants are from agricultural operations on each side of the refuge. The east side is predominantly corn, rice, soybeans, wheat, and cotton; while the west side is predominantly rice, soybeans, and wheat. In addition, there can be minor spills in conjunction with forest management operations such as occurs around skidders, etc.

A recent study (Smith et al. 2007) addressing pesticide body residue in amphipods, genus *Hyalella* found the lowest concentrations of selected agricultural chemicals on refuge lakes compared to other lakes in the Mississippi Delta. Organisms in Swan Lake, Lower White Lake and Columbus Lake had the lowest concentrations of selected chemicals when compared to other sites in the Delta.

Other water quality issues are abandoned water wells and an irrigation well at Kansas Lake, which is scheduled for capping and closure according to Arkansas Department of Environmental Quality procedures.

AIR QUALITY

The National Ambient Air Quality Standards (NAAQS) exist for six contaminants, referred to as criteria pollutants, and apply to the ambient air. Ambient air is the air that the general public is exposed to every day (USEPA 2002). These criteria pollutants include carbon monoxide, ozone, particulate matter, nitrogen oxides, sulfur dioxide, and lead.

Areas where the ambient air quality does not meet the NAAQS are said to be non-attainment areas. Areas where the ambient air currently meets the national standards are said to be in attainment. The four Arkansas counties in which the refuge is found are all in attainment for all six criteria pollutants (USEPA 2009).

BIOLOGICAL RESOURCES

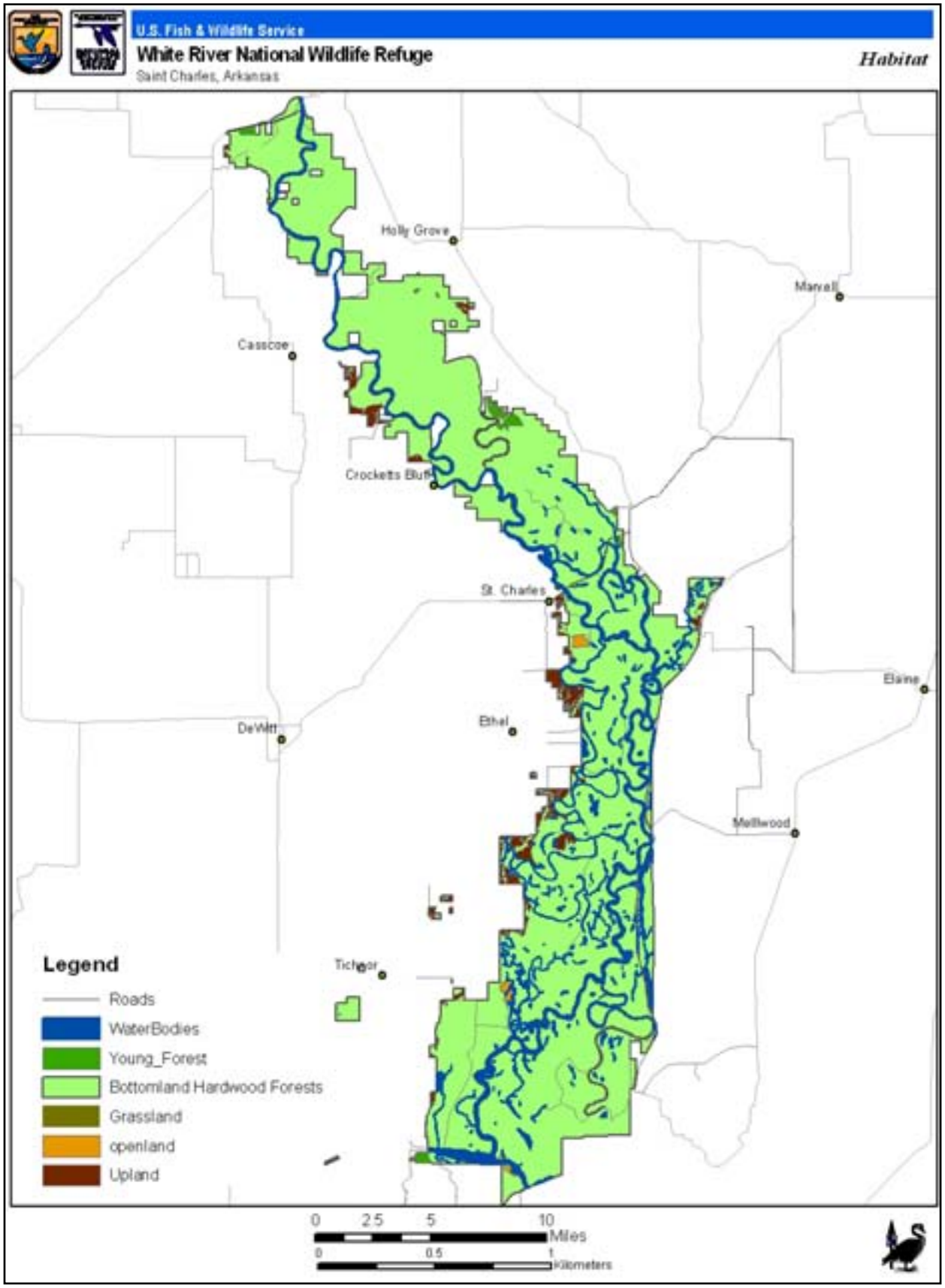
HABITAT

The refuge contains a variety of habitats, which is summarized below (Figure 4).

Farmland

Farmland at White River NWR occurs on the Farm Unit. Crops cultivated at this unit are mostly rice, soybeans, milo, and/or millet. These crops primarily benefit waterfowl and to a smaller extent resident wildlife such as deer and turkey. This open habitat also provides habitat for numerous

Figure 4. Habitat types on White River NWR



grassland species which breed on the site including dickcissel, northern bobwhite, and grasshopper sparrow, while wintering grassland birds include LeConte's sparrow, Lincoln's sparrow, and clay-colored sparrow.

In 1979 the refuge had over 600 acres in row crop production and by 1980 the acreage was still higher with 762 acres under some type of crop production. However, by 1988 cooperative farming had dropped to 300 acres.

The Farm Unit contains 300 acres of open agriculture fields and is the largest block of open habitat on the refuge with initial clearing taking place in the late 1930s and final clearing taking place as late as 1960s. The clearing in the 1960s was to create fescue/Bermuda grass pastures for the benefit of migratory Canada geese. By the early 1990s, numbers of Canada geese were only a fraction of what had once utilized the refuge. Consequently, the refuge did not need as many acres of open agricultural land to meet Canada geese habitat objectives and a large portion of the fields were restored to grasslands and forest habitat. The remaining 300 acres of agricultural land at the Farm Unit are managed primarily to provide crop foraging habitat for wintering ducks.

Forested Habitat

In general, the lower White River is a very large, complex area containing a number of forest communities. The site includes not only the broad, extensive floodplain of the river, but also a system of bluffs, ravines, and slopes along the western edge of the floodplain where the highly dissected topography of the Grand Prairie terrace is situated. The White River floodplain contains all of the geomorphic landforms associated with a large brownwater river including natural levees, sloughs, backswamps, ridge and swale topography, oxbow lakes, meander scars, and point bars. The floodplain along the lower White River averages about 4.5 miles in width (USFWS 1994).

Most of the area is comprised of second and third growth, selectively logged bottomland hardwood and swamp forest, although patches of older timber are scattered, particularly cypress stands in deepwater swamps adjacent to oxbow lakes and meander scars. Seasonally flooded bottomland hardwoods occupy the natural levees and terraces in the floodplain. Common canopy trees include Nuttall oak, willow oak, overcup oak, green ash, sugarberry, sweet pecan, cottonwood, American elm, and sweetgum. Possumhaw is the predominant shrub. Various grasses, sedges, and forbs comprise a nearly 100 percent groundcover in some areas.

The most common community in the lower flats is the overcup oak/bitter pecan association, with less common canopy trees being sugarberry, green ash, and honey locust. Groundcover is usually sparse due to a generally closed canopy and prolonged flooding. In deeper sloughs and around the margins of oxbow lakes and other watercourses, a bald cypress/tupelo gum forest is the characteristic community. Common shrubs here include button bush, water elm, and swamp privet.

The only extensive area of upland forest is the eroded margin of the Grand Prairie terrace along the western margin of the floodplain. It has been downcut by numerous streams and creeks draining into the White River. Natural vegetation of these dissected uplands is predominately upland oak-hickory forest, with common canopy trees being white oak, southern red oak, mockernut hickory, shagbark hickory, blackgum, willow oak, and sweetgum.

Approximately 150,000 acres at White River NWR are forested, dominated by bottomland hardwood stands. Thee major forest types and their relative size as identified in the 2007 update of the Forest Habitat Management Plan are shown in Table 1.

Table 1. Relative size of White River NWR forest types

Forest types	Approx. acreage	% of refuge
Shrub-scrub	1,500	1.0
Cypress	6,000	4.0
Cypress-tupelo	4,500	3.0
Tupelo	750	0.5
Willow	750	0.5
Cottonwood	1,500	1.0
Sugarberry-Pecan	5,700	3.8
Overcup oak-Bitter pecan	45,000	30.0
Oak-Sugarberry	45,000	30.0
Oak-Gum	37,500	25.0
White oak-Hickory	1,500	1.0
Pine	300	0.2
Totals	**150,000**	**100.0**

Source: USFWS 2007a

The Forest Resources Conservation Working Group (FRCWG) of the LMVJV classified the refuge's forests more broadly:

Type	Percentage
Swamp forest	8.5
Wet bottomland forest	30.5
Moist bottomland forest	55.0
Dry bottomland forest	1.2
Levee forest	4.8

Refuge forests have also been classified as being Early Successional (less than 30 years old), Single Canopy (greater than 30 years old), or Multiple Canopy (greater than 30 years old) to relate the forest structure for wildlife habitat. About 800 acres are in Early Successional as old fields, about 1,000 acres as former clearcuts, about 750 acres as willow bars, and about 1,500 acres in scrub/shrub, for a total of about 4,000 acres of Early Successional forest on the refuge. Most of the refuge forest has or is growing into the Single Canopy condition, an estimated 126,000 acres. About 20,000 acres are thought to be in the Multiple Canopy condition, mostly in the oak-sugarberry forest type.

Uncommon Habitats

Several small, but important habitat types occur or should occur on the refuge where site conditions are appropriate: cane, upland oak savannah, and prairie. Cane occurs in disturbed areas under tree canopy along the higher natural levees along many waterways. It is used by Swainson's warblers and other wildlife. Upland oak savannahs occur in the transition forest from the open prairie to the floodplain along

the escarpment on the west side of the refuge. Tall-grass prairies are virtually eliminated from the surrounding landscape. However, existing man-made features may provide opportunities for restoration of this habitat type. The grassland habitats are restricted to several isolated areas.

WILDLIFE

Threatened and Endangered Species

A key objective of White River NWR is to provide habitat and protection for threatened and endangered species. At this time there are four federally listed endangered animal species which may be associated with the refuge by the Service, they include the ivory-billed woodpecker, interior least tern, pink mucket mussel, and fat pocketbook mussel. Additionally, the wood stork (though not federally listed in Arkansas, but a listed species elsewhere in the Southeast) uses the refuge for several months each fall (August-September). The formerly threatened bald eagle was de-listed in 2007.

Ivory-billed Woodpecker
In February 2004, Cornell Lab of Ornithology biologists became aware of a credible sighting of the ivory-billed woodpecker (IBWO) on a portion of Bayou DeView, which is located on Cache River NWR north of White River NWR. Subsequently, Cornell biologists and their partners documented the presence of at least one IBWO in that area. Sixteen sightings of the IBWO were reported deep within the cypress-tupelo swamp of the Bayou DeView in 2006.

Rediscovery of the IBWO in 2004 on the Cache River National Wildlife Refuge was announced in 2005. The larger area of the Big Woods consists of several refuges and state wildlife management areas (WMA's) that are considered to be potential habitat for this species. Researchers from Cornell, with assistance from personnel from TNC, AGFC, Audubon Arkansas, and the Service, along with volunteers, have been searching the Big Woods of Arkansas, including White River NWR, for the last several years. There have been many reported sightings, interesting audio, and other supporting data, but no additional video or still pictures have been recorded. The refuge has been supporting the search team and conducting IBWO habitat inventory and assessment of the forest on the refuge to determine potential habitat.

Since the re-discovery, there has been an ongoing partnership between AGFC, Arkansas Forestry Commission (AFC), and non-governmental organizations, including TNC and Cornell Lab of Ornithology, to continue to search for the ivory-billed woodpecker on the public lands, and where possible on private lands, in the Big Woods of Arkansas. Although there is no conclusive documentation of IBWO on White River NWR, it may be possible that one or more IBWO's are present.

Interior Least Tern
The interior least tern is sighted occasionally on sand bars within the Lower White River Basin (one to two sightings per year). At this time no nesting activity has been documented which is no doubt due to the lack of suitable sand bars along the river during nesting season.

Mussel species
Two endangered mussel species – the pink mucket and fat pocketbook – occur within the main stem of the White River within White River NWR. Because of their life history requirements, it is doubtful they occur within the refuge itself, although large numbers of mussels are present within the lakes, sloughs, chutes, and bayous of the refuge.

Two major threats to mussel species include sedimentation and chemical runoff from agriculture. Sedimentation is created by a number of sources including agricultural runoff, headcutting in fields and drainage tributaries, stream bank erosion, and stream channel instability and degradation. A wide variety of chemicals are used in modern agriculture including pesticides, herbicides, defoliants, and fertilizers. Some of these chemicals can be detrimental to fish and wildlife if they accumulate in large enough quantities in streams and other water bodies. Malacologists (biologists who specialize in mussels and other mollusks) generally agree that contaminants are partially responsible for the decline of freshwater mussels.

There have been a number of mussel surveys conducted on White River, with only minor surveys being conducted on White River NWR lakes and streams. These preliminary mussel surveys on the refuge did not yield any threatened and endangered mussel species, although several species were found which are listed as species of concern.

Bald Eagle
The bald eagle has been closely monitored since the 1980s with the discovery of the first eagle nest in Arkansas. Since that time eagle nests have increased on the refuge up to a total of six nests. The number of eagles observed during the midwinter count has steadily decreased however (Figure 5). This is believed to be a result of the lower waterfowl numbers on the refuge and on the surrounding private lands.

Although recently de-listed, bald eagles are still protected by the Bald and Golden Eagle Protection Act and all efforts will be made to provide continued protection for the bird. Continued protection of bald eagles year-round and future monitoring of nests will continue in keeping with a cooperative agreement with AGFC personnel, who routinely monitor refuge nests each year. Nest monitoring to determine success of the nest will also be important.

Species of Concern
There are also 26 known species of concern and 2 Special Element – Natural Communites on the refuge, according to Arkansas Department of Natural Heritage Commission databases. Table 2 lists species identified in the database and provides the status and rank.

Figure 5. Mid-winter bald eagle survey results, 1986-2007

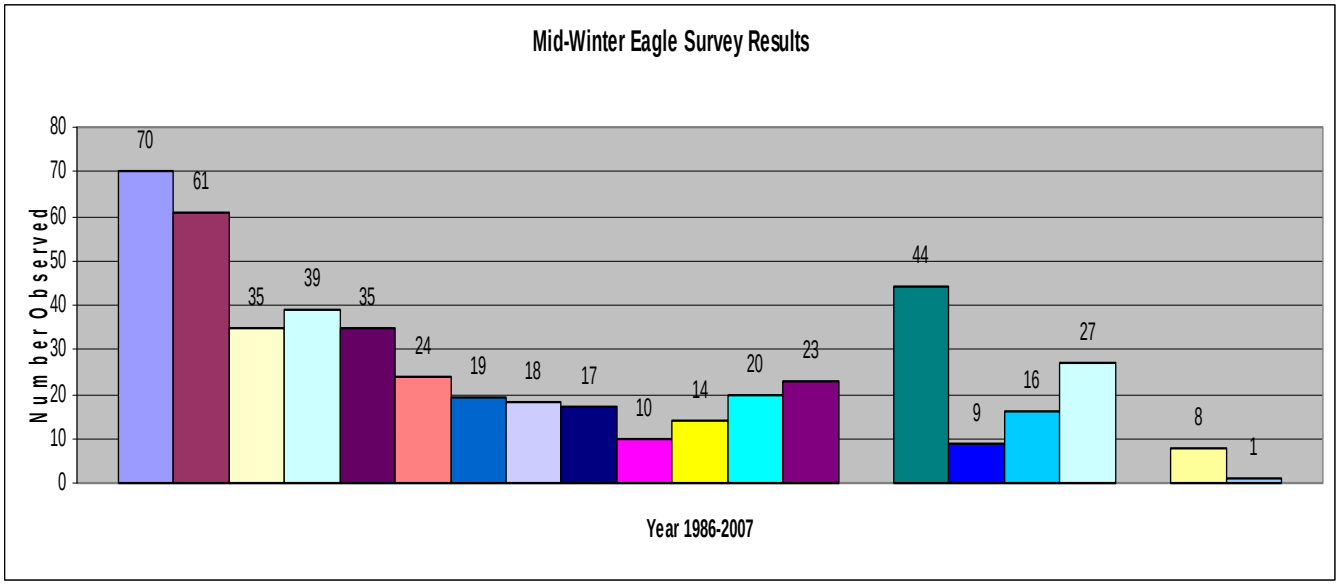


Table 2. Listing of species/communities of concern

3/15/2011	Arkansas Natural Heritage Commission				
Department of Arkansas Heritage Elements of Special Concern White River National Wildlife Refuge					
Scientific Name	Common Name	Federal	State	Global	State
		Status	Status	Rank	Rank
Animals-Invertebrates					
Cicindela cursitans	ant-like tiger beetle	-	INV	G4	S2S3
Cyprogenia aberti	western fanshell	-	INV	G2G3Q	S2
Lampsilis abrupta	pink mucket	LE	INV	G2	S2
Ligumia recta	black sandshell	-	INV	G5	S2
Obovaria jacksoniana	southern hickorynut	-	INV	G2	S2
Obovaria olivaria	hickorynut	-	INV	G4	S3
Quadrula apiculata	southern mapleleaf	-	INV	G5	S2
Quadrula cylindrica cylindrica	rabbitsfoot	C	INV	G3G4T3	S2
Quadrula metanevra	monkeyface	-	INV	G4	S3S4
Toxolasma lividus	purple lilliput	-	INV	G3	S2
Animals-Vertebrates					
Atractosteus spatula	alligator gar	-	INV	G3G4	S2?
Crystallaria asprella	crystal darter	-	INV	G3	S2?
Cycleptus elongatus	blue sucker	-	INV	G3G4	S2
Elanoides forficatus forficatus	swallow-tailed Kite	-	INV	G5TNR	SNR
Erimyzon sucetta	lake chubsucker	-	INV	G5	S2?
Etheostoma fusiforme	swamp darter	-	INV	G5	S2?
Haliaeetus leucocephalus	bald eagle	-	INV	G5	S2B,S4N
Hiodon alosoides	goldeye	-	INV	G5	S2?
Lampetra appendix	American brook lamprey	-	INV	G4	S2?
Limnothlypis swainsonii	Swainson's Warbler	-	INV	G4	S3B
Moxostoma pisolabrum	pealip redhorse	-	INV	G5	S2?
Mugil cephalus	striped mullet	-	INV	G5	S1?

3/15/2011	Arkansas Natural Heritage Commission				
Department of Arkansas Heritage Elements of Special Concern White River National Wildlife Refuge					
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**Global Rank**	**State Rank**
Notropis maculatus	taillight shiner	-	INV	G5	S3
Notropis sabinae	sabine shiner	-	INV	G4	S2?
Ophisaurus attenuatus attenuatus	western slender glass lizard	-	INV	G5T5	S3
Polyodon spathula	paddlefish	-	INV	G4	S2?
Special Elements-Natural Communities					
Mississippi River Low Floodplain	-	-	INV	GNR	SNR
(Bottomland) Forest					
Willow oak forest			INV	GNR	S2

Key to Status and Ranks

STATUS CODES

FEDERAL STATUS CODES

C = Candidate species. The Service has enough scientific information to warrant proposing this species for listing as endangered or threatened under the Endangered Species Act.

LE = Listed Endangered. The Service has listed this species as endangered under the Endangered Species Act.

STATE STATUS CODES

INV = Inventory Element. The Arkansas Natural Heritage Commission is currently conducting active inventory work on these elements. Available data suggests these elements are of conservation concern. These elements may include outstanding examples of Natural Communities, colonial bird nesting sites, outstanding scenic and geologic features as well as plants and animals, which, according to current information, may be rare, peripheral, or of an undetermined status in the state. The ANHC is gathering detailed location information on these elements.

DEFINITION OF RANKS

Global Ranks

G1 = Critically imperiled globally. At a very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 = Imperiled globally. At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3 = Vulnerable globally. At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 = Apparently secure globally. Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 = Secure globally. Common, widespread, and abundant.

GH = Of historical occurrence , possibly extinct globally. Missing; known from only historical occurrences, but still some hope of rediscovery.

GU = Unrankable. Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

GX Presumed extinct globally. Not located despite intensive searches and virtually no likelihood of rediscovery.

GNR = Unranked. The global rank not yet assessed.

GNA = Not Applicable. A conservation status rank is not applicable.

T-RANKS= T subranks are given to global ranks when a subspecies, variety, or race is considered at the state level. The subrank is made up of a "T" plus a number or letter (1, 2, 3, 4, 5, H, U, X) with the same ranking rules as a full species.

State Ranks

S1 = Critically imperiled in the state due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors making it vulnerable to extirpation.

S2 = Imperiled in the state due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it vulnerable to extirpation.

S3 = Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 = Apparently secure in the state. Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 = Secure in the state. Common, widespread and abundant.

SH = Of historical occurrence, with some possibility of rediscovery. Its presence may not have been verified in the past 20-40 years. A species may be assigned this rank without the 20- 40-year delay if the only known occurrences were destroyed or if it had been extensively and unsuccessfully sought.

SU = Unrankable. Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SX	=	Presumed extirpated from the state. Not located despite intensive searches and virtually no likelihood of rediscovery.
SNR	=	Unranked. The state rank not yet assessed.
SNA	=	Not Applicable. A conservation status rank is not applicable.

General Ranking Notes Q = A "Q" in the global rank indicates the element's taxonomic classification as a species is a matter of conjecture among scientists. RANGES= Ranges are used to indicate a range of uncertainty about the status of the element. ? = A question mark is used to denote an inexact numeric rank. B = Refers to the breeding population of a species in the state. N = Refers to the non-breeding population of a species in the state.

Birds

*Waterfow*l

The MAV and particularly White River NWR have historically supported one of the largest concentrations of mallards and other wintering waterfowl in the United States. Due to the river's high-quality forested wetlands and significant numbers of wintering waterfowl, White River NWR (along with Cache River NWR and Dagmar WMA) were designated a Wetland of International Importance in 1989.

In early White River NWR Annual Narratives, the importance of the refuge to migratory waterfowl is evident. These records indicate that at selected times, peak numbers of wintering ducks were reported in excess of 150,000 to 250,000 in the period from 1978 to 1992. Counts of 75,000 ducks are now fairly uncommon and in most years the refuge may approach peak numbers of 20,000 ducks per day on resting areas such as Dry Lake, Farm Unit, and the Demonstration Area).

There is a significant response from waterfowl as the river reaches flood stage at St. Charles, as and in all cases overall refuge wintering waterfowl numbers are dependent on river levels and rainfall patterns. Recently, higher ambient air temperatures, coupled with an increase in managed waterfowl habitats immediately north of Arkansas, appear to have slowed and/or stopped migration of birds and this aspect of waterfowl migration may be a glimpse into long-term trends of waterfowl numbers throughout the region as global temperatures continue increasing.

This trend has also occurred to a degree throughout Arkansas in recent years. While this shift has been attributed to both warmer weather and increasing food resources north of the state as well as to lower nest production in the prairie pothole region of the continent, there has also been a slight shift in birds stopping in the northern half of the state.

The overall aim of the refuge is to provide habitat for migratory birds and in particular for waterfowl. In pursuit of this aim, the refuge attempts to provide habitats sufficient to meet the habitat and population goals of the NAWMP as stepped down through the LMVJV.

The MAV is an important ecoregion for migrating and wintering ducks and geese in North America and White River along with Bald Knob and Cache River NWRs provide important foraging and resting habitats within the MAV for these waterfowl as well as serving an integral role in the habitat management efforts of the NAWMP.

Over the past several decades not only have waterfowl numbers changed but also species composition has shifted. Mallards still comprise the majority of all wintering waterfowl species on the refuge, followed by gadwalls, wood ducks, and ring-necked ducks. Spring and fall flights of blue-winged teal appear to have remained rather constant from old reports and casual observations made today, but other changes in waterfowl are dramatic.

Early reports indicated that thousands of lesser scaup, American wigeons, and pintails were observed, but their numbers have declined significantly in recent years.with the exception of wigeon these species are now rare observations. Other noteworthy changes are large numbers of hooded mergansers that were reported during the summer months. In August 1972, 800 hooded mergansers were reported to be using the refuge.

The most significant change has been not only the reduction in the numbers of mallards but of particular interest is how much later mallards remained on the refuge in the early 1970's. As late as March (1972), 28,500 mallards were still on the refuge as were 850 Canada geese and this was down from late February when 225,000 mallards were on site. Today, mallards and all waterfowl are essentially gone by mid-February with the exception of Northern shoveler, which only number in the hundreds. Depending on water levels, shovelers can make up a large portion of late winter waterfowl on the refuge. Yet in the 1970s their numbers rarely reached or exceeded 200 per month.

Wood ducks are the most numerous waterfowl species at White River NWR on a year-round basis; their numbers peak during winter migration. Until the late 1990s, wood duck nest boxes were maintained throughout the refuge, but with the numerous natural cavities available it was determined that nest boxes were having little effect on the population.

Through the 1960s, several hundred acres of land were cleared exclusively for Canada goose management, but by 2000, numbers of Canada geese using the refuge had dropped to near zero, with only a few "local resident" birds present. Numbers of white-fronted geese have remained fairly constant from 2000 to 2005, with small flocks of 50-250 birds using Farm Unit fields or impoundments. In 2007, this trend changed, when white-fronted geese increased to several hundred per day, not only on the Farm Unit but throughout Arkansas County. The change in this species was also noted by local waterfowl guide services who reported killing a record number of "specks." Through the 1970s, 1980s, and 1990s, this species remained constant and only comprised low numbers.

Historically, the same was true of snow geese, which in old reports were classified as "other geese." At this time, monthly waterfowl surveys rarely recorded the species or if it was reported only 1-15 birds were observed. Biologists from AGFC noted changes statewide in snow geese and in 2004 they became the predominant species using the Farm Unit. Daily numbers of these birds were reaching and/or exceeding 5,000 to 10,000 birds per day while winter wheat was planted on the Farm Unit. Since eliminating winter wheat from the Farm Unit in 2008, snow goose use has declined significantly

Shorebirds

While management of shorebirds is secondary to waterfowl, efforts are made to provide habitat for shorebirds. This is accomplished by allowing at least one impoundment on the Farm Unit or approximately 10 acres per summer to remain high until late April or early May to provide for mudflat foraging opportunities to benefit blue-winged teal and shorebirds. In some years back water from the White and Mississippi Rivers remains high well into the summer; water is then drawn down slowly to enhance habitat for killdeer, yellowlegs, plovers, etc.

With the topography and the limited number of impoundments used for waterfowl, it is difficult to dedicate large amounts of habitat for shorebirds. Even with ideal drawdowns (those not effected by late/high backwater), numbers of shorebirds are typically lower within the refuge than on surrounding private lands (drawdowns on rice fields). The largest number of shorebirds observed on surrounding private lands has occurred on the east side and shorebirds have more opportunity for habitat selection on these areas.

Other Resident and Migratory Birds
White River NWR was established in 1935 for the purpose of providing habitat for migratory birds, and at this time this was almost exclusively for the benefit of waterfowl. Nowadays the refuge has expanded its focus to embrace all species of migratory birds.

Like waterfowl, many neotropical migratory bird species are experiencing long-term declines as a result of habitat loss across their full range of breeding and migration habitats in North America and their wintering habitats in Central and South America. However, the immediate causes of the decline are not as clear, and evaluation of the problems is complicated by their intercontinental range and by the fact that this group of migratory species is actually composed of over 250 individual species within a number of different habitat guilds (USFWS 1994).

As a group, resident songbirds are not currently exhibiting the degree of recent population decline documented for neotropical migratory species; but, it seems apparent that the 85 percent habitat loss in the Big Woods ecosystem must have caused a commensurate decline in their populations and distributions from a historic perspective. Finally, migratory songbirds which overwinter in the habitats of this ecosystem, as a generalization, have also not experienced declines in density as dramatic as those of the neotropical species.

In contrast to wintering waterfowl, breeding neotropical migratory birds and songbirds which use the Cache/Lower White Rivers ecosystem are less able to shift habitat use from one type to another completely different type. Breeding birds, again unlike wintering birds whose primary requirement might be suitable foraging habitats, can also not be appreciably concentrated while breeding. Therefore, area sensitive species, those associated with and seemingly requiring relatively large (20,000 acres or greater) blocks of habitat, have been most adversely impacted by habitat loss in the system. Examples include the swallow-tailed kite, cerulean warbler, Swainson's warbler, Acadian flycatcher, great-crested flycatcher, wood thrush, red-eyed vireo, and northern parula. Bottomland hardwood-bald cypress forest and/or riparian woodlands have been identified by the Partners in Flight program (which focuses on the conservation of neotropical migratory land birds) as the top habitat conservation priority throughout the Southeast (Hunter et al. 1992). The forested wetlands of the MAV consistently provide optimal breeding habitat for many of the highest priority species in the region.

Due to various aspects of their biology and difficulty of study, detailed population and migration information of the type possible for waterfowl does not exist for neotropical migratory birds, which prevents many direct evaluations or comparisons among broad geographic areas. However, because of the prominence of the Cache/Lower White ecosystem as the largest remaining habitat of its type in the MAV, and because its north-south orientation serves as a migration corridor traversing approximately one-quarter of the total length of the MAV, the system must be considered one of the most important sites in the region for this general group of species (USFWS 1994).

For neotropical migratory bird conservation purposes, the MAV is considered to contain five primary habitat guilds:

1. mature bottomland forest, canopy
2. mature bottomland forest, understory/midstory
3. forest edge, canopy
4. forest edge; scrub-shrub; and
5. open areas.

At this time a majority of all current habitat management effort emphasizes manipulation of forest conditions, particularly for a multiple canopy condition in the forest. The manipulation of the forest (i.e., thinning and regeneration) has provided habitat for numerous neotropical migratory birds. At this time the most intensive management for migratory waterfowl is currently conducted at the Farm Unit, selected greentree reservoirs (GTR's) and other impoundments using moist-soil management techniques. Due to the large number of natural lakes and bayous, no directed management is needed or occurs for wading birds; however, a small segment of the Farm Unit, Dry Lake, and the Demonstration Area do receive management consideration for shorebirds, as noted above.

The refuge is well recognized not only locally, but throughout the world, as an important contributor to international efforts for the conservation of birds:

- In 2006, White River NWR was designated as a Globally Important Bird Area by the American Bird Conservancy.
- In 1989, it was designated as a RAMSAR site as a Wetland of International Importance. One of the primary reasons for this designation was due to the fact the Lower White River provides habitat for the largest wintering area for mallards on the continent.
- The Lower White River is one of six flagship areas of the North American Waterfowl Management Plan.
- It has been designated an Audubon Important Bird Area.

In 2007, the refuge birding check list was updated and there are now 273 species of birds are known to inhabit the refuge (Appendix I). While a great deal of effort and management is dedicated to all migratory birds, recent research has been conducted on several species that are of particular concern.

<u>Swainson's Warbler</u> – This species is listed as being of regional concern and is totally dependent on forest disturbance. Swainson's projects have been ongoing for decades, beginning with a study of the bird on the refuge and nearby private lands in the 1950s and continuing with research investigating habitat requirements during nesting season. The refuge has become an important not only for research but as a control to compare population trends at other localities throughout the Mississippi Delta. The most important method in habitat development for this species is ongoing forest management operations such as thinning, which maintains portions of the forest in early succesional stages that produce high stem densities preferred by this species.

<u>Swallow-tailed Kite and Mississippi Kite</u> – Research on these related species began in 2000 and was originally planned to focus entirely on the swallow-tail kite, but with only one pair using the refuge, the the project was expanded to include Mississippi kites. In continuing research on the nesting ecology and habitat requirements of these birds on the refuge, swallow-tailed kites have constructed and attempted nesting for seven years and in all instances these nests have failed. Reasons for failures include: storms and barred owl predation, and in 2008 it was believed that the researcher placing a video camera too close to the nest caused the adults to abandon the nest.

The Mississippi kite portion of the project has been successful in collecting/comparing population demographics. Of particular interest has been the excessive nest predation by western rat snakes which have predated nests in excess of 100 feet high. AGFC has been a cooperating partner throughout the refuge kite research work.

Chimney Swift – At present this species is neither listed or nor of concern but only of interest due to some interesting facts about the population on the refuge. Historically, chimney swifts had completely shifted their preferred nesting locations into man-made structures such as chimneys; hence the name "chimney swift." This change into manmade structures had actually occurred by the early 1700s, and since 1900, fewer than a dozen reports of the species nesting in natural cavities has been documented throughout North America.

Incidental surveys have been ongoing at the refuge since 2005 and, to date, five cypress trees have been identified as nesting cavities. In 2006, the first documentation of a chimney swift nesting in a natural cavity in Arkansas was reported/photographed in a cypress tree at Brushy Lake on the North Unit. This report, along with dozens of sightings, fully demonstrates that the local (refuge) population is fully imprinted on natural cavities and continues to nesting at these sites. To date, all located nests have been on the shore of refuge lakes in large but still actively growing cypress trees.

Mourning Dove – This species is neither hunted nor actively managed for but refuge staff has been conducting annual dove counts since the early 1950s as part of a national migratory bird survey effort. The current route is south of the refuge on the Arkansas River Levee.

Woodcock – This migratory bird moves through both in the winter months and during the spring. Singing or "peenting" surveys were attempted in 2002 and 2003 in an effort to determine where birds were using various habitats on the refuge. Two areas – the Farm Unit and Surround Field – both held the highest number of "peenting" woodcock. Other birds were noted, but in much lesser numbers. Throughout the fall and early winter, woodcock are noted in areas such as Jacks Bay and the North Unit, where suitable habitat exists.

Wild Turkey – Turkeys on the refuge were apparently never extirpated, as they were elsewhere, and AGFC trapped and moved large numbers of birds off the refuge to reestablish turkeys throughout the State of Arkansas. Reproduction of turkeys is variable and heavily influenced by flooding. In addition, nest predation may be a detriment to the population.

Brood production is moderate compared to other sections of the state, but falls within normal ranges when compared to the surrounding Delta region. White River NWR typically places within the "Top 10" for total number of birds harvested in the State of Arkansas, with an average of around 51 birds harvested each year.

White River was chosen as one of 19 areas statewide for a project called Wild Turkey Gobbling Chronology/Phenology Survey. The actual location on the refuge was Jack's Bay, classified as a heavily hunted area. Gobble counts were run twice a week on mornings with no rain or exceeding light winds for a 12- week period, March 1 through May 23. Stops were 1 mile apart with 5 minute listening periods. Other information collected included bud break, green up, and full leaf conditions. After the first year, it appears that gobbling was not influenced by hunting pressure or weather.

Mammals

Some 72 species of mammals occur in Arkansas and 52 of them have been documented or are likely to occur in the Cache/Lower White Rivers ecosystem. The only attempt at developing a formal species occurrence listing that has been produced to date for public lands in the region has been for the White River NWR. The refuge list identifies 30 species of mammals as occurring on the Southern Unit of the refuge (Appendix I), 40 percent of which are rodents (USFWS 1994).

White-tailed Deer

White-tailed deer are an important species both from the perspective of public interest as well as a potential influence on ecosystem function and processes. Bottomlands are very productive habitats for deer, with a potential average carrying capacity (maximum sustainable population density) being cited as one deer per 10 acres, three or more times higher than comparable estimates for upland hardwood/pine and upland pine habitats (USDI 1984). However, hydrologic influences can reduce this high potential carrying capacity by reducing the availability of effective habitat by prolonged and/or deep flooding, as is the case for much of the lower White River NWR. Nevertheless, deer productivity in some areas of the region may now be very high due to the proximity of most remaining forested areas to cropland, which the deer use extensively for feeding during times of flooding.

White-tailed deer are now widely distributed throughout the wetland corridor along the White River and tributaries where even a minimal amount of forested habitat remains. However, prior to the establishment of the White River NWR, hunting pressure almost eliminated the species from the ecosystem. However, the deer population grew rapidly with protection afforded by the establishment of the national wildlife refuge and implementation of restrictive regulations by AGFC. By the time the first gun hunt was conducted in 1961, the deer population was so large that their foraging was having a significant and obvious effect on the White River NWR, evidenced by a pronounced browse line throughout much of the refuge (USFWS 1994).

From the standpoint of public use, white-tailed deer are the most popular mammal on the refuge. There is a long history of deer hunting at White River NWR, which began in 1956 with the first archery deer hunt. Administering deer hunts has occupied a great deal of staff time. When the refuge opened its first gun deer hunt in 1961, White River NWR was one of the first tracts of public land in the southeastern United States to implement either sex deer hunting, which was extremely controversial at that time. In 1974, the refuge implemented the first muzzleloader deer hunt.

Black Bear

Although not endangered, the black bear population at White River NWR and on surrounding lands is zoologically unique. Historically, black bears were found throughout the lower 48 states, Canada, and Mexico. Although this was a wide distribution, there were however, a number of bear populations that became isolated for a variety of reasons that today make their populations unique.

Geographic isolation, and resulting genetic isolation, caused the species to split into subspecies. This process may have occurred thousands of years ago for unknown reasons, but it is that fact which makes these populations so unique. For this reason the lower White River NWR population has been under close scrutiny and a great deal of effort has been made in an attempt to determine the actual subspecies of this population. The debate continues as to whether these bears are American black bears (*Ursus americanus americanus*) or Louisiana black bears (*U. a. luteolus*).

Because of isolation, it is believed the population developed slightly different characteristics, including habitat preference, body size, and morphological differences. At this time, the Louisiana black bear is listed by the Service as a threatened species. Originally, this subspecies was found throughout east Texas, Louisiana, and Mississippi in the once expansive bottomland hardwood forests found in the LMRV.

Due to decreasing numbers of bears across the state, AGFC began translocation projects in the 1950s and 1960s to reestablish bears. This relocation effort was conducted primarily in the northwestern section of Arkansas with bears from Minnesota and Manitoba. The population at White River NWR was never supplemented with stocking “non-native” bears. In fact, during this period covering over a half century, the White River NWR has remained virtually isolated from both the Louisiana and Ozark populations. In a recent publication, bears at White River NWR were found to be more genetically distinct from bears in Louisiana. The author further stipulated that all efforts should be made to protect the population for the purpose of future repatriation projects in the LMRV.

Over the years, there have been several surveys to determine the status of the population on the refuge. Beginning in 1987, bear bait stations were established and surveyed annually until 2007, when this survey was dropped. Essentially no changes were noted on visitation rates over this time period, with the exception of increased visitations on the North Unit line (Clarendon to St. Charles) The South Unit line (St. Charles to Benzal Bridge) remained unchanged during this period. Bears are more heavily concentrated on the southern portion of the refuge.

The importance of overcup oak and bald cypress for black bear dens on the refuge is demonstrated by the following chart (Table 3) developed from data collected during the winter (January-March) from 2000-2006. At this time staff members from AGFC, White River NWR, and the University of Tennessee inspected black bear dens on the White River NWR. As a result, this survey indicated which tree species as well as sizes are of importance for providing bear dens on the refuge. They are ranked in importance.

In 2000, the estimated population on the White River NWR was believed to be 300 to 500 bears. Beginning in 2001, AGFC opened bear hunting season on lands surrounding the southern portion of the refuge. This was a result of increased depredation complaints on bee yards, crops, and even damage to diesel power units (some bears were pulling and tearing fuel lines off motors).

Two new bear zones were established immediately outside the refuge boundary. Each zone was assigned a harvest quota, and when this quota was reached, the bear season would close. Additionally, 42 sows and 92 cubs have been removed from the refuge to serve as the source population for a repatriation project to establish bears at Felsenthal NWR in south Arkansas. The combination of hunting and relocating bears has reduced the White River NWR population significantly.

Table 3. Black bear den characteristics on White River NWR

Species	Total sample N=170	Percentage of sample	Avg. DBH	Range of DBH	Avg. Height (feet) of Den Entrance
Overcup Oak	65	0.382	41.790	36-54	27.87
Bald Cypress	59	0.347	77.357	42-144	35.49
Nuttall Oak	25	0.147	42.45	33.5-55	31.69
Sycamore	8	0.047	48.980	42-60	48.98
Willow Oak	2	0.011	54.00	48-60	40.00
Brush/Ground	10	0.058	N/A	N/A	N/A
Dead Snag	1	0.005	48	N/A	N/A
Beaver Lodge	1	N/A	N/A	N/A	N/A

Furbearers

Furbearers include Virginia opossum, raccoon, striped skunk, river otter, beaver, mink, muskrat, nutria, red fox, gray fox, coyote, and bobcat. Among these species, the river otter, beaver, nutria, muskrat, and mink are mostly dependent upon permanently inundated wetlands and/or riverine habitats. Raccoons are well-adapted to the full range of permanently flooded to upland habitats, and the opossum, bobcat, fox, skunk, and coyote are most associated with the more upland areas. Most are distributed throughout all or most of the White River NWR ecosystem, but little or no data are available to provide population indices for these species (USFWS 1994)

Hunting effort for furbearers has remained fairly steady in this decade. Trapping activity slowed in the late 1990s, but the refuge continues to issue small numbers of special use permits for trapping each year despite low fur prices. In the 2007-08 seasons, two trappers did not report harvesting any furbearers; however, up until 2007, these same individuals harvested well over a hundred animals from the refuge. Trappers in the past have reported harvesting beaver, mink, muskrat, nutria, raccoon, and river otters. It was not until 1976 that the exotic nutria was first documented on the refuge. While not a furbearer, the first armadillo was documented in 1958, and is now common throughout the refuge.

Opossums, skunks, and coyotes, all widespread and adaptable species, are clearly abundant in suitable habitat throughout their range. All indications are that the coyote range continues to expand and populations increase. There is no evidence of significant population change one way or the other for skunks or opossums. The gray fox is relatively uncommon in the region and the red fox is also uncommon in the Delta, and appears to have been declining in recent decades.

Mink and river otter are also relatively abundant in the ecosystem. Mink have adapted to making extensive use of road ditches and other marginal wetland habitats, while river otter are found primarily in association with relatively large areas of bottomland hardwoods associated with riverine habitats of the White River.

Muskrat are locally abundant and common; nutria do not currently appear to be widespread or abundant, but are probably expanding their range and population size.

Although extremely adaptable, the general habitat preference of raccoons is bottomland hardwoods with an abundance of den trees, which characterizes most of the remaining bottomland hardwood acreage remaining in the ecosystem. Raccoons are omnivorous and opportunistic in their foraging, and their habitat is abundant in the system, as is their population.

Beaver, distributed throughout the refuge and wider White/Cache ecosystem, as much of the public and private forested wetlands are either habitat or potential habitat, are also extremely abundant.

Among all the furbearers, the greatest evidence of significant and ongoing population increases exists for raccoons and beaver. Road-killed raccoons are increasingly abundant, and reports of sick or "tame" animals by the public have also increased steadily over the years. These sick animals, when collected and tested, are often diagnosed with distemper. Raccoon populations are known to harbor distemper and rabies, and during past periods of higher than normal raccoon population densities, outbreaks of distemper have often been documented. Evidence of increasing beaver populations in the ecosystem exists in the form of an increasing acreage of wetlands affected or inundated by their dam-building activities. This, in turn, increases investments of management effort needed to deal with dams, which inundate hardwoods or affect water control structures on the refuge.

Beaver ponds have likely always been an important component of the MAV forested wetland complex; however, it is clear that if at this time beavers were left unchecked, a very significant proportion of the remaining areas of forested wetland in this ecosystem would be inundated. The result would be a rapid conversion of bottomland hardwoods to dead timber/scrub/shrub areas, with the associated loss of habitat to the majority of wildlife species in the ecosystem which are dependent upon living bottomland hardwood forests. Thus, unregulated beaver populations have the potential to radically alter the overall ecosystem structure and processes, and therefore function (USFWS 1994).

The widespread and significant adverse impact of raccoons is manifested primarily through their ability to be a significant predator of migratory and resident bird eggs. Studies have documented the degree to which raccoon predation may be adversely affecting reproduction and recruitment rates of breeding neotropical migratory birds in hardwood habitats (Cooper and Ford 1993) and nesting wild turkeys in Arkansas (Moore 1993).

A complete evaluation of the relatively rapid growth in population density for these species has not yet been conducted. Commercial/recreational harvest of most of the furbearing species was, until the 1980s or 1990s, widespread and significant throughout much of the Big Woods ecosystem. If the harvest of furbearers (including raccoon and beaver) was an important mechanism in controlling their population density, that would, in turn, imply that the original functioning ecosystem included mechanisms which would have provided that particular function prior to settlement. Thus, it seems reasonable to speculate that the large predators (e.g., red wolves, cougars, and possibly American Indians) which have been eliminated from the ecosystem played an important function in helping to regulate the population of these and possibly other medium-sized mammals. Regardless of the ultimate explanation, the historic processes which regulated some of these populations have apparently been disrupted (USFWS 1994).

Bobcats

The generally secretive, nocturnal habits of bobcats result in almost no population information being available; however, their population density is most likely relatively stable across the broad range of habitats they utilize.

Small Game (Squirrels and Rabbits)
Gray and fox squirrels are both abundant and distributed throughout the refuge where suitable, mast-producing forested habitat is available. Although they share habitats to some degree, gray squirrels are most common in deep woods, whereas fox squirrels prefer small woodlots and the edges of larger forested tracts. Their high potential recruitment rate (controlled largely by levels of available hard mast), high natural mortality rates, and other population processes would lead to the expectation that no significant long-term changes in their population densities within available habitat have occurred. Annual harvests on White River NWR have ranged from 10,000-40,000 squirrels.

Cottontail rabbits and swamp rabbits are relatively common throughout the region, but are not abundant. Their population numbers are largely controlled by the limitation of habitat available to them. With most of the terrace lands and uplands having been cleared, available dryland habitat becomes relatively limiting during periods of high water. Their basic biological processes are such that hunting cannot affect their landscape-scale population trends, so that activity has therefore traditionally been permitted on all public lands in the area without adverse Impacts.

Herptofauna (Reptiles and Amphibians)
Detailed information about taxa other than birds and mammals is relatively scant for the refuge. The species list for the White River NWR includes 48 species of amphibians and reptiles (Appendix I).

One of the most common snakes associated with bottomland hardwoods is the black rat snake, a significant nest predator of birds. Other species relatively commonly found in suitable habitat types are the mud snake, timber rattlesnake, and copperhead. Habitats in direct association with water are most commonly inhabited by cottonmouth and a number of the water snake group. Common turtles in the system include the three-toed box turtle, red-eared slidereared slider, map turtle (several species), soft-shell turtle (two species), and common snapping turtle.

Herpetofauna population trends in the Cache/Lower White Rivers system are unknown with no monitoring of any type occurring, but their relatively low mobility, as a group, would lead to the expectation that populations trends would be roughly proportional to loss of the various habitat components upon which the associated herpetofauna depend. Also, it has been suggested that some regional declines in amphibians may be related to the loss of old-growth stands of forest. Younger forests, being less subject to windthrow of large, old trees, have, in turn, resulted in reduced availability of the many widespread small pools of water created by the depressions left at the tree bases when they fall. These small, shallow, relatively short-lived pools are believed to play an important role in amphibian reproduction.

Alligator snapping turtles, the largest of the turtle group, and attaining sizes of up to approximately 250 pounds, were comparatively abundant in the ecosystem until relatively recent times. Commercially exploitable populations in several major rivers and tributaries are an indication of their relative abundance. However, due to concern about the efficiency of recent exploitation and unknown reproductive rates of this long-lived species, AGFC halted all take of alligator snapping turtles in Arkansas in 1994.

The timber rattlesnake is locally common within the ecosystem, but largely restricted to use of forested habitats located on or very near upland sites. There is a growing concern about the possibility of range-wide declines in the abundance and distribution of this species, primarily as a direct result or byproduct of habitat loss. In the Mississippi Delta in general, there is at least a perceived association of this species with cane thickets, leading to the local common name of canebrake rattlesnake. AGFC closed this species to take in 1987 (USFWS 1994).

Frogs and Toads
Frogs and toads have not been systematically sampled using stand call surveys due to the flooding conditions that routinely occur on the refuge, making these surveys difficult to complete at uniform time lines. One of the major limiting factors on frog/toad production appears to be high flood waters which totally inundate isolated "puddles," allowing numerous fish access to these sites, making predation on tadpoles a problem.

The refuge allows harvest of bullfrogs concurrent with statewide frog seasons. At this point, there are no harvest figures on numbers of "froggers" participating or number of frogs harvested during a season.

American Alligator
In 1971 alligators were transplanted onto the refuge. A total of eight gators 3-7 feet long and 18 one-year olds were released on Scrubgrass Bayou and the Water Storage area. In 1971 nineteen additional gators were captured and moved from Blackbeard Island NWR in Georgia and released on Scrubgrass Bayou. Another fifteen animals were released in 1979, bringing the total number released to 78. By the late 1970s, observations were down to only two a year and today that remains about the same.

Today the refuge has a small population of alligators within its boundary, with the majority of these classified as transients. Highly variable water levels, particularly in the spring during nesting season make reproduction highly variable if not impossible and high water in the winter flooding out dens make survival difficult. It is highly likely that all alligators found on the refuge were hatched in the adjacent Arkansas River navigation canal, which maintains static water levels throughout the year. In the fall of 2007, Arkansas held its first public alligator hunt and several were harvested on COE lands adjacent to the refuge. To date there are no known nests located on the refuge (USFWS 2008a).

Fish

The aquatic habitats of the Cache/Lower White Rivers ecosystem, which include bayous, rivers, and oxbow lakes of many sizes and depths, support a very diverse and abundant array of fish species. The Lower White River is now classified as one of the least modified river systems in the contiguous lower 48 states, as other large rivers across the country have been subjected to many modifications, including levees, channelization, bank armor, weirs, and dams. Yet while the Lower White River remains a somewhat natural or pristine river system, it has not escaped the influence of hydrologic changes from dams such as Greer's Ferry, Beaver, Table Rock, Taneycomo, Bull Shoals, and Norfork on the headwater and the Arkansas River Navigation Project on the river's upper reaches. These engineering works have altered the dates and frequency of floods. In addition, dredging on the lower 10 miles for the Arkansas River Navigation Project and the Mississippi River Navigation System maintenance has created enormous headcutting on the river and smaller feeder sloughs, as discussed earlier in this chapter. All of these human interventions have altered fish communities in some form or fashion.

The quality of fisheries and other aquatic resources on the refuge and throughout the Lower White River System is totally dependent on connectivity of the river with the floodplain habitat. Both the floodplain and the river comprise one interactive system that functions via a mechanism commonly referred to as the "flood pulse concept." Essentially the aquatic habitat is expanded into the bottomland. Many of the life history requirements of native fish are tied to the frequency of flood events along with the depth, duration, and timing of the flooding. Combinations of these all have different outcomes on the resource. Overall productivity of riverine fishes is regulated by the lateral exchange of nutrients and organic material, which is occurring and/or interchanging between the floodplain and the river channel during floods.

The refuge has over 400 lakes, sloughs, and bayous, and each of these water bodies varies slightly in its connectivity date with the river. This connectivity is not always obvious as some lakes that are more than two miles from the river may be receiving overflow water before lakes that are within 100 yards of the river (Kansas Lake versus Cooks Lake, respectively). Distance from the river is a factor but connectivity is determined by the network of chutes, bayous, and unnoticeable scour channels in the ridge and swell topography that direct the water across the bottoms. Still, linear distance from the main stem of the river remains an important consideration.

One important aspect of flooding is also drawdown. In a natural river system, it is not possible to manage or affect the drawdown, but it should be noted that long, slow receding spring floods are important to many fish in the floodplain. In regulated rivers there is less “contact time” between the river and the higher floodplain fish because of rapid drawdown. One research report noted that black bass produced better size classes during long duration spring and summer floods. Along with water clarity, lake depth, and dissolved oxygen, the degree of flooding along with the distance to the river still has the greatest influence on White River NWR fish communities.

Popular species that anglers pursue have not changed over time: crappie, black bass (largemouth and spotted), bluegill, red-eared sunfish, and catfish remain the most sought after species. Many more species of fish are also present but not pursued; in fact, many of these are unknown to most of the public. Species such as the flyer, taillight shiner, pirate perch, and swamp darter are all important species to the ecosystem.

The refuge has identified 481 water bodies, including both natural and manmade, ranging in size from 0.5-acre to 609 acres. As a group, they provide enormous opportunities for recreational fishermen in the Lower White River System. The refuge-held youth fishing derby, held annually on the refuge, continues to be a popular event with local residents.

Commercial fishing activity has been used as a management tool for many years as a way of harvesting prolific numbers of non-game fish such as buffalo, carp, drum, and catfish. As an example, in 1968, 12 commercial fishermen harvested a total of 120,451 pounds of fish among the following species during the period when commercial tackle was legal:

Buffalo	87,820 pounds
Carp	25,649 pounds
Drum	1,572 pounds
Catfish	757 pounds
Other	4,653 pounds

In other years reviewed (1966 to 1989), commercial fish harvests ranged from 67,000 to 152,409 pounds of fish. The refuge stopped collecting commercial harvest data in the late 1980s and the number of persons purchasing commercial tags has declined in more recent years. As an example, in 2010 the refuge issued nine commercial fishing permits.

The potential effects of chemical contaminants on fish populations and their predators, including humans, is a growing national concern. A draft contaminant survey of the White River NWR (Inmon 1993) documented “elevated" levels of several organochlorines (trans nonachlor, PCB's, and DDT and its derivatives), selenium, and mercury. Although none of these levels were above FDA guidelines for the protection of human health, many were in excess of action levels for protection of predatory wildlife species (USFWS 1994).

Finally, several fish species of special concern occur or may occur in the system. These include the pallid sturgeon, a federally listed endangered species which is probably transient in the lower White River, with its major habitat being the Mississippi River; blue sucker, which occurs in much of the White River and comprised two percent of the 1971 AGFC sample; crystal darter, known from the White River above and below Clarendon; paddlefish, currently being studied by AGFC and other state and federal agencies due to concerns about declining numbers, possibly related to navigation projects, other hydrologic alterations, and exploitation for its roe; and the alligator gar, the largest fish species in Arkansas, can attain lengths of over 10 feet and weights in excess of 300 pounds, which was once relatively common but has experienced dramatic population declines in the last 40 years (Robison and Buchanan 1988).

Invertebrates

The invertebrates which have received the most attention within the Cache/Lower White River Ecosystem are the freshwater mussels (Harris and Gordon 1990). Once extremely abundant, some species continue to be locally abundant while others have not fared as well. Mussels were a common food of Native Americans, as indicated by their middens along the White and other major Arkansas rivers. There was also a vigorous commercial market for some species of mussels (e.g., washboard, threeridge, mapleleaf, and ebonyshell) for the button industry between the late 1800s and 1940s. However, the market largely disappeared with the advent of plastic until recently, when it reemerged to meet the demand for the production of nuclei for Japanese pearl culture (USFWS 1994). The effect of commercial harvest on the population status of target or non-target species is unknown.

The current status of the refuge's mussel populations has not been fully evaluated, although it is known that mussel populations here and all over the country are significantly reduced from historic times. Being relatively stationary filter feeding organisms, they are potentially excellent indicator species of overall ecosystem health (Harris and Gordon 1990). Different species have varying sensitivities to parameters such as contaminants, nutrient loads, water clarity, water temperature, sediment, commercial exploitation, and status of fish hosts for the larval stage. Many of these parameters are known to have been significantly altered over time; however, the potential effects on mussels have not been evaluated.

The pink mucket is known to occur in the White River system in several locations. The fat pocketbook mussel was historically found in the White River system, but is rarely found today, although there has been at least one record as recently as the early 2000s. Other invertebrates have rarely been the subject of study in the ecosystem. One 1990s study of aquatic macroinvertebrates of White River NWR documented a diverse fauna of 240 taxa (Chordas 1992). The diversity and abundance of macroinvertebrates were significantly lower for areas most directly affected by runoff from surrounding agricultural lands in comparison with the less impacted areas of the refuge. Interestingly, some of the sample sites with the lowest diversity and abundance values were very near some of the collection sites for the contaminant survey in which elevated levels in fish were noted. The importance of invertebrates in the wildlife food web should not be underestimated. Many fish species and their predators are of commercial and/or recreational value (e.g., largemouth bass, crappie, and sunfish) and are dependent upon invertebrates. Most breeding neotropical migratory birds are insectivores, and nest success may be affected by annual variation in insect populations (Cooper and Ford 1993).

Aquatic invertebrates are an extremely important part of the diet of many waterfowl species, which obtain them in natural habitats and their managed counterparts such as moist soil units, as well as from flooded agricultural lands such as rice fields during late winter and spring migrations. Dabbert (1991) found that foods of mallards collected in flooded forests at the White River NWR and similar nearby habitats contained 35 percent animal matter. As with mussels, increased knowledge of other

lower taxonomic categories might reveal that some serve as better ecological indicators than most vertebrate taxa. The lower taxa might better provide "early symptoms" or early warnings of problems with underlying ecosystem processes and functions than birds and mammals, for which observable problems may be more analogous to the "advanced stages" of possible ecosystem health problems.

CULTURAL RESOURCES

The first inhabitants of the area now comprising the White River NWR were nomadic hunter-gatherers referred to as Paleo-Indians and occupied the immediate area from 10,500 years to 12,000 years before present (BP). This group hunted many of the mega mammals which are now extinct.

The Dalton period, which lasted about 1,000 years, was the introduction of many improved stone tools such as the adze (ax), which was followed by the Archaic period (9,500 to 3,000 years BP). This group is credited with first woven baskets and more specialized tools. The final group was classified into the Woodland period which lasted from 3,000 years BP until the arrival of Europeans.

The first Europeans arrived at the White River with De Soto's explorations in 1542. Journals from the expedition make a reference to his crossing the White River at what is suspected to be St. Charles. However, by the time the French had arrived in the area in 1673, the area was almost completely devoid of human inhabitants. Historians now believe this was a result of the inadvertent introduction of foreign diseases into the area by the Spaniards.

The French set up a settlement at the Quapaw village of "Arkansea," which the French later called Arkansas. The name was later given to the surrounding region and one of the three rivers passing through the area. The original site of Arkansea was rediscovered in 2003 and is now known be located on the refuge; this site is currently under consideration for the National Register of Historic Places (NRHP).

In 1686, the French established Arkansas Post as a trading station and this was the first French settlement west of the Mississippi River. This site is now under the management of the National Park Service as a National Memorial. Settlement in the area was slow and by 1800 the entire area now designated as the State of Arkansas still only had fewer than 400 settlers. However, by 1820 the population jumped to more than 50,000 persons.

As Cherokee Indians were increasingly displaced by white settlers in the southeastern states during the first two decades of the nineteenth century, the number of Cherokees immigrating to Arkansas increased. Many of these new arrivals settled between the Arkansas River and White River valleys. The Cherokee population in this region grew so rapidly that in 1805 a trading post opened at Spadra Bluff, near present-day Clarksville, to serve the emigrants. A land cession obtained by the Federal Government from the Osages in 1808 (negotiated in St. Louis by William Clark, the renowned explorer of Corps of Discovery fame) opened enormous tracts of land in the northwest part of the state. Between 1809 and 1812, roughly 2,000 Cherokees settled along the White River and in the Arkansas River valley upstream from Little Rock (Logan no date).

The lands associated with the refuge and the surrounding areas were also actively traveled during the Civil War. The battle at St. Charles on June 17, 1862, in what is actually classified as a naval engagement, occurred when ironclads and tinclad ships moved up the White River. The battle is now famous because of the single shot called the deadliest shot in the Civil War. It was fired by the Confederates into the port hole of the US Mound City, hitting the boiler and killing 92 sailors. The Confederate camp (now the site of refuge's St. Charles Compound) was later occupied by Union troops until the end of the war.

On March 4, 1933, President Franklin D. Roosevelt created the Civilian Conservation Corps (CCC) to be used in simple work, including forestry, the prevention of soil erosion, flood control, and similar projects until the program's termination in 1942.

Several federal agencies were involved in the implementation and success of the CCC, including the U.S. Biological Survey (predecessor to the U.S. Fish and Wildlife Service and U.S. Geological Survey). Many "sub-marginal" lands designated as national wildlife refuges were improved to provide habitat for waterfowl, upland game, mammals and songbirds. The CCC was instrumental in implementing the new wildlife program on the new refuges. The primary objectives of CCC camps associated with the Biological Survey were the improvement of wildlife habitat and construction of national wildlife refuge administrative facilities and infrastructure. By 1942, 53 refuges had benefited directly from their work. Examples of work projects included dam, dike, and water control structure construction; establishment of food plots; planting of various vegetation including millions of trees; stabilizing stream banks; and erecting numerous buildings, fire towers, boundary fences, telephone lines and support facilities. White River NWR possesses the most complete and intact collection of CCC structlures remaining in the Refuge System. These buildings are concentrated on the refuge's Farm Unit and the St. Charles Work Center, the later consisting of a combination shop/garage building, metal hsed, an office/garage or Service Building, a metal skeletal frame fire tower, three brick residences, and a Civil War-era cannon display. Another brick residence, carpenter shop, and storage barn are located at the Farm Unit.

There were three CCC camps assigned to the refuge when it was established on September 5, 1935. One camp was located south of the current visitor center. The second camp was known as the CCC Navy Camp and was the only floating camp in the country. This floating camp consisted of eight quarterboats and was located just below the St. Charles Compound. The third camp was on the south end of the refuge at Jacks Bay. Many of the refuge houses, original refuge headquarters, and several storage buildings still remain from CCC construction projects and are now considered historic structures.

In general, cultural resources include historic properties as defined in the National Historic Preservation Act (NHPA), cultural items as defined in the Native American Graves Protection and Repatriation Act (NAGPRA), archaeological resources as defined in the Archaeological Resources Protection Act (ARPA), sacred sites as defined in Executive Order 13007, *Protection and Accommodation of Access To "Indian Sacred Sites"* to which access is provided under the American Indian Religious Freedom Act (AIRFA), and collections. As defined by the NHPA, a historic property or historic resource is any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP, including any artifacts, records, and remains that are related to and located in such properties. The term also includes properties of traditional religious and cultural importance (traditional cultural properties), which are eligible for inclusion in the NRHP as a result of their association with the cultural practices or beliefs of an American Indian tribe. Archaeological resources include any material of human life or activities that is at least 100 years old, and that is of archaeological interest.

SOCIOECONOMIC ENVIRONMENT

Arkansans are avid anglers, hunters, and wildlife watchers, and both Arkansans and Americans in general are avid users of “The Natural State’s” wildlife resources. These are the principal conclusions of the 2006 *National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* for the State of Arkansas (USFWS 2007b). This nationwide survey reports results from interviews with U.S. residents about their fishing, hunting, and wildlife watching habits, specifically focusing on 2006 participation and expenditures of persons 16 years of age and older.

The 2006 Survey found that 1.4 million Arkansas residents and nonresidents 16 years old and older fished, hunted, or watched wildlife in Arkansas (Table 4). Of the total number of participants, approximately 655,000 fished (46 percent), 354,000 hunted (25 percent), and one million (71 percent) participated in wildlife watching activities, which include observing, feeding, and photographing wildlife (Table 5 and Figure 6). The sum of anglers, hunters, and wildlife watchers exceeds the total number of participants in wildlife-related recreation because many individuals engaged in more than one type of wildlife-related activity (USFWS 2007b).

Table 4. Number of participants in wildlife-associated recreation in Arkansas in 2006

Participants in Wildlife-Associated Recreation in Arkansas: 2006
(U.S. residents 16 years old and older)

Total	**1.4 million**
Sportspersons	
Total	**790 thousand**
Anglers	655 thousand
Hunters	354 thousand
Wildlife Watchers	
Total	**1.0 million**
Away from home	435 thousand
Around the home	811 thousand

Note: Detail does not add to total because of multiple responses.

Source: Tables 3, 24, and 39.

Source: USFWS 2007b

Figure 6. Percent of total participants by activity in Arkansas

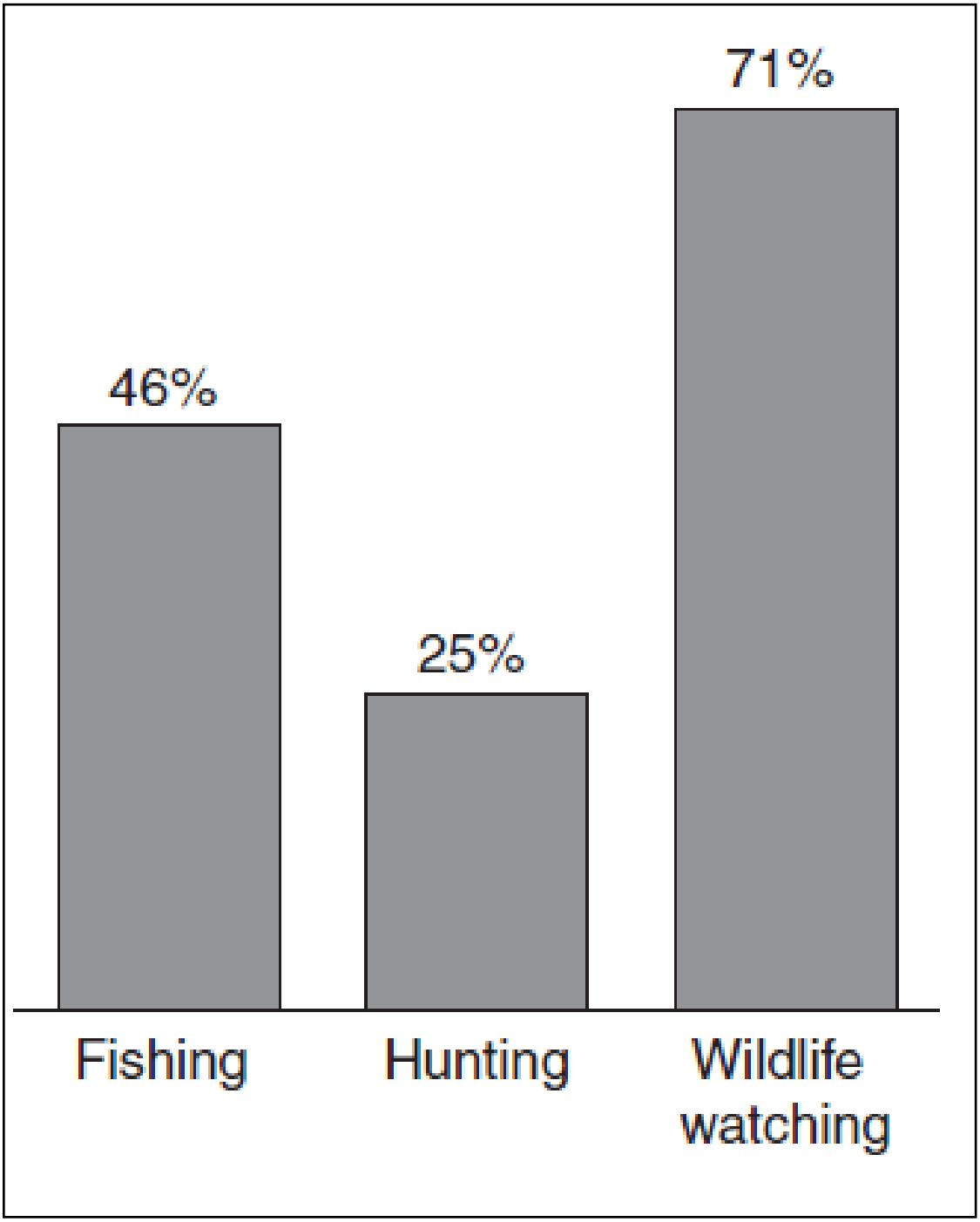


Table 5. Information from the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation for Arkansas

Activities in Arkansas by Residents and Nonresidents	
Fishing	
Anglers	**655,000**
Days of fishing	10,812,000
Average days per angler	17
Total expenditures	$420,571,000
Trip-related	$272,160,000
Equipment and other	$148,411,000
Average per angler	$639
Average trip expenditure per day	$25
Hunting	
Hunters	**354,000**
Days of hunting	7,882,000
Average days per hunter	22
Total expenditures	$788,575,000
Trip-related	$182,192,000
Equipment and other	$606,383,000
Average per hunter	$2,108
Average trip expenditure per day	$23
Wildlife Watching	
Total wildlife-watching participants	**1,011,000**
Away-from-home participants	435,000
Around-the-home participants	811,000
Days of participation away from home	4,148,000
Average days of participation away from home	10
Total expenditures	$606,701,000
Trip-related	$114,879,000
Equipment and other	$491,822,000
Average per participant	$591
Average trip expenditure per day	$28

Activities in Arkansas by Nonresidents	
Fishing	
Anglers	**225,000**
Days of fishing	1,539,000
Average days per angler	7
Total expenditures	$100,969,000
Trip-related	$80,911,000
Equipment and other	$20,058,000
Average per angler	$449
Average trip expenditure per day	$53
Hunting	
Hunters	**53,000**
Days of hunting	662,000
Average days per hunter	13
Total expenditures	$167,811,000
Trip-related	$30,606,000
Equipment and other	$137,205,000
Average per hunter	$3,184
Average trip expenditure per day	$46
Wildlife Watching	
Total wildlife-watching participants	**161,000**
Away-from-home participants	161,000
Around-the-home participants	(X)
Days of participation away from home	409,000
Average days of participation away from home	3
Total expenditures	$168,191,000
Trip-related	$49,892,000
Equipment and other	$118,299,000
Average per participant	$989
Average trip expenditure per day	$122

(X) Not applicable.

Source: USFWS 2007b

While the focus of the National Survey is on the activity of participants 16 years old and older, the activity of 6- to 15-year-olds can be calculated using the screening data covering the year 2005. Thus, there were an estimated 111,000 resident anglers, 42,000 hunters, and 113,000 wildlife watchers in the 6-15 year-old age bracket.

In 2006, residents and nonresidents spent $2.1 billion on wildlife recreation in Arkansas. Of that total, trip-related expenditures were $569 million and equipment purchases were $1.1 billion. The remaining $434 million was for licenses, contributions, land ownership and leasing, and other items.

These statewide data are reflected in the popularity of public use of White River NWR.

Demographic data from the four counties in which the refuge is located document the area's rural nature (Table 6). Each of the counties has a lower population density than Arkansas as a whole, which itself is less densely populated than the United States. Three of the four counties have less than half the population density of the state. Another feature of these four counties is also characteristic of many counties in rural America – their populations are becoming smaller, even as the state and the country are becoming larger, that is, their populations are growing. Arkansas' population is growing at slightly less than one percent annually, and the U.S. at about one percent. In contrast, among the four counties in which White River NWR is situated, each had a smaller population in 2008 than in 2000. Phillips County's population was 18 percent smaller in 2008 than 2000.

Each of the four counties also has a smaller median household income and per capita money income than the state as a whole and than the country overall. Once more, this is typical of rural America and is a function of lower educational levels, fewer job opportunities, and generally lower wages in the kinds of occupations available. In keeping with these figures, the poverty rate in the four counties is also higher than that of the state or the nation. The poverty rate in Phillips County is double that of Arkansas and nearly triple that of America. High school and college graduation rates in all four counties are also substantially below statewide and nationwide norms.

Table 6 shows that the racial and ethnic composition of the four counties differs markedly from state and national averages. In general, there are many more blacks, and many fewer Hispanics, Asians, and Native Americans, than in Arkansas generally and the United States overall. The percentage of whites who are not Hispanic is well below the statewide average in three of the four counties (Desha, Monroe, and Phillips) and about equal to state and national averages in the fourth county (Arkansas).

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

Farmland

The primary purpose of the refuge cooperative farming program is to provide habitat for migratory waterfowl as directed under the NAWMP and step-down plans found under the LMJV. Earlier programs have also involved programs on adjacent private lands such as the Service's Cache/Lower White River Private Lands Flagship Project, the Arkansas Partners Program and Ducks Unlimited's "Managing Rice for Ducks" program.

Farming on White River NWR is occurring on the Farm Unit (Figure 4) and the overall goal, which has been in place since the 1940s, is to provide supplemental food primarily for waterfowl.

The Farm Unit contains 300 acres of open agriculture fields and is the largest block of open habitat on the refuge, with initial clearing taking place in the late 1930s and final clearing taking place as late as the 1960s. The clearing in the 1960s was to create fescue/Bermuda grass pastures for the benefit of migratory Canada geese. By the early 1990s, numbers of Canada geese were only a fraction of what had once utilized the refuge. During this period, farm acreage was approaching 700 acres; however, by 1998, the actively farmed area had been reduced to around 300 acres, with the remaining fields having been restored to grasslands and forest habitat.

The open habitat of the Farm Unit also provides habitat for numerous grassland species which breed on the site, including dickcissel, northern bobwhite, and grasshopper sparrow while wintering grassland birds include LeConte's sparrow, Lincoln's sparrow, and clay-colored sparrow.

Primary goals and objectives found within LMVJV regional step-down plans indicate the acreage required of the farming program to meet these needs:

- Provide supply of hot foods for migratory waterfowl
- Meet or exceed all objectives of the LMV step-down plan, specifically the step-down objectives for dabbling ducks specifically set for White River NWR, which are as follows:
    1. Moist Soil - 400 acres objective and 554,400 DUD
    2. Bottomland forest (GTR) - 4,900 and 617,400 DUD.
    3. Harvested Crop - 0 - actual use is 131 acres
    4. Unharvested Crop - 0 - actual use is 115 acres
    5. Total DUD objectives 51,529,611.
- Allow the cooperative farmer to provide a good quality crop which is economically feasible while reducing soil erosion, chemical use, and applying Best Management Practices.
- When and where possible encourage the use of new farming methods to promote sound resource management principles.
- Provide cover for resident species such as deer, turkey and black bear.
- Provide wintering grassland cover for migratory passerines.

Within the current 345 acres of agricultural fields, the following crops are grown: rice, grain sorghum (milo), soybeans, corn, wheat, and Japanese millet. Crop shares are divided 75 percent/25 percent between the cooperative farmer and refuge, respectively. While refuge shares are taken from the rice and milo, the share from soybeans is received on an acre-for-acre basis in the form of planted Japanese millet or other crop beneficial to waterfowl.

Moist-Soil and Greentree Reservoirs

Habitat for waterfowl has been managed on White River NWR since the late 1930s when the CCC constructed some of the first water management structures in the Refuge System. By the 1960s, White River NWR had the highest number of control structures to date and water management had become extremely intensive. Unfortunately, by the early 1980s, many water control structures (most of which were approaching 40 years old) were in a poor state of repair and being abandoned due to the lack of funding and cutbacks in personnel needed to maintain the structures both seasonally and on a daily basis.

Table 6. Comparison of demographic statistics for Desha, Monroe, Arkansas, and Phillips Counties, Arkansas, and the USA

Category	Desha Co.	Monroe Co.	Arkansas Co.	Phillips Co.	Arkansas	USA
Population, 2008 estimate	13,538	8,518	19,236	21,603	2,855,390	304,059,724
% population change 2000-2008	-11.8	-16.9	-7.3	-18.3	6.8	8.0
Persons per square mile (density)	20.1	16.9	21.0	38.2	51.3	79.6
Median household income, 2007	$28,119	$27,141	$37,344	$26,261	$38,239	$50,740
Per capita money income, 1999	$13,446	$13,096	$16,401	$12,288	$16,904	$21,587
% Below poverty level, 2007	26.6	27.2	17.9	37.2	17.6	13.0
% High school graduates, 2000	65.0	63.8	72.4	62.2	75.3	80.4
% Bachelor Degree, 2000	11.1	8.4	12.2	12.4	16.7	24.4
% White*, 2008	47.1	57.8	72.4	35.6	75.6	65.6
% Black, 20008	47.8	38.4	24.9	61.5	15.8	12.8
% Hispanic, 2008**	4.1	2.1	1.3	1.8	5.6	15.4
% Asian, 2008	0.4	0.2	0.4	0.6	1.1	4.5
% Native American, 2008	0.4	0.4	0.2	0.3	0.9	1.0

Source: USCB 2009
**Percentage of non-Hispanic whites ** Denotes Hispanic ethnicity of any race*
Note: The numbers do not add to 100% due to difference between race (white, black) and ethnicity (Latino and non-Latino) and not including people who identify as multiple races or some other race.

Today waterfowl management occurs within moist-soil impoundments, flooded crop fields, and greentree reservoirs (GTRs) (Figure 7). Some of the most valuable habitat is found when overbank flooding occurs within the entire floodplain, it providing thousands of acres of habitat for wintering waterfowl. With topography of less than 1 percent slope, the area is flooded by shallow slow-moving flood waters which can occur several times per year and last from a few days up to four to six months. During these routine events, headwater flooding from the White River and backwater flooding from the Mississippi River can flood the bottoms from a few inches to several feet deep. At this time all water control structures/levees (with the exception of the Farm Unit fields) are completely inundated. Late spring floods also routinely occur and these high waters will inhibit manipulation of moist-soil impoundments. While valuable, they are still unpredictable and timing, depth, and duration do not always occur at the optimal time.

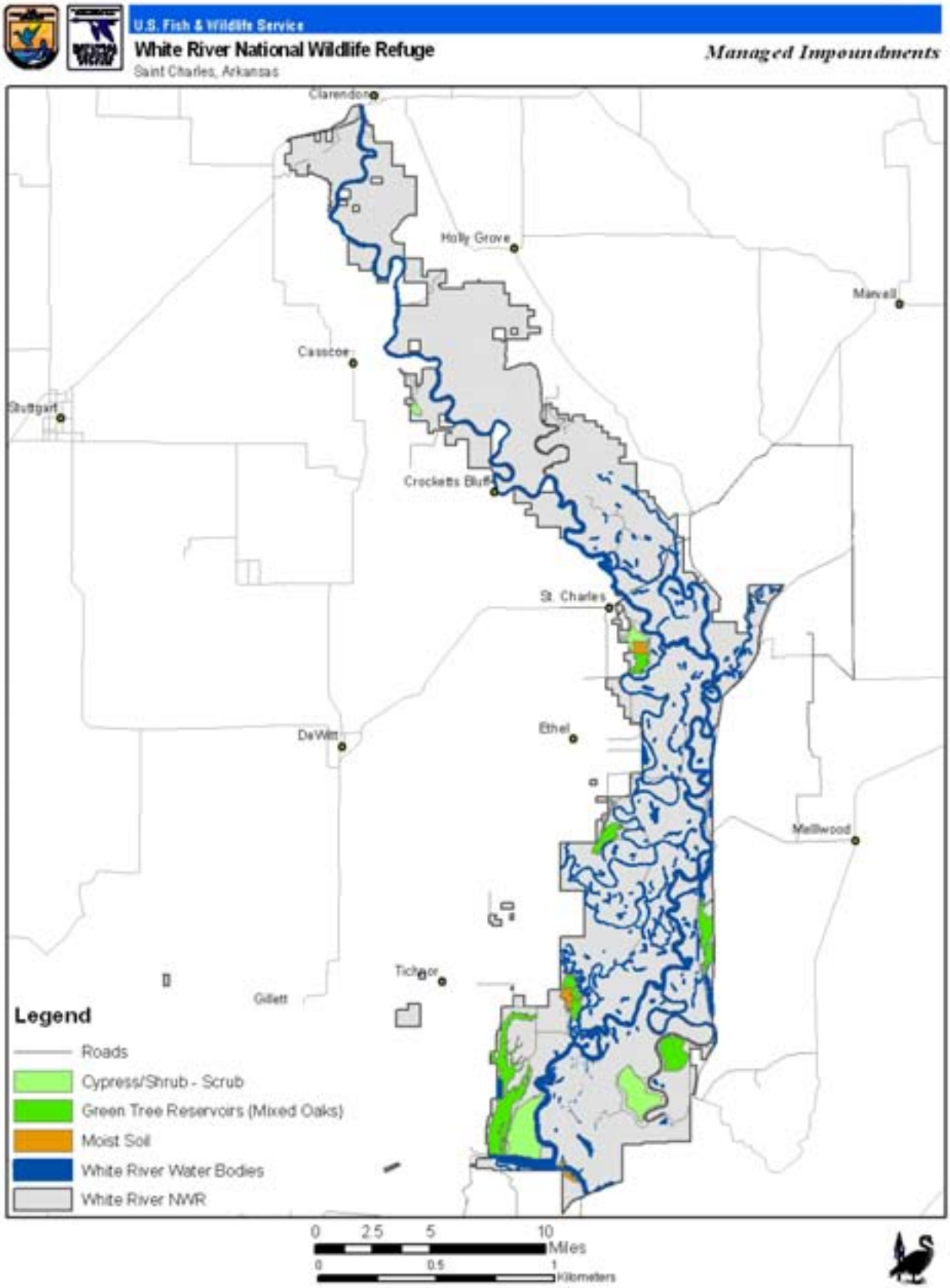
During dry cycles, water levels on most of the 300 oxbow lakes/sloughs/bayous begin lowering, which allow natural moist-soil vegetation to become established. It is not known how many acres of habitat are provided in this manner, but believed to exceed several hundred acres each year. Unfortunately, there is no control of timing and depth of flooding, since it is dependent on rainfall/natural flooding, and due to this fact these acres are not included in the step-down objectives for waterfowl. Additionally, several thousand acres of annual plants are also produced in the forest, particularly where forest thinning operations have recently occurred. Again, these acres are not included because of the lack of control on timing and depth of water levels.

Past water management on the refuge has been typical of water regimes utilized in GTRs, with an emphasis on hunting conditions rather than forest productivity and sustainability. Water was added to some GTRs at precisely the same time each fall in order to have huntable water in areas open to duck hunting. Even in non-hunted areas there was a tendency to flood annually early in the fall, without regard to the normal year-to-year flooding variability (i.e., some years are dry with little flooding while other years flooding would typically occur in late winter and spring). All structures were closed up in late September or early October to catch early rain. This was justified due to the unreliability of early winter rains and the critical need to have water available in the early winter months. Repeated early season flooding has resulted in stressed and dead blocks of forest stands, which are converting to a monoculture of buttonbush habitat, principally in Levees A and B impoundments. This problem has also been exacerbated by beaver activities.

Currently, White River NWR has the capability to provide habitat for wintering waterfowl at 31 structures/impoundments and/or fields which have varying degrees of water level management capabilities. It should be mentioned that only eleven of these impoundments are considered to have complete water management capability using LMVJV standards. As an example, Dry Lake and the Demonstration Area are two sites that have held the highest numbers of ducks of any of the refuge impoundments, yet they are influenced by the Mississippi River and White River, respectively. These two impoundments also lack a reliable water delivery system and are totally dependent on rainfall/watershed flows from streams in which the impoundments were constructed. In many cases, the water may arrive as late as mid-December and in three of five years backwater completely inundates both impoundments, only making them “functional” one to two months each year. In many cases, particularly at Dry Lake, water depths can exceed 10 feet over most of the lake during late winter and spring.

At this time only the small ponds, moist-soil impoundments, and flooded fields on the Farm Unit are considered to have complete water management capability, where the timing, depth, and duration of flooding can be controlled with water control structures and irrigation wells.

Figure 7. Impoundments with management capabilities on White River NWR



The intensity of management has also changed drastically over the past few decades. In the 1950s through the early 1990s, Dry Lake and the Demonstration Area were farmed intensively by refuge staff who planted corn, milo, and moist-soil and Japanese millet. Up until the early 1990s, two full-time employees were permanently assigned to Jacks Bay, and among their duties were to manipulate crops and water levels on Dry Lake, Goose Lake, Levee A, Levee B, Wolf Lake, Big White, Parrish, Oxbow, and several other structures; however, as the staff was reduced, these full-time positions were moved to a central location. The same scenario was true of the east side of the refuge, where staff assigned to the Levee building intensively maintained structures including Duck Rest Levee, Lower Taylor, Upper Taylor, Six Mile, and Alligator, as well as selected structures on the levee.

Today, only a portion of these impoundments remains functional. The most elaborate water delivery system was constructed by the COE and was mitigation for construction of the McClellan-Kerr Navigation System, yet today it does not function as originally planned. While it is still capable of delivering free and unlimited water, a majority of the delivery ditches are silted in as a result of runoff from agricultural operations upstream in Honey Locust Bayou. The system was originally designed to deliver water to Dry Lake by directing gravity flow water from the Arkansas River Navigation System at Lock 2 into Levee B impoundment. As B impoundment began filling up, water began backing north and overflowed into Wolf Bayou, where it finally moved downstream into Dry Lake. This was a long process, which typically began in late September or early October. Flooding Dry Lake occurred at optimum times and depths; however, today this is now impossible due to heavy siltation and beaver dams. Even in the late 1980s, a bulldozer was used each summer to maintain the “dragline ditch.” Once this work was stopped, the ditch completely filled, making this system non-functional.

In addition to these management units, the refuge has 356 natural lakes, sloughs, and ponds, as well as the White River. It should be noted that in most years the majority of these natural lakes are not as productive as the managed units due to the lack of sufficient food; however, during low water levels in the summer months many of these lakes do produce a wide range of moist-soil aquatic species utilized by waterfowl. This can change during routine overbank flooding, when the entire floodplain is inundated, and today the refuge as well as the Lower White River floodplain continues to operate in a somewhat “normal” pattern in that the river provides seasonal overbank flooding. From the standpoint of waterfowl, timing, depth, and duration must be correct if they are to obtain maximum benefits from the 150,000 acres of bottomland forest habitat.

Forest Management

As noted in the discussion under refuge habitats above, White River NWR is dominated by forests, particularly bottomland hardwoods. Approximately 150,000 acres of the refuge are forested. Currently, forests on the refuge are managed according to the 2007 update of the Forested Habitat Management Plan (FHMP).

Forest Management History

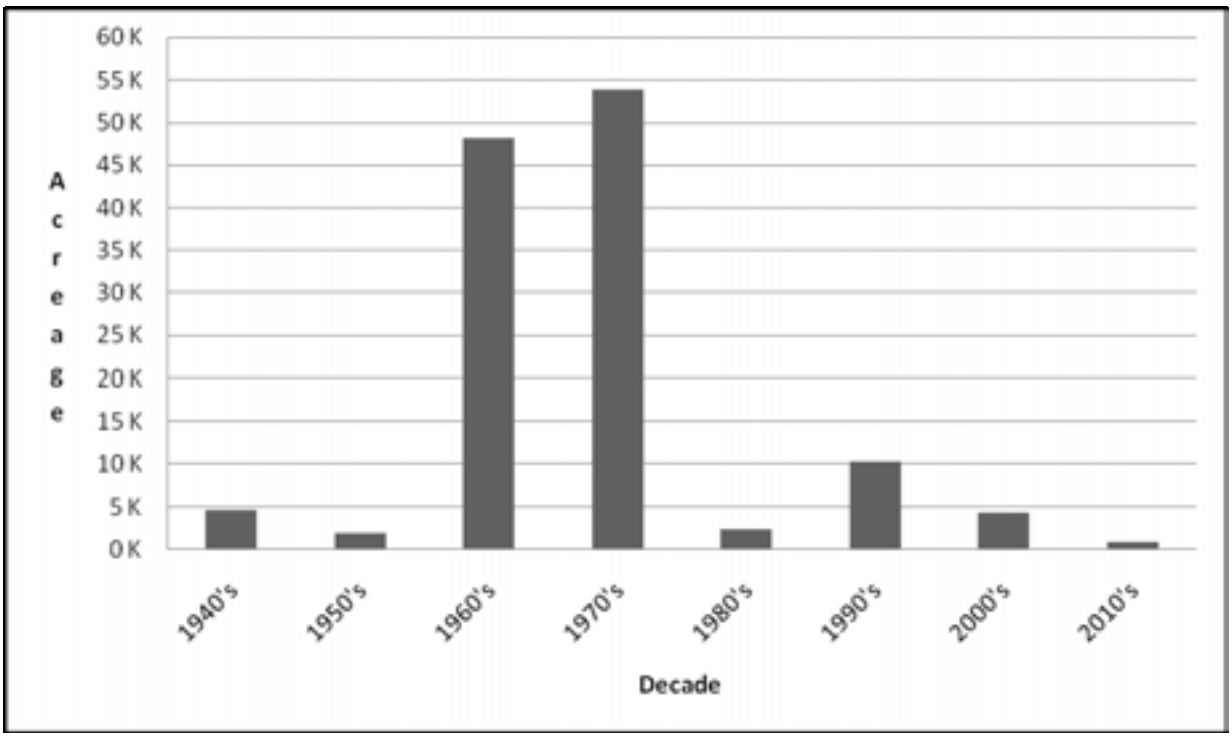
Prior to the refuge’s establishment and subsequent land acquisitions, some of the timber on much of the refuge had been cut by previous owners. The Service prepared Forest Management Plans in 1948, 1957, 1966, 1977, and 2001 (approved in 2002). The 1948 plan resulted mostly in protection of the forest from fire and timber trespass. Extensive management of the forest for wildlife habitat was implemented by the 1957 plan and continued under the 1966 plan. During that era, most of the refuge was selectively cut for a combination of sawlog removal, sanitation, stand improvement, and regeneration establishment objectives.

Early records of timber harvests are scarce. There are a few accounts of harvesting beginning in 1944 following a wind storm. The areas affected were Stinking Bay and Moon Lake/Belknap Lake area and north of Highway 1 to Waters Bayou. Only broken and downed trees were removed during this time. The total area harvested was 2,500 acres at Moon and Belknap Lakes and 1,400 acres at Stinking Bay. Prior to this event only timber reservations were harvested (no records).

In 1945 an experimental harvest was conducted on what is now compartment LV5 east of Scrubgrass Bayou. This was initiated by recommendations from the USDA Forest Service. The treated area was 696 acres in size and only sawlogs 13" and greater were taken out. Subsequent harvests did not occur for another 10 years.

Three cutting or harvesting cycles have occurred on the refuge. In the first, from 1944-1975, almost 100,000 acres were treated. The second cutting cycle was from 1976-1998, during which approximately 17,100 acres were treated. The third cutting cycle, from 1999 to the present, is ongoing; to date, just over 7,100 acres have been treated. Figure 8 denotes the forest management history at the refuge.

Figure 8. Acres of forest thinnings at White River NWR by decades, April 2010



The current FHMP was completed in 2001 after an extensive and exhaustive process that included two public comment periods. Most of the collaboration occurred from the formation of a large interagency and interdisciplinary workgroup. The workgroup was fundamental in formulating the Desired Future Conditions (DFC) and management techniques to achieve those conditions.

Additionally since the FHMP was approved, the Forest Resources Conservation Working Group (FRCWG) of the LMVJV has been in the process of determining Desired Forest Conditions (also DFC) for trust wildlife resources, including IBWO (Wilson et al. 2007). The LMVJV is a wide-

ranging partnership of state wildlife agencies, non-governmental agencies, and federal agencies, including the Service. The FRCWG has been noted as the epitome of the LMVJV partnership in cooperation, efforts, and results. Even though both the FHMP and the FRCWG have determined Desired Future or Forest Conditions, they are different, yet fully compatible. They describe the same thing in a different manner.

Service policy requires habitat management plans be reviewed every 5 years for revision. This and the recognition of the presence of IBWO on the refuge necessitated the FHMP be updated in 2007. The 2007 Update related the refuge's DFC as included in the Forest Plan to the LMVJV Working Group's DFC. This facilitated assessing how the refuge's forest conditions fit into the landscape level planning sought by the LMVJV partners.

The 2001 FHMP is the fourth forest management plan on White River NWR implemented by the Service over a 55 year span. Most of the forest has been thinned periodically to enhance wildlife habitat. One area of about 1,000 acres (Sugarberry Research Natural Area) is not known to have been cut, but may have had some cutting in the 1800s for steamship fuel if nothing else. Another area of about 3,700 acres (Mink Bayou Natural Area) has not been cut since the late 1930s. Additional areas have been denoted in the 2001 FHMP as Natural Areas such that a total of over 11,000 acres are now designated as Natural Areas where tree cutting is not to occur.

The basic tenets of the 2001 FHMP were as follows:

- Increase the proportion of forest in a multi-canopied condition.
- Increase the proportion of forest that is species diverse.
- Increase the proportion of forest containing larger diameter class trees.

The FHMP also noted the following types and percentage of the forest:

Type	% present	% desired future condition
Oak-sugarberry	30.0%	40.0%
Overcup oak-Bitter pecan	30.0%	25.0%
Oak-gum	25.0%	20.0%
Cypress	4.0%	4.0%
Cypress-tupelo	3.0%	3.0%
Tupelo	0.5%	0.5%
Sugarberry-Pecan	3.8%	4.6%
Cottonwood	1.0%	0.2%
White oak-Red oak-Hickory	1.0%	1.2%
Willow	0.5%	0.5%
Pine	0.2%	0.0%
Scrub/Shrub	1.0%	1.0%

With implementation of the current FHMP, the annual evaluation of habitat condition has been conducted on 39,935 acres of land with 35,275 acres of forest (24 percent of refuge forest). The majority of those areas (18,925 acres, 13 percent of refuge forest, 54 percent of areas evaluated) were deferred from having forest thinnings implemented. This decision was based on current and projected habitat conditions. Restated, the condition of the habitat was adjudged to be achieving DFC without further intervention at that time. Those areas were purposely not disturbed or manipulated via treatment.

During the same time, about 11 percent of the refuge forest (46 percent of areas evaluated) was planned to have habitat enhancement via mostly thinning. Since implementation, about 5,175 acres (3.5 percent of refuge forest) were manipulated, typically using thinning treatments. The exception was 40 acres of native hardwood restoration that removed non-native pines. In early 2005, a moratorium on timber harvesting was instituted refuge-wide, in response to the IBWO rediscovery. The moratorium provided time to examine potential effects of forest management on IBWO and conduct an abbreviated inventory of the entire refuge forest to assess habitat conditions for IBWO. The moratorium was lifted in 2008 and forest thinning resumed in 2009. Wet conditions limited thinning in 2009, yet dry conditions in 2010 resulted in oversupply at local mills causing quotas on deliveries and thus logging.

The tendency of the forest along White River is for the overstory trees to continue to compete for available sunshine. Of the life requirements of plants on the refuge, nutrients and water during the growing season are not limiting factors except on a few hundred acres of upland ridges. Sunshine is the limiting factor and the trees will capture nearly all available sunlight until a disturbance opens up the canopy. Natural disturbance rates distributed across the MAV in the pre-Euro-American period forest must have provided sufficient canopy gaps for disturbance-dependent wildlife to thrive. As the MAV forest is disturbance-dependent (storms, floods, and river meandering), all native wildlife must also be somewhat disturbance-dependent. With widespread conversion of habitats to agriculture and other non-forested habitat, natural disturbance now occurs across fields and towns instead of forest.

The habitat benefits of a number of introduced disturbances accumulate, and then diminish over time. About three years post-thinning, the vegetation growth has been stimulated by the additional sunlight available to the lower layers of habitat. After 10 to 15 years, depending upon the level of disturbance, the midstory and/or overstory closes up, shading out the ground layer and understory. The heavy shade results in the loss of the lowest layers of habitat until another disturbance breaks up the closed canopy.

About 16 percent of the refuge forest is currently considered within DFC's, either from thinnings in 2003 – 2004, prior to the moratorium, or in stands that are inherently within DFC's such as Cypress or Tupelo. To achieve DFC's on the 35 – 50 percent of the forest as recommended by the Workgroup and noted in our Biological Review, thinning could be conducted on 3.5 – 5 percent of the refuge forest yearly, equating to about 5,250 – 7,500 acres annually. The consequences of not implementing thinnings are that the refuge forest will remain severely deficient in Desired Forest Conditions, and thus deficient in productivity as wildlife habitat on about 100,000 acres.

Fire Management

Fire is an important tool for sustaining and restoring grassland habitats. White River NWR possesses these native savannah and nonnative grasslands. Fire history for these areas is not known.

Neither the White River Bottom nor the flooded delta habitats appear to be dependent on fire. Fire does not seem to have an ecological function in these areas and fire may have a negative impact on the habitat. During the last 30 years there have been 18 wildfires, which burned a total of 192 acres on the refuge. The largest fire burned 80 acres in 1965. The smallest fire burned 0.1-acre in 1993. Four of the fires were in the interior of the refuge. The other ten fires were on or near the refuge boundary. Almost all of the fires have been described as slow-moving or smoldering and were readily extinguished. Despite the fact that farmers have been burning their wheat and rice stubble annually for decades on lands adjacent to the refuge, the Arkansas Forestry Commission has no historical records of major wildfire occurring within the White River Bottoms.

Fire Effects on Vegetation, Fuels, Wildlife, Air Quality, and Soils
Wildfires kill or severely damage seedlings, saplings, and pole-sized trees, and can damage large trees. Fuels would be consumed by fire. Most fuel loads are less than a 3-year buildup, due to rapid decomposition. Most wildlife can escape from creeping fires, the most common fire type on the refuge. Air quality is temporarily impaired by the smoke of fires. Organic materials in the top layer of soil can be consumed by fire.

Fire Management Objectives
The fire management objectives for the refuge are to protect life, property, and other resources from unwanted fire. In addition, prescribed fire will be used to accomplish resource management objectives, including the management and restoration of prairie-savanna habitat type. The specific objectives of the refuge's Fire Management Plan (FMP) are to protect from fire important wildlife, scientific, historic, and scenic resources; key visitor and administrative facilities; and to use fire as a tool for enhancing habitat for indigenous species and migratory birds including waterfowl.

The refuge fire management strategies are to:

1. Confine all wildfires.

2. Control low-intensity wildfires.

3. Control wildfires threatening private property or refuge facilities.

4. In addition to reducing hazardous fuels, prescribed fire will be used to accomplish resource management objectives.

5. No earth work will occur around archaeological sites, including Native American Mounds.

The FMP stipulates that all wildfires will be confined to reduce the damage to resource values. Although historically fire has had little if any significant effect on the value of the refuge's natural resources, it would be imprudent to let fires burn unchecked. Therefore, wildfires will be confined. If wildfires are of low intensity, with flame length less than one foot, then direct attack will be used to control the wildfire.

Wildfires on the refuge that threaten private property will be controlled. Although this option is more costly than confinement, it is important to maintain good relations with refuge neighbors and to reduce the likelihood of litigation that may result from fire escaping the refuge and causing damage to private property. Prescribed fire may be used to reduce hazardous fuels and in habitat enhancement particularly in the Prairie Restoration Area.

Invasive Species Management

Invasive Plants
Invasive plants have not been a pressing issue on the refuge due primarily to the routine and long duration of flooding. Flooding that occurs from backwaters of both the White and Mississippi Rivers quickly extinguish colonization efforts of invasive plants; however, there are several species established on the higher portions of the Grand Prairie Terrace.

There are also several species which are listed as “normal crop pests” that include Johnson grass, Sesbania, and shattercane, and these species are covered in the Farm Management Plan. At this time the refuge does not have a formal monitoring program because of the relatively small areas infested by the invasive species in the list below (Table 7).

There are a number of exotic ornamentals on and/or adjacent to the refuge residences which have been transplanted on these sites since the 1930s. These have been identified from the residences on the refuge: mimosa, Chinaberry, forsythia, orange day lily, yucca, and crimson clover.

Invasive Animals
At this time there are several known vertebrates listed as invasive on the refuge which are wild hogs, Eurasian collared doves, carp (e.g., silver, grass, bighead and common), and nutria. All of these are covered in the Nuisance Wildlife Plan.

Wild Hog – There have always been sporadic reports of wild hogs on the refuge; however, no efforts were made to collect actual locations until 2005, when deer hunters were asked to report and document locations of wild hogs. Hogs have been reported from both the North and South Units. At this time there does not seem to be a consistent location or any quantifiable numbers on population densities; however, hogs have been reported from both the North and South Units. the greatest concentration of hogs species appears to be on refuge property managed under cooperative agreement with AGFC as a portion of Trusten Holder WMA lands. In 2007-08, refuge staff killed eight hogs which were attracted to the wood duck bait site on the Demonstration Area and during high water conditions were on the Farm Unit. Information obtained from local residents also disclosed information that a large number of hogs had been released on private property immediately west of the Demonstration Area. This species, like the invasive plants above, is susceptible to long duration flooding occurring on the refuge.

Table 7. Invasive species and their locations on White River NWR

Common Name	Scientific Name	Approximate Acres	Location
Bermuda Grass	*Cynodon dactylon*	50 ac	OVC/Farm Unit
Kentucky 31 Fescue	*Festuca arundinacea*	50 ac	Farm Unit
Kudzu	*Pueraria lobata*	5 ac	Wilcox Acres
Chinese Privet	*Ligustrum sinense*	10 ac	OVC/Compound
Zoysia Grass	*Zoysia japonica*	2 ac	OVC
Loblolly Pine	*Pinus taeda*	120 ac	Farm Unit/
Water Hyacinth	*Eichhornia spp.*	Unknown acres	Levee A/B Impoundments
Didymo (algae)	*Didymosphenia geminata*	1,000 ac	Levee A/B Impoundments
Japanese Honeysuckle	*Lonicera japonica*	5 ac	GP Terrace
Chinese Bamboo	*Bambuseae*	1 ac	Farm Unit
Japanese climbing fern	*Lygodium japonicum*	1 ac	Levee

Nutria – Nutria are present in moderate numbers, particularly on the South Unit near Jack's Bay. They are not causing any observable problems with habitat or with native aquatic mammals at current population levels.

Invasive Birds – There are several invasive birds being observed within the compound, OVC, and around the Farm Unit and other locations that include the Eurasian collared dove, starling, and house sparrow. To date none have been observed nesting or using the bottomland habitat.

Fish – Common carp are found throughout most refuge waters and in more recent year's silver, grass and bighead carp are being found in greater numbers in the White River and associated refuge waters. These invasive fish species compete with native species for the same food resources and typically cause greater water turbidity as a result of bottom feeding activity.

Invasive Invertebrates – At this time the only known invasive invertebrate is the Asian clam.

Waterfowl Sanctuary and Hunting

White River NWR was established as an inviolate sanctuary in 1935 and during these early years no persons were allowed to enter the refuge except from March 1 to November 1, when it was open primarily for fishing. In 1955, very limited and restrictive hunting opportunities began opening up for deer and small game, and it was not until 1979 that the first duck season opened.

In 1979, waterfowl hunters were allowed to hunt the Levee B, Levee A, and Wolf Bayou impoundments on the Jack's Bay section of the South Unit. A year later, in 1980, hunters were given access to the Duck Rest Levee; however, hunting was closed in 1990 due to the fact that few hunters were using the Duck Rest Levee

In 1992, additional lands were obtained north of Brown Shanty Lake when the Potlatch Land Exchange occurred. With this addition, all lands north of Highway 1, including approximately 10,000 acres of original refuge lands, were opened to waterfowl hunting. This portion of original refuge land had been closed to waterfowl hunting since 1935. Currently, the only sections closed to waterfowl hunting on the North Unit are the Cook's Lake and Kansas Lake areas, the latter of which was purchased with Migratory Bird Conservation Funds.

While hunting pressure varies from year-to-year, the majority of all private lands surrounding the refuge receives intensive waterfowl hunting pressure each season. Due to its strategic location in the heavily hunted MAV, coupled with the ability of the refuge to manage for a concentrated source of high-quality waterfowl food resources, White River NWR provided critically important waterfowl sanctuaries. These established sanctuaries must remain in place in order to provide areas free from disturbance to wintering waterfowl.

In contrast to the heavily hunted North Unit, with the exception of the Jack's Bay area, the entire South Unit is closed, providing sanctuary for waterfowl. In contrast, the entire North Unit is open to hunting, with only the Cooks Lake and Kansas Lake areas designated as a sanctuary.

VISITOR SERVICES

White River NWR provides all of the Service's priority wildlife-dependent recreation uses to the public: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Public Access

Most of the 160,000 acres on the refuge have suitable access with the exception of the North Unit, which many refuge users access from the river via several boat ramps or through private lands on the east boundary. All boat ramps on the river are maintained by AGFC but other sites (e.g., East Lake, Green Lake and Maddox Bay) are on private land and those wishing to access the refuge are typically required to pay a fee to launch a boat ($5) or unload their all-terrain vehicle (ATV). Numerous attempts have been made to purchase land that connects the east boundary line with Highway 17, but there have been few willing sellers and property prices have been above appraised value, thus preventing purchase.

At this time the refuge maintains 72 listed roads which are 98 miles long in aggregate (Figures 9 and 10). Of these roads there are 95 miles of gravel roads and 3 miles of asphalt roads. Most of these roads are open to the public and provide opportunities to hunt and fish by reaching campgrounds, ATV trailheads, and refuge lakes. Most of the refuge lakes also have boat ramps in varying conditions that allow fishermen to launch boats.

The refuge also periodically utilizes approximately 477 miles of dirt forest management roads. Hunting and fishing related ATV use is currently allowed on some 357 miles of forest management roads. In addition, the refuge maintains some 26 ATV trails totaling approximately 50 miles that provide wildlife-dependent hunting and fishing access primarily to the some of the more popular yet remote refuge lakes. Both the dirt forest management roads and ATV trails are actually multi-purpose trails and are not only open to use by ATVs for hunting and fishing related access , but also to foot travel or bicycle (i.e., mountain bikes), as long as the user is actively engaged in wildlife-dependent recreational activity. The refuge also maintains six foot trails for hiking and associated wildlife observation. Roads and trails on the refuge are summarized in Table 8.

Table 8. Summary of roads and trails at White River NWR

Feature	Number	Length
Roads	72	98 miles
Gravel	63	95 miles
Asphalt	9	3 miles
Dirt Forest Mgmt.	326	477 miles
ATV	26	50 miles
Foot	6	5 miles

Current campgrounds include ten sites which are open all year and 14 campgrounds that are only open March 1 to December 15 each year (Figures 11 and 12). Peak use of these campgrounds is during refuge quota deer hunts, archery deer season, squirrel seasons, and furbearer season.

Fishermen utilize selected campsites during the spring and early summer, but to a lesser degree than the hunters. Currently, the only available campsites outside the refuge are provided by the COE at Merrisach Lake (near Jack's Bay) and three private campgrounds in St. Charles, Clarendon, and Maddox Bay Landing. However, these are used minimally compared to refuge campgrounds.

Figure 9. North Unit roads and bridges, White River NWR

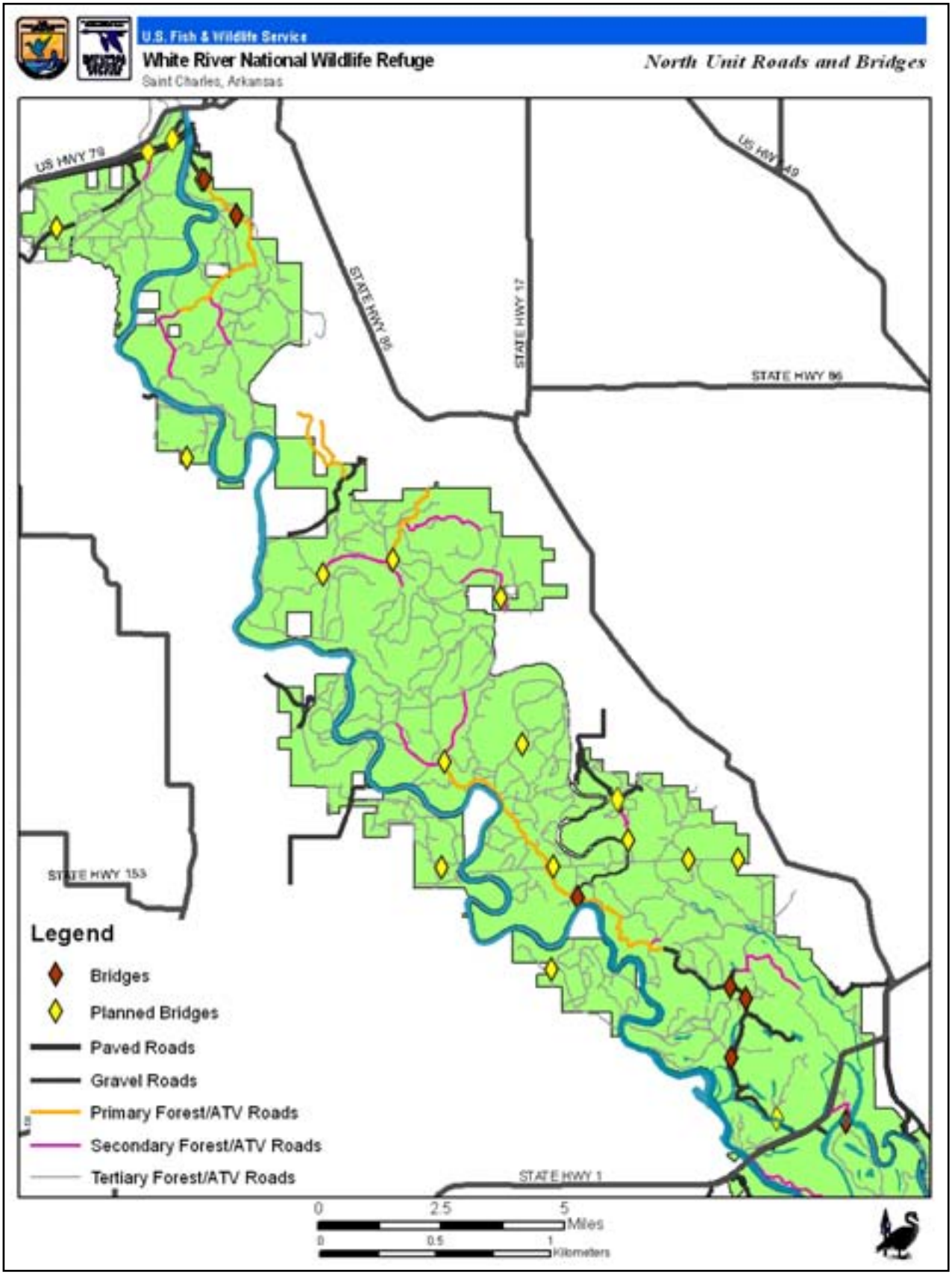


Figure 10. South Unit roads and bridges, White River NWR

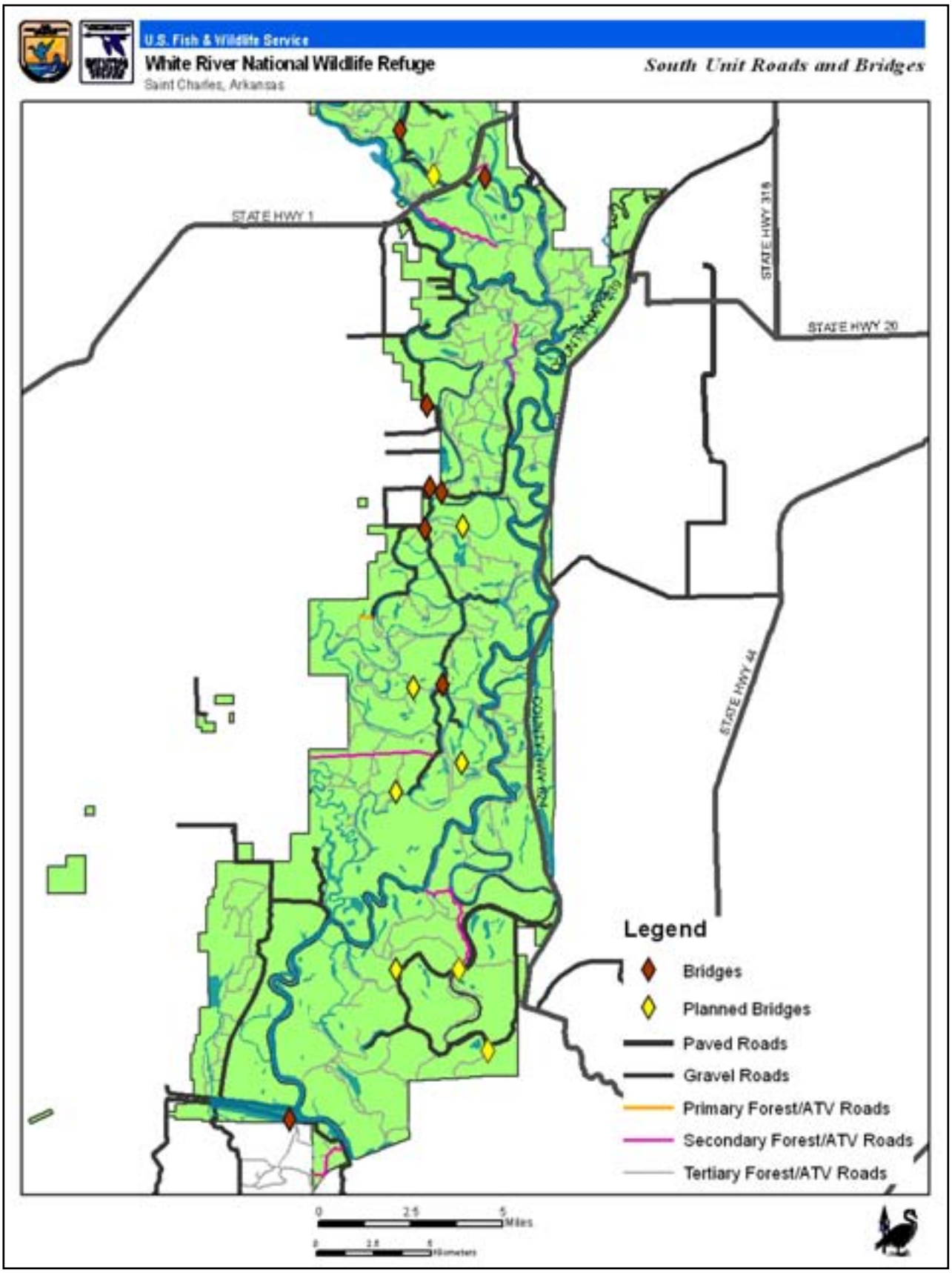


Figure 11. Public use areas – North Unit, White River NWR

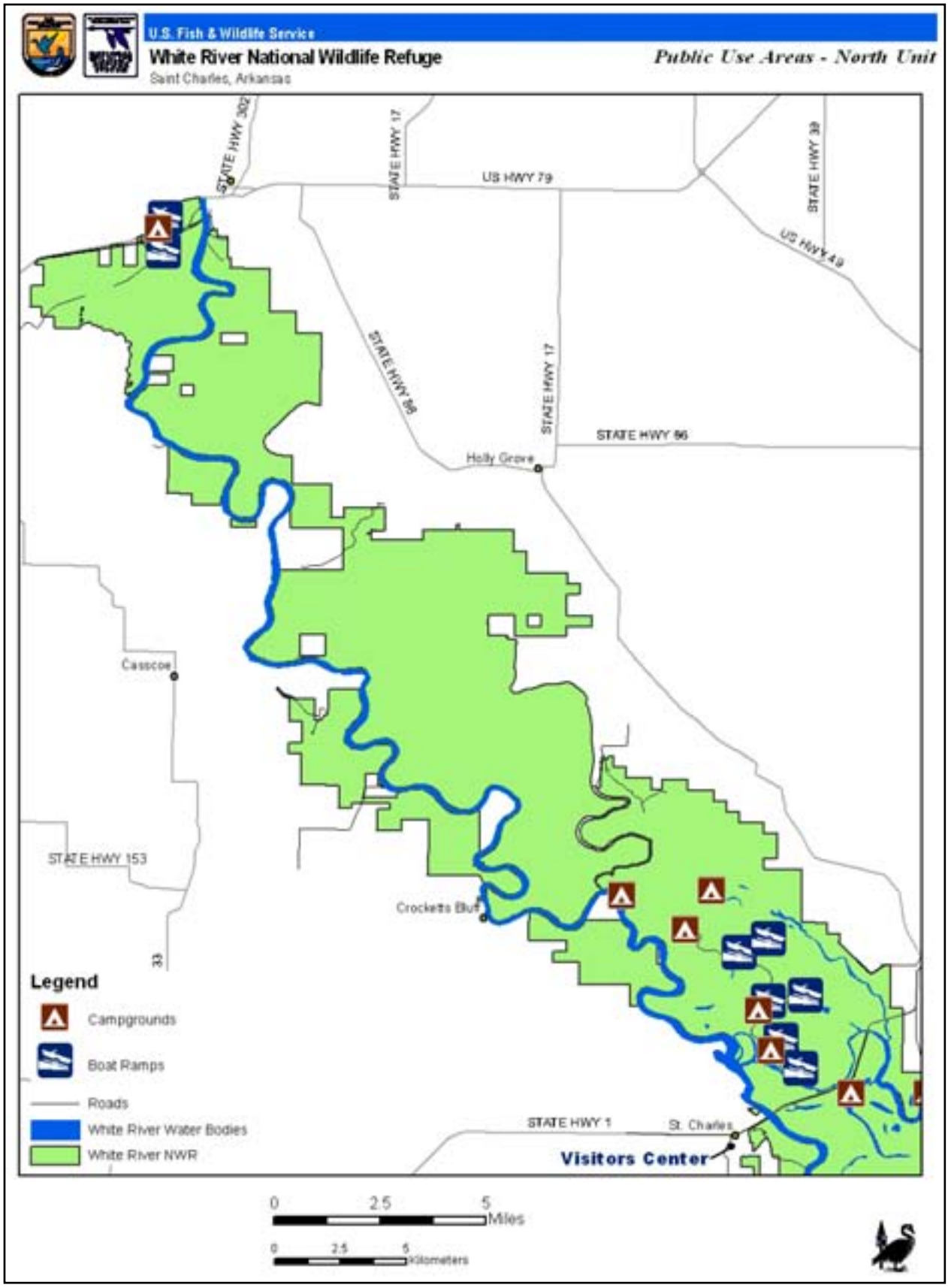
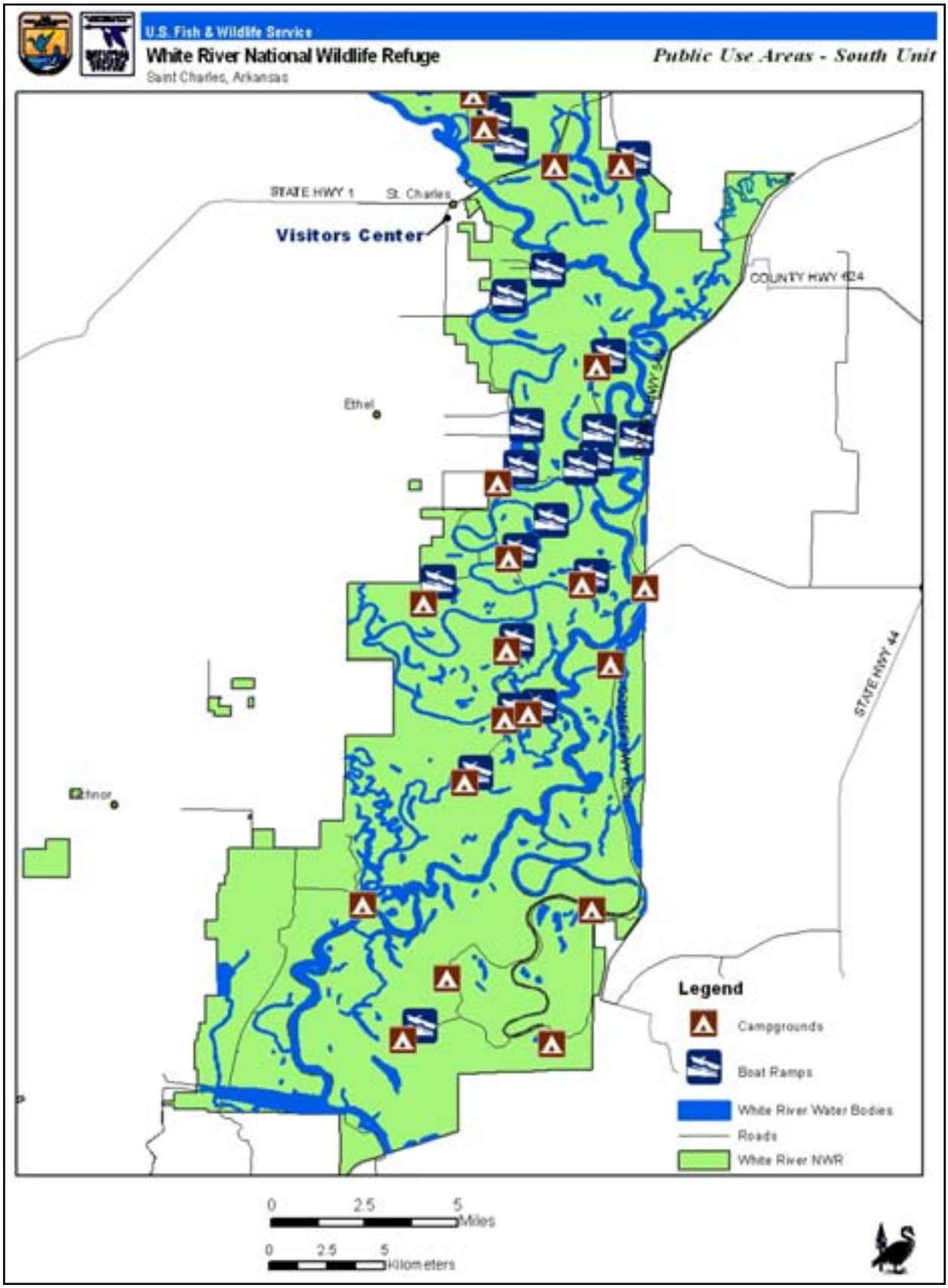


Figure 12. Public use areas – South Unit, White River NWR



Boat Ramps
Table 9 shows lakes that have “improved” boat ramps and are accessible by gravel roads. There are also well over 100 small “unimproved” boat ramps that are only accessible by ATV.

Table 9. Refuge lakes with improved boat ramps and gravel road access

North Unit				
Buck Lake	Swan Lake	Little Moon Lake	Brushy Lake	Lambert Bayou
Goose Lake	Old Town	Passmore Bayou		
South Unit				
Prairie Lake	H Lake	Wolf Lake	Columbus Lake	Long Lake
Escronges Lake	Burnt Lake	Jones Lake	Round Lake	Little White
Frazier	Horseshoe	Gut	Covington Lake	Turner Lake
Lower White	East Moon	Chute	Indian Bay	

All refuge lands on the South Unit typically open March 1 for public access unless delayed due to White River flooding stage. The primary entrances for the refuge to public access are shown in Table 10.

Hunting

White River NWR offers the public a wide range of hunting opportunities including seasons for archery, muzzleloader, and modern gun as well as special opportunities for youth and mobility impaired hunters. The refuge is well known for producing numerous Boone and Crocket and Pope and Young class white-tailed deer as well as for quality waterfowl hunting in the flooded bottomland forests. Deer hunting remains the most popular season, followed by, waterfowl, squirrel, furbearers, and turkey. Each year approximately 114,000 visitor use-days of hunting are logged (USFWS 2008c).

In addition to these hunting seasons, White River NWR hunters also have the opportunity to harvest beaver, nutria, muskrat, and feral hog, incidental to any daytime hunt with weapons that are legal for that particular hunt.

The refuge is divided into the North Unit and the South Unit, with each unit having slightly different hunting season frameworks due to their period of acquisition and associated refuge purposes. All of the outlying tracts are open concurrent with all statewide seasons/regulations, with the exception of black bear hunting, which is closed on all refuge out tracts and cooperative land (AGFC Trusten Holder WMA).

Gun (modern and muzzleloader) deer hunting is through a quota system with typical quotas ranging around 3,000 and 1,000 permits issued for the South and North Units, respectively. Approximately 80 percent of selected quota hunters deer hunters remit a $12.50 fee for their quota permits and approximately 80 percent of those hunters actually participate in their selected hunt. The annual refuge deer harvest averages 700 deer from all archery, muzzleloader, and modern gun hunts (USFWS 2008a).

Table 10. Primary public access entrances for White River NWR

Access Name	# Lakes Access	Total Acres Accessed	Road Open (all year) or (seasonally)
Clarendon Boat Ramp*	River		All year
First Old River *	2	4,445	All year
Lost Lake		1,080	All year
Red Cat		6,020	All year
East Lake* (Private Fee)			All year
Green Lake* (Private Fee)			All year
Johnson's Access (Private Fee)		10,585	All year
Aberdeen Boat Ramp*	River	800	All year
Preston Ferry Boat Ramp *	River		All year
Cooks Lake	1	1,940	Special Use
Little Round Pond		1,695	All year
Maddox Bay Landing* (Private Fee)			All year
Kansas Lake *	2	4,725	All year
North Unit Road Hwy 1 *		20,965	All year
South Unit Hwy 1			All year
Belknap Lake *		4,170	All year
Moon Lake *		645	All year
Indian Bay *		2,200	All year
Indian Bayou (Hwy 1) *		620	All year
Indian Bayou (east)		640	All year
St. Charles Boat Ramp	River		All year
OVC CC Camp Road		2,395	All year
Frazier Lake Road			Seasonal
Farm Unit		1,765	Special Use
Horton Landing			Special Use
Jones Lake			All year
Big Island		8,515	Seasonal
Smokehouse Hill		28,315	Seasonal
Webber Boat Ramp	LaGrue		All year
Jacks Bay Road		6,940	All year
Jacks Bay Boat Ramp	River		All year
Levee B Road		5, 680	Seasonal
Wild Goose Boat Ramp *	River		All year
Trusten Holder WMA Road		1,935	All year
Levee Road (south)		3,070	Seasonal
Levee Road (north)		4,430	All year
Levee Road (Mellwood)		6,575	All year
Levee Loop Road		23,680	Seasonal
Pumping Station Boat Ramp *	River		Seasonal
Hudson's Landing Boat ramp *	River		All year
Big Creek Road (from Levee)			All year

* Indicates boat ramp with access from outside refuge

Waterfowl hunters are restricted to two locations. The Jack's Bay section located on the South Unit is open to waterfowl hunting Saturday, Sunday, Tuesday, and Thursday, while the North Unit is open to waterfowl hunting each day of the season. Waterfowl hunters in both locations must not enter the hunt area earlier than 4 a.m., with waterfowl hunting closing at 12 Noon and hunter exit required by 1 p.m. Waterfowl hunters wishing to hire guides can do so, since the refuge allows commercial waterfowl hunting guides access to specified areas of the refuge. Each year 17 commercial waterfowl guide permits are offered in a random drawing to qualified guides.

Furbearer hunting for raccoon and opossums with dogs is only allowed from sunset to sunrise. Hunters are also allowed to use horses during night hunting only. Prohibiting the use of dogs and horses during daylights hours helps minimize conflicts between furbearer and archery deer hunters.

In addition to waterfowl hunters using retrievers, other hunters are also allowed to use dogs (during daylight hours only) for hunting squirrel and rabbit on the North Unit.

Table 11 provides a chronology of the refuge's hunting opportunities and milestones.

Commercial Waterfowl Guiding

White River NWR is one of the few refuges in the country to allow commercial guiding for waterfowl hunting. Although it has been allowed on the refuge since 1993 under a special use permit, it was not until 2003 that the numbers of guides were restricted. Through the 1990s, the refuge's waterfowl harvest increased significantly, as did the number of waterfowl hunters. This resulted in a large increase in commercial guides requesting permits to conduct private operations on the refuge. Since 1993 the number of special use permits issued for commercial waterfowl guiding on White River NWR have ranged from a low of 21 during the 1994-95 hunting season to 43 permits during the 2001-02 hunting season. Following extensive public hearings and comment periods as required by NEPA, the refuge was divided into five guide hunt areas with a total of 17 commercial waterfowl guide permits available on an annual basis, with successful guides paying $1,900 dollars per year for a special use permit.

These 17 permits were available to commercial guide on 55,275 acres of refuge land currently open to waterfowl hunting. While this number of guiding operations seems low within this large acreage, there are only 4,395 acres which actually provide waterfowl habitat and hunting opportunities under normal (low) water conditions. Within this acreage, water areas suitable for duck hunting are restricted to oxbow lakes, sloughs, or scattered beaver ponds, while the Jack's Bay hunt area is the only portion of the refuge open for waterfowl hunting that has artificial flooding capabilities. While flooding is a natural event and occurs in most years, flood dates are variable, with high water occurring from late November to early June, and with flooding during waterfowl season typically occurring only one in five waterfowl seasons.

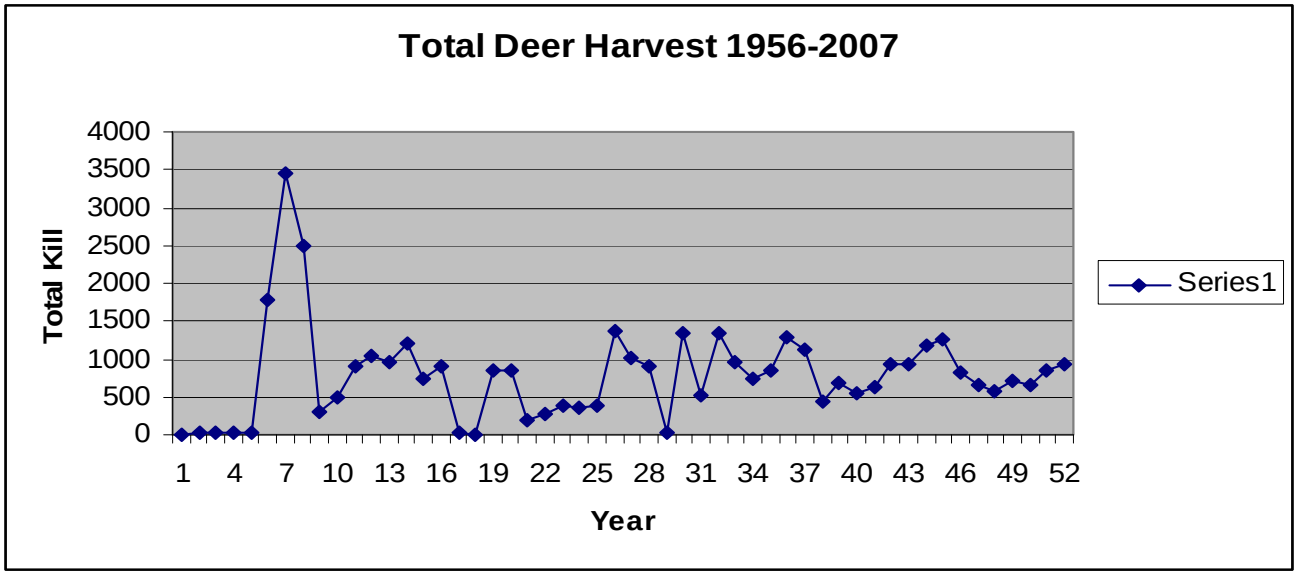
Limiting commercial waterfowl guides to 17 permitted guides per year was intended to help reduce crowding and conflicts between guided and non-guided hunters, while meeting standards to ensure refuge users a safe and quality waterfowl hunting experience. After meeting a list of minimum standards including past guiding experience on the refuge, no wildlife violations, possession of state guide license, First Aid/CPR training, insurance, etc., these guides are included in an annual drawing for designated sections of the refuge. Successful guides are then granted the right to guide hunters in assigned zones of the refuge, but do not have exclusive hunting rights to any specific site. Each refuge waterfowl hunting site is essentially available on a first come first served basis and subject to applicable Arkansas hunter harassment laws. The objective and justification for allowing waterfowl guiding is to provide the opportunity for a high-quality waterfowl hunt for that segment of the public lacking the knowledge and/or equipment required to hunt in flooded bottomland forests.

Table 11. Chronology of hunting milestones on White River NWR, 1932 to present

1935-1955	Refuge closed to all hunting; Fishing allowed from March 1 to October 31.
1956	Received approval to conduct a bow and arrow hunt for deer. Approval was also received to take squirrel, bobcat, rabbit, and raccoon with bow. Hunt was conducted from October 18 -31; 288 permits issued and 5 deer killed.
1957	Bow season October 16-31; 303 permits issued and 15 deer killed.
1958	First hunt plan prepared and submitted 6/5/1959; recommended archery hunt for deer and allowed incidental taking of squirrels, rabbits, and bobcats with bow.
1959	Prepared and submitted amendment to plan recommending gun squirrel hunt. First squirrel hunt; October 1-31; 4,200 permits issued. Deer archery season; October 8-31; 833 permits issued and 26 deer killed.
1960	Taking of squirrels, rabbit, and deer was approved by Central Office and notice was published in Title 50 of the *Code of Federal Regulations*. Squirrel hunt October 1-7; Archery Deer Hunt October 10-29; 808 permits issued and 27 deer killed.
1961	Prepared and submitted amendment to hunt plan recommendations, gun deer hunt. Squirrel Hunt October 2-8. Archery Deer Hunt October 12-30; 52 deer killed. First Gun Deer Hunt from November 16-1; 6003 permits issued and 1726 deer killed.
1967-	Prepared and submitted amendment to hunt plan recommending hunting of turkey and raccoon. First Gun Turkey Hunt (fall hunt) November 3-4; 1000 permits issued and 54 birds killed.
1968	No Turkey Hunt
1969	Squirrel, archery deer, gun deer hunts held; no turkey hunt; raccoon hunt scheduled but cancelled.
1970	First raccoon hunt; no turkey hunt scheduled.
1971	No raccoon hunt and no turkey hunt scheduled.
1972	First spring turkey hunt; 500 permits issued and 139 birds checked. Fall turkey hunt cancelled; no raccoon hunt.
1974	First muzzleloader deer hunt, fall turkey hunt, no spring turkey hunt, raccoon hunt held.
1978	First youth-adult deer hunt; no turkey hunt.
1979	Amended plan to allow waterfowl hunting. First duck hunt held. This was first year that all present day hunts were held.
1980	First January Archery deer hunt.
1988	Hunt plan was rewritten to incorporate all previous amendments; deleted doves, snipe, and woodcock from huntable species and added incidental taking of beaver and coyote.
2001	First Cook's Lake youth deer hunt
2003	First waterfowl season commercial waterfowl guiding services are regulated on refuge.

White-tailed Deer
As noted earlier, white-tailed deer are the most popular game species on the refuge. There is a long history of deer hunting at White River NWR, which began in 1956 with the first archery deer hunt and 1961 for the first gun deer hunt. The refuge was one of the first tracts of public land in the southeastern United States to implement either sex deer hunting, which was very controversial at that time. In 1974, the refuge implemented the first muzzleloader deer hunt, and in an effort to increase interest in this aspect of the sport, sponsored black powder shooting demonstrations and contests at the Chute Bridge. Figure 13 shows total deer harvest on the refuge from 1956 to 2007.

Figure 13. Number of deer harvested on White River NWR, 1956-2007



From 1961 to 1992, refuge deer hunts were managed identically as one unit. However, with the acquisition of the Potlatch land the refuge was divided at Highway 1 into the North and South Units. At this time hunters were provided more liberal hunting seasons on the North Unit while the South Unit remained unchanged from previous management. Deer hunters on North Unit hunts were provided a 3-day quota either-sex hunt with 8 days of additional buck only hunting in both the modern gun and muzzleloader season, following the close of the quota hunt.

Furbearers
Furbearers include the opossum, raccoon, striped skunk, river otter, beaver, mink, muskrat, nutria, red fox, gray fox, coyote, and bobcats. Hunting effort for furbearers has remained relatively steady over the years.

The refuge opened its first raccoon hunt in 1969. Only 45 hunters participated, harvesting 65 raccoons. By 1976 this number was increasing (as were fur prices) and hunters were allowed to hunt over wider areas of the refuge. In the 1976 Annual Narrative, one hunter reported killing 31 raccoons in one night.

While raccoon hunting continues to be a popular sport, the refuge no longer collects harvest information from hunters. From 2001-2006, spotlight surveys indicated that raccoons were the most numerous furbearers on the refuge. In 2002, spotlight results on established routes indicated that

raccoons were observed at a rate of 1.2/mile (1127.5 acres of visibility) on refuge roads while opossums were second at 1/4.8 miles (1110.39 acres of visibility).

Squirrels
By far the most popular small game hunting on the refuge has been squirrel hunting. Early reports indicated that as many as 5,000 squirrels were harvested on opening weekends of season. A 1969 Annual Narrative indicated that squirrel hunters logged “7,500 man-days killing 23,675 squirrels." The harvest in 1969 was 56 percent fox (red), 39 percent gray, and 5 percent fox (black). Today this percentage remains about the same. Average kills in the 1960s were 3.5 squirrels/hunter/trip, and in 1988 the figure was 3.32 squirrels per trip.

Rabbits
The refuge has both swamp and cottontail rabbits but their numbers are low. Hunting seasons for these species run concurrent with squirrel hunting. At this time there are no data on actual numbers harvested.

Black Bear
Black bear hunting is prohibited on the refuge but allowed on adjacent private lands. The bear harvest of 278 bears on adjacent private lands, along with the removal of 42 sows and 92 cubs from the refuge since 2000 have combined to reduce the White River NWR bear population. In 2000, the black bear population on the refuge was estimated at 300-500 animals.

Bullfrogs
The refuge allows harvest of bullfrogs concurrent with statewide frog seasons. At this point there are no harvest figures on numbers of "froggers" participating or number of frogs harvested during a season.

Turkey Hunt
Each year numerous hunters pursue turkeys during the spring (gobbler) hunt. The entire refuge is open concurrent with the statewide season. At this time the greatest concentration of turkeys is found at Jack’s Bay, Alligator Lake, and the Levee. Prior to the 2008 flood, it appeared that the turkey harvest had leveled off but the flock is strongly influenced by river levels.

Conflicts Between Hunter Groups
The refuge’s regulations have resulted in providing quality hunting opportunities for this user group, and many conflicts have been addressed, avoided, and minimized to a great extent. Currently, the most significant conflicts are between (1) dog (raccoon and squirrel) hunters and archery deer hunters, and (2) hunter groups using commercial waterfowl guides and freelance waterfowl hunters competing for the same hunting sites.

Fishing

Fishing on the North Unit is open year-round (January 1 through December 31) in conjunction with Arkansas fishing regulations (including size restrictions and limits), and depending on specific areas within the South Unit, fishing is closed from December through February 29 each year to eliminate disturbance to wintering waterfowl on refuge lakes and bayous.

The refuge currently has over 400 lakes and bayous, many of which are accessible to vehicles and boats using established boat ramps. There are many more isolated lakes which are not accessible by vehicle but can be accessed by ATV and many fishermen on the refuge use ATVs to pull smaller boats into these isolated lakes and bayous. Fishermen can also use boat ramps that are open all

year. Anglers have opportunities to catch largemouth bass, crappie, catfish, and sunfish. Recreational fishermen are also allowed to take frogs and crawfish.

Recreational Fishing
Popular species sport fisherman pursue have not changed over time: crappie, black bass (largemouth and spotted), bluegill, red-eared sunfish, and catfish remain the most sought after species. Many more species of fish are also present but not pursued; in fact, many of these are virtually unknown to the public. Species such as the flyer, taillight shiner, pirate perch, and swamp darter are all important species to the ecosystem.

The refuge has identified 481 water bodies, including both natural and manmade, ranging in size from 0.5-acre to 609 acres. Each provides outstanding opportunities for sport fishermen in the Lower White River System. The refuge sponsors an annual youth fishing derby that continues to be a popular event with local residents.

Commercial Fishing Activity
Commercial fishing has been used for many years as a way of utilizing excess numbers of nongame or rough fish such as buffalo, carp, drum, and catfish. From 1966 to 1989, commercial fish harvests ranged from 67,000 to 152,409 pounds. The refuge stopped collecting commercial harvest data in the late 1980s. The number of persons purchasing commercial tags has remained relatively steady. In 2008, the refuge had 19 requests for commercial fishing permits with 18 being issued at a cost of $50 per permit.

Wildlife Observation and Wildlife Photography

White River NWR is part of the Big Woods, where the endangered IBWO was discovered in 2004. Public lands within the Big Woods include White and Cache River NWRs; Dagmar, Rex Hancock/Black Swamp, Trusten Holder and Wattensaw Wildlife Management Areas; and Benson Creek Natural Areas. The odds of seeing an IBWO are miniscule, but the chance to experience the woodpecker's habitat and the forested backwaters of the nation's largest alluvial plain attracts many bird watchers from around the world. The Big Woods Birding Opportunities Web site, developed by the Service, includes maps and information on trails and canoe access points, search safety tips, and links to lodging and camping information (USFWS 2008c).

There is a large variety of wildlife to be observed on the refuge. The American black bear is one of the most sought-after species among wildlife observers and photographers. Spotting a black bear is generally a matter of being in the right place at the right time. The best chance for sighting one is from a boat by watching the shoreline of the lower White River.

Except for closed areas, vehicles are allowed on designated roads only. The refuge maintains 72 roads totaling 98 miles (95 miles gravel, 3 miles asphalt), 40 boat ramps, 26 campgrounds, and 5 miles of foot trails. The auto tour route is seasonally opened and provides opportunities for wildlife observation and photography and limits disturbances to wildlife and habitat. This route allows visitors to view a representative sample of refuge habitats. There are no vehicle pullouts for viewing wildlife.

Most of the public use facilities are maintained for hunters and anglers with the large network of forest management dirt roads where ATV use is permitted for wildlife-dependent hunting and fishing-related activites. These dirt road/trails are are also utilized by other refuge users, including passive activities such as birding and photography. Most of the refuge lakes are excellent for viewing and photographing wildlife. There are over 500 miles of these dirt roads/trails that provide public access to most of the refuge.

The refuge has 41 points of entry either by road, trail, or water (boat ramps). In addition, boat ramps are maintained by AGFC, the Levee Board, and COE at several locations. The refuge web site describes hiking trails including Upland, CCC, Big Island Chute, Champion Cypress Tree, and Observation Tower. These facilities are placed to provide good wildlife observation and photography opportunities while limiting disturbance to wildlife and habitat.

There is one observation tower at the Demonstration Area that provides the public viewing opportunities March 1 to November I. The observation tower is closed during waterfowl season and during flood events. This two story tower is partially inundated during flood events and may be closed parts of the year (USFWS 2008c).

Environmental Education and Outreach

The refuge offers several curriculum-based environmental education programs, ranging from animal adaptations to habitat management, to hundreds of students each year. The refuge partners with the educators at the Cook's Lake Conservation Education program, which overlays the refuge and reaches roughly 1,000 students each year. The refuge assists with teacher workshops taught in conjunction with Cook's Lake and the Southeastern Arkansas Interpretive Team. About eight educator workshops are conducted yearly, and are attended by approximately 100 attendees (USFWS 2008c).

The refuge offers visiting schools a variety of equipment to use during their visit: binoculars, dip nets, bug boxes, microscopes, plus forestry supplies, waterfowl banding equipment, etc. School groups enjoy the use of the classroom in the Visitor Center, as well as the exhibit area and nearby Upland Trail. The refuge maintains a good education website for educators and reaches K- college level classes and home-school groups

Interpretation

Bottomland hardwood ecology, forest disturbance, animal adaptations, species interdependence, the Refuge System, and refuge management are the primary themes and messages currently interpreted on the refuge. These themes and messages help visitors understand the key resource issues related to the Service, the Refuge System, and the refuge (USFWS 2008c).

There is one visitor services position at the refuge. This individual provides programs to visitors such as evening "campfire programs" in summer months and guided interpretive hikes along Champion Cypress Tree Trail. The exhibits in the visitor center are designed to provide interpretive information about the refuge habitats and management.

PERSONNEL, OPERATIONS, AND MAINTENANCE

Personnel

Current, White River NWR has a staff of 15, including the following full-time positions:

- Project Leader (refuge manager)
- Deputy Project Leader
- Wildlife Refuge Specialist
- Refuge Biologist
- Law Enforcement Officer (2)
- Forester (2)

- Forestry Technician
- Visitor Services Manager
- Administrative Officer
- Equipment Operator (3)
- Administrative Support Assistant (Term)

The above full-time staff is supplemented with 4 to 8 seasonal forest technicians and student trainee positions. All staff is based out of the St. Charles Headquarters and visitor center. The impressive size and length of the refuge dictate long drives, or long rides on the river, to and from work sites.

Volunteers and Partners

The refuge has approximately 40 volunteers that range from helping at special events to resident volunteers staying at the refuge and volunteering an average of 3,000 hours per year. Volunteer recruitment is an ongoing effort and all new volunteers receive appropriate orientation and training prior to work assignments. The refuge's remote rural location is somewhat of a limiting factor with regard to the number of available volunteers who possess the time, interest, and skills to assist on the refuge. The resident volunteer program is an excellent way to bolster local volunteers and the refuge hopes to expand on this program in the future.

Community partners include Phillips Community College University of Arkansas, Friends of White River, Arkansas State Parks, National Park Service, Wild Turkey Federation, Ducks Unlimited, Bass Pro Shops, Arkansas Bow Hunters Association, Entergy Power Company, 4-H Shooting Sports, and DeWitt Bank and Trust. Some projects planned by the partners to assist the refuge staff in the near future include developing a boardwalk trail behind the visitor center, business of birding, increasing wildlife observation and photography on the refuge, and special events. The partnerships also involve local lodge owners and chambers of commerce in promoting tourism of the Arkansas Delta (USFWS 2008c).

Friends Group

White River NWR currently has a six-year old Friend's Group with a recent Cooperative Agreement. However, due to a change in directors and staff, the Friends Group is redeveloping all of its documents. They are re-writing their Bylaws, Articles of Incorporation, and clarifying their mission, goals, and objectives.

The Friends Group runs the bookstore in the visitor center and pay for it to be staffed on Saturdays. They also sponsor a soda machine on the deck outside the visitor center. The Friends Group helps sell food at the Wildlife Festival, assist with the Fishing Rodeo, and are involved in the new Refuge Photo Club (USFWS 2008c).

Facilities, Equipment, and Infrastructure

Visitor Center/Headquarters
In October 2003, White River NWR officially opened its new $2.6 million visitor center and administrative offices on Highway 1 in St. Charles. This site was selected because of its location along the Great River Road, a National Scenic Byway that follows the Mississippi River through 10 states that border the river.

This 10,000-square foot facility allows the refuge to showcase the White River, the ecological and wildlife diversity within the refuge, and the history of southeast Arkansas. It houses a bookstore, environmental education classroom, and interpretive exhibits that focus on bottomland hardwood forests, prehistoric animals, the U.S. Civil War, and Native American history. The refuge is also in the process of developing several miles of interpretive trails that will loop around the visitor center (FHWA 2005).

Roadways
The refuge has a number of roadways that require periodic maintenance for reliable and safe use. These roadway types and total miles of road type on the refuge are identified in Table12.

Table 12. Refuge roadways

Roadway type	
Paved	**3**
Gravel roads	95
Dirt forest roads	477
ATV trails	50

Gravel roads are maintained to provide suitable access by registered passenger vehicles. Refuge roads in the South Unit are open only from March 1 through December 15, as allowable given flooding conditions during any particular year. All other refuge roads are open year-round. A locked gate, road closed sign, or other barrier (e.g., mounded dirt) indicate that a road is closed to vehicular travel.

A typical gravel road on the refuge is a single lane with a width of approximately 18 to 20 feet. In addition, the refuge maintains a clear zone on either side of the gravel road that has been observed to vary between 15 and 25 feet.

In 2001, the Federal Highway Administration (FHWA) completed a study titled "The Road Inventory of White River National Wildlife Refuge." This study summarized existing roadway and parking conditions at the refuge to aid in the identification of infrastructure deficiencies and to help identify and prioritize roadway maintenance and improvement projects. Conditions were rated from 1 to 10 with 1 being the least favorable and unacceptable "failed" roadway surface condition, and 10 being excellent. The majority of surface conditions (76 percent) were determined to have "fair" condition and 17 percent were considered "poor." No surfaces were rated as "failing."

The refuge roadway network consists almost entirely of unpaved routes. Approximately 1 percent of the roads are paved. Of the unpaved surfaces, 98 percent consist of gravel surfaces. The remaining 1 percent of the refuge roadways is native earth. Note that the study evaluated only the gravel and paved road system. The vast network of dirt forest roads and ATV trails were not evaluated and rated as part of the study conducted by the FHWA. The refuge utilized a system of approximately 477 miles of dirt forest roads for periodic forest management operations. Currently, some 357 miles of these dirt forest roads are also open for hunting and fishing related ATV access. There are an additional 50 miles of ATV trails that were created solely to provide hunting and fishing related access to some of the more remote areas of the refuge. A summary of results for the entire refuge is provided in Figure 14.

Figure 14. Condition of gravel and paved refuge roads in 2001

Bridges
Eleven bridges are actively managed and maintained by the refuge, with five in the North Unit and six in the South Unit. In late 2003, the Service conducted a detailed bridge inspection and appraisal report for each of these water crossings. The purpose of this effort was to determine the general condition of the structure, to evaluate the progression of deterioration of the bridge since the previous inspection (if any), and to assess the level of both maintenance and replacement costs that would be required.

The 2003 Bridge Inventory and Appraisal Report indicated that all 11 bridges were found to be in a "satisfactory" condition or better. Many of the bridges were in "very good" condition, requiring only the removal of some debris and installation of roadway signage.

More than half of the maintenance costs identified within the report were related to improvements required for the Trusten Holder Bridge in the South Unit. This bridge was found to not meet bridge standards set by the American Association of State Highway and Transportation Officials (ASSHTO). The bridge is only one lane wide and sits on a severe 90 degree turn and 20 percent down-slope. While not heavily traveled, improvement of this structure will help to improve area transportation safety conditions. The report determined that, at this time, none of the other existing bridges required any replacement costs (FHWA 2005).

Equipment
The refuge has an adequate inventory of heavy equipment, habitat management implements, trucks, boats, and various off-road vehicles needed to operate and manage the refuge's diverse habitat management and public use programs. The majority of refuge equipment is stored at the

maintenance compound located at the Farm Unit. The maintenance compound has a modern shop, fuel storage facilities, and open equipment storage facilities. Other equipment and vehicles are stored at either the St. Charles headquarters parking area or the historic St. Charles sub-headquarters site that was originally constructed by the CCC in the early 1930s. Historically, some equipment was stored at the Levee building on the east side of the White River and the Jack's Bay shop located on the extreme south end of the refuge when these two work sites had staff reporting to them daily. As the overall staff size declined in the 1990s, staff no longer reported to these two sites and all equipment was moved to either the maintenance compound or St. Charles sub-headquarters. Additional covered equipment storage facilities are needed to adequately store all refuge boats and heavy equipment.

Operations and Maintenance

White River NWR is currently maintained by a staff of 15 full-time members and some 4 to 8 supporting temporary and seasonal employees. The current annual budget for the refuge exceeds $2.2 million.

The largest portion of funds in the annual budget is used to support labor costs for refuge staff. Fluctuations in funding reflect appropriations for special projects and/or major equipment purchases, or moving costs for new employees. Most funding is earmarked via one of two Facility Management

Systems that are used by the refuge to track its operational, managerial, and construction needs: Service Asset Maintenance Management System (SAMMS) and Refuge Operations and Needs System (RONS).

Service Asset Maintenance Management System (SAMMS)
SAMMS, formerly known as Maintenance Management System (MMS), is used to identify and appropriate dollars to justify the funding of refuge maintenance and construction projects for existing facilities. SAMMS documents existing facility needs and justifies budget appropriations for maintenance requests, and it serves as a tool for sound facility decision-making. SAMMS is also used to identify funding needs for staffing salary costs and escalation and facility operations costs. SAMMS is divided into four major components:

- Property Inventories
- Condition Assessments
- Budget Planning
- Management Reporting System

Refuge managers use this facility management tool to establish both short- and long-term management goals over a multi-year period.

Refuge Operations and Needs System (RONS)
RONS is used to identify, justify, and prioritize future projects and programs at the refuge. Future projects identified through the RONS are required to be formally articulated via an approved comprehensive conservation plan for the refuge, that is, via this document. (If a CCP does not exist for a given refuge, projects identified under RONS must comply with approved short- and long-term goals for that refuge as approved by the Service and the Department of the Interior.

Over the past decade or two, the biggest challenge White River NWR has faced is operating and managing an enormous refuge with very constrained staffing and funding resources. In 1992, the size of White River NWR increased from 112,000 acres to over 160,000 acres with the Service's acquisition via land swap of the North Unit from Potlatch, Inc. However, since that time, refuge funding and staffing have actually decreased. Currently, the entire refuge is operated with a staff of 15 full-time employees (or approximately one permanent employee per every 10,666 acres).

III. Plan Development

PRE-PLANNING

Prior to public scoping in 2009, a Biological Review and a Visitor Services Review were conducted. In August 2008, a diverse team of some 22 federal and state personnel undertook a comprehensive review of habitat and wildlife management programs at the refuge. The team then considered how the refuge might fit into achieving a number of relevant regional and system-wide, as well as landscape conservation needs. The Biological Review team included staff from the refuge, as well as Service fish and wildlife biologists from the Regional Office and the Division of Ecological Services and Division of Migratory Birds. In addition, wildlife biologists from the AGFC, USDA Forest Service, Arkansas Natural Heritage Commission, and Ducks Unlimited participated. The team's recommendations were set forth in its final report entitled, *White River National Wildlife Refuge Biological Review*, and will be instrumental in the planning process.

The Visitor Services Review was conducted in 2008 by Service public use and outreach specialists. The review team toured the refuge, identified and discussed the current status of public use programs, and debated the pros and cons of various recommendations for enhancing and improving these programs.

The comprehensive conservation core planning team, which consists of the refuge manager, deputy refuge manager, refuge forester, refuge biologist, law enforcement officer, visitor services manager, and a contractor with experience in comprehensive conservation planning met for the first time in March 2009, for an initial tour of the refuge and an overview of its habitat and wildlife resources and public use programs, facilities, and opportunities. The core planning team also conducted additional internal scoping and prepared a preliminary schedule and plans for public involvement. The core team developed a mailing list of the public, landowners, state and tribal agencies, non-profit organizations, and local governments. Letters were sent notifying these parties of the planning process being initiated, and encouraging their participation in the scoping of issues in preparation for developing this Draft CCP/EA.

External (public) and additional internal scoping were conducted in June 2009. Three public meetings were held in three towns near different parts of the refuge.

SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

The planning team identified a number of issues, concerns, and opportunities related to fish and wildlife protection, habitat management and restoration, public uses, non-wildlife-dependent recreation, and management of threatened and endangered species. Additionally, the planning team considered federal and state mandates, as well as applicable local ordinances, regulations, and plans. The team also directed the process of obtaining public input through public scoping meetings, open planning team meetings, comment packets, and personal contacts.

Three public scoping meetings were held – in Helena, Clarendon, and DeWitt – on June 2, 3, and 4, 2009, respectively. These locations provided geographic proximity to different segments of this large refuge. The scoping meetings introduced the comprehensive conservation planning process to the public and allowed the Service to receive input, perspectives, and comments as to the issues, concerns, and opportunities that the public felt should be addressed in the planning process. The following bullet points summarize the issues raised orally by the public at these meetings, and later, in written comments received as e-mails, faxes, letters, and on comment forms.

All public and advisory team comments were considered; however, some issues important to the public fell outside the scope of the decision to be made within this planning process. The team considered all issues that were raised throughout the planning process, and has developed a plan that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in the team's best professional judgment, are most significant to the refuge. A summary of the significant issues follows.

FISH AND WILDLIFE POPULATION AND HABITAT MANAGEMENT

- Raise the water level of the Graham Burke Pumping Station during the duck season; holding the water at or above 145 feet - 6 inches would help tremendously;
- High water levels after the crops have been harvested and during the duck hunting season, and lowering the water level after duck season would greatly enhance duck hunting, provide waterfowl rest areas and not harm anybody;
- Habitat and timber management plans are adequate;
- Intensify forest management;
- Timber management is important, but don't construct permanent bridges and new gravel roads;
- Keep the refuge a remote, difficult to access place for wildlife; control wildlife-to-people ratio;
- Control travel associated with timber management; keep limited access to points within the refuge;
- The refuge is for wildlife;

VISITOR SERVICES

- Role of duck hunting guides;
- Commercial waterfowl permits are very underpriced; a guide has the potential to have his permit paid for in one day; in few businesses is the cost of doing business so low;
- Guides should not be allowed to operate on refuge;
- Don't turn refuge into a park;
- Hunting and fishing on refuge should be supported; refuge has done a great job correlating its seasons with state seasons;
- Government always wants to improve public use and turn refuge into a park, which it shouldn't;
- Cutting non-permit deer hunt on North Unit by two days;
- Increase in the number of bow hunters;

- Refuge reneged on original deal; they said nothing would change when they took over and now we have 1 week of muzzle-loader season and 1 week of rifle; Kansas Lake was closed to duck hunting;

- Kansas Lake should be reopened to duck hunting and seasons should be longer;

- Need fewer gun hunters on south unit; too crowded;

- Coon hunters need to obey the rules; they should have to keep their 4-wheelers on the marked trails;

- Improve ATV trails;

- Not enough enforcement of ATV's on North Unit; lots of joy riding;

- Keep parts of North Unit relatively inaccessible (hard to reach); keep it primitive; more roads and ATV's would only add to disturbance;

- ATV's are needed for older, more physically challenged folks;

- Provide better access to ATV roads off East Lake;

- Allow reasonable but not unlimited utilization of ATVs; develop an ATV use plan that would license ATV's, improve or reduce ATV trails;

- ATV's are necessary on the refuge, but should be restricted within reason; consider annual license;

- Charge ATV's a trail fee of $24/year;

- ATV trails on the North Unit should be repaired such as by removing logs and filling big holes;

- Over time, phase in permit system for boats left on refuge; any boats without a permit can be presumed to be abandoned and can therefore be cleaned up rather than left on the refuge due to lack of clarity as to ownership;

- Institute an inexpensive license program for boats; remove boats left on refuge with no license;

- Charge docking fee of $15 for boats that stay on refuge a full year;

- Abandoned boats do litter the refuge; charge use fee for them and ATV's;

- Refuge is suffering from overuse; it is changing from a refuge to a high-use park-like facility;

- ATV trails and campgrounds are the two most important issues facing the refuge; there should be stricter rules for ATV use;

- ATV trails are crucial to travel on the refuge due to its size;

- Add more access points (4-wheeler trails) that connect to the river for ease of access to body of refuge;

- Camping should be allowed in designated sites;

- Charge camping fee for campgrounds or just eliminate them; only problem with eliminating them is that most are built around a lake and still require a nice parking area for public use;

- Improve on refuge hunting and fishing; put length limits on fish (e.g., 10-inch minimum crappie length);

- Most lakes are overfished;

- Public access to crooked lakes from Holly Grove should not be encouraged due to litter, poaching, and pressure that would cripple that specific resource;

- There should be fewer gun-hunting permits issued on the south unit; density of hunters is too high;

- Refuge should offer occasional nature or education program for adults or children; possible programs include campfire and/or Dutch oven cooking, basic fishing, trains maintenance, canoe and kayak paddling, compass use and orienteering; these could be scheduled during fall festival; such programs would need to be advertised to attract the public;

- Offer guided nature or birding hikes, canoe/kayak and van tours on the refuge; these would help familiarize visitors with what the refuge has to offer;

- Deer hunting on the North Unit should be nine days as it was previously set;

- Consider 2-3 day hunts for modern gun hunt – 1 for permit hunt and 1 for those not able to get permit; make the hunts on weekends for those who have to work;

- Reopen the borrow pits below the pumping station to duck hunting outside the levee;

- Horseback riding should be permitted outside spring turkey and fall gun deer seasons;

REFUGE ADMINISTRATION

- Setting priorities given staffing shortages;

- Status of extending road on North Unit;

- Navigation under bridge at Maddox Bay;

- Extension of road north from BrownBrown Shanty;

- Having groups maintain roads to save the Service money and extend its management would not reach because they would eventually think they own the road and may try to exclude others who aren't part of the "club;"

- Green Lake access needs a parking area and right of way or easement so that users to not have to cross private land;

- Refuge should investigate online permit applications and notifications; this would require less manpower and funds; money left over from permit fees could be put to deer management or refuge maintenance;

- Maintaining existing roads is a major concern of the public;

- Roads that have been closed to vehicles including ATVs should still be maintained for foot traffic. Thick undergrowth impedes travel in much of the refuge;

- Refuge staff face overwhelming demands and thus refuge should avail itself of the willingness of volunteers to pitch in;

- Avoid overdevelopment of roads;

- The following roads should be opened to provide refuge access:
    - The old road in Gregory Slough, from East lake to the North-South roads that runs along East Lake about a mile south of Horseshoe Lake;
    - The road that would allow fishing on the south side Mud Lake in the summer;
    - The road to the south in the River Rat hole that would allow fishing and duck hunting in this area;

- Refuge understaffing and underfunding are its two biggest issues;

- Some trails should be closed and others opened;

- Some trails should be cleaned up and kept that way by volunteers under the supervision of refuge employees;

- There should be more trails for non-hunters like the one at the visitor center;

- Road to Lost Lake at Clarendon should be graded at least annually;

- Don’t construct any new gravel roads;

- Bridge coming from Kansas Lake needs to be wider so boats can be carried in;

- If possible, the pipeline needs to be maintained better; being mowed every 3 years has resulted in too much vegetative growth and when mowed leads to many flats on 4-wheelers;

WILDERNESS REVIEW

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. The results of the wilderness review are included in Appendix H.

IV. Management Direction

INTRODUCTION

The Service manages fish and wildlife habitats while 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 Improvement Act is for the Service to maintain the ecological health, diversity, and integrity of refuges. Public uses are allowed if they are appropriate and compatible with wildlife and habitat conservation. The Service has identified six priority wildlife-dependent public uses. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Described below is the proposed comprehensive conservation plan for managing the refuge over the next 15 years. This proposed management direction contains the goals, objectives, and strategies that will be used to achieve the refuge vision.

Three alternatives for managing the refuge were considered: A. No Action (Current Management Direction); B. Minimal Resource Management; and C. Enhanced Resource and Public Use Management. Each of these alternatives is described in the Alternatives section of the Environmental Assessment, which is Section B. The Service chose Alternative C as the proposed management direction.

Implementing the proposed alternative will result in a number of benefits, including the following:

- an increase in the acreage of lands subjected to active management and habitat manipulation for migratory waterfowl;
- maintaining current waterfowl sanctuaries and evaluating the biological need for additional well-distributed and functional waterfowl refuges/sanctuary areas throughout the refuge;
- increasing wood duck nesting and brood-rearing habitat through land acquisition and banding 63 wood ducks annually;
- providing 10-50 acres of fall (southbound) shorebird migration habitat flooded to 4 inches or less from July through October;
- maintaining tree-less wetlands with dense emergent vegetation for marsh birds; providing foraging habitat and secure rookery sites for colonial nesting waterbirds and wading birds;
- providing and enhancing sufficient forest habitat to support forest breeding birds designated as high priority in the MAV (Bird Conservation Region 26);
- supporting the protection and enhancement of endangered species; providing and enhancing habitat for resident game species to support game species health and diversity and quality hunting opportunities;
- enhancing habitat in support of resident nongame mammals, reptiles, and amphibians, particularly those recognized as Species of Greatest Conservation Need by the Arkansas Wildlife Action Plan;
- maintaining and enhancing aquatic habitat for a diverse assemblage of fish species, particularly those recognized as species of special concern by state and/or federal agencies;
- providing open lands to meet the needs of migratory birds, including migratory waterfowl, shorebirds, wading birds, and secretive marsh birds;
- achieving Desired Forest Conditions on 40 percent of the refuge to protect, manage, and restore the values and functions of the forest land to sustain the biological needs of native wildlife and migratory birds;

- improving and restoring the aquatic habitats on 50 percent of the lakes, sloughs, and bayous on the White River NWR;
- expanding understanding of hydrologic patterns and habitat responses;
- repairing and replacing all 12 malfunctioning or abandoned water control structures to properly manage all refuge wetland habitats;
- maintaining water quality in waterbodies on and flowing through the refuge;
- preparing, maintaining, and beginning to implement an Inventorying and Monitoring Plan;
- approving, designing, and beginning to implement long-term monitoring which has potential to track and assess changes due to global climate change;
- developing and implementing a Cultural Resources Management Plan;
- developing step-down management plans for invasive aquatic animals, terrestrial animals, and plants;
- complete the 10 percent minor expansion of refuge as allowed with Regional Director approvals and explore larger acquisition boundary expansion in support of larger landscape conservation needs;
- developing and beginning to implement a Visitor Services Plan;
- replacing and updating refuge brochure and panels on kiosks;
- issuing a new hunt plan that has improved the consistency of hunting regulations on the North and South units;
- modifying the commercial duck guiding program to allow service and minimize conflicts between guides and nonguided hunters, reducing the number of permits to 5;
- augmenting visitor facilities and resources by adding benches, distance markers, trails, wildlife drive, and accessible fishing pier as feasible;
- developing a series of standard environmental education programs for visiting school groups and training for teacher-led discovery field trips;
- developing and installing a display that explains forest management program and desired forest conditions;
- developing forest demonstration plots and interpretive panels at wildlife drive pullouts;
- reduce trails open to ATV use by a minimum of 25 percent within 3 years after CCP completion and prepare an overall refuge Access Plan within 5 years that will provide criteria and guidance to manage both forest management roads and ATV trails with long-term goals of improving hydrological connectivity, minimizing seasonal susface impacts, and reducing the total miles of ATV trails by 50 percent;
- eliminating those campgrounds where suitable alternatives by nearby private campgrounds could meet demand;
- continuing to write a newspaper column, updating the refuge webpage, giving occasional speeches to groups in surrounding communities, providing tours/media days to local officials, and developing a portable display about the refuge;
- adding 14 staff positions that will improve the capacity and capability of White River NWR to achieve its legislated purposes and accomplish management goals and objectives in the final CCP;
- acquiring and maintaining all of the facilities, infrastructure, and equipment necessary to perform habitat management, restoration, and enhancement on the refuge in addition to maintaining and improving essential infrastructure such as roads and levees;
- increasing the number of volunteers to 50, expanding the intern program, collaborating further with the Friends Group, and increasing cooperation with partners to accomplish refuge goals and objectives.

VISION

White River NWR was established in 1935 for the primary purpose of protecting migratory birds and other wildlife and their habitats, particularly bottomland hardwood forests. Since that time, the refuge has strongly emphasized habitat management that benefits waterfowl and other trust species. The refuge also has a very active public use program and provides a number of visitor services to facilitate use and appreciation of the refuge by visitors.

In coming years, the refuge will continue to protect and enhance the bottomland hardwood forest ecosystem of the Lower White River and other habitats. Overall, the refuge will strive to be a model for wise landscape management and conservation of native species of flora and fauna. The refuge will also provide for appropriate and compatible wildlife-dependent use by the public. We will work to maintain and expand on partnerships to accomplish this vision.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies presented are the Service's response to the issues, concerns, and needs expressed by the planning team, the refuge staff and partners, and the public and are presented in hierarchical format. Chapter V, Plan Implementation, identifies the projects associated with the various strategies.

These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the Improvement Act, the mission of the Refuge System, and the purposes and vision of White River NWR. The Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

FISH AND WILDLIFE POPULATION MANAGEMENT

Goal 1: Manage and protect migratory birds and native wildlife populations on White River NWR to contribute to the purpose for which it was established and to fulfill the mission of the Refuge System.

Discussion: The establishing purposes of the refuge largely relate to wildlife conservation, referring to White River NWR's use as a refuge and breeding ground for migratory birds and other wildlife; its use as an inviolate sanctuary, or for any other management purpose, for migratory birds; the conservation, maintenance, and management of wildlife, resources thereof, and its habitat; and the conservation of endangered species or threatened species. The refuge supports hundreds of diverse species associated with bottomland hardwood forests, riverine and lake aquatic habitats, and open lands.

Objective 1-1: Migratory Waterfowl Population – Over the life of the CCP, continue to support migratory waterfowl populations with a focus on providing wetland habitat to wintering ducks and breeding wood ducks.

Discussion: The MAV is an important ecoregion for migrating and wintering ducks and geese in North America. White River NWR provides crucial foraging and resting (sanctuary) habitats within the MAV for these waterfowl. The primary authorizing purpose of the refuge was to provide "a refuge and breeding ground for migratory birds" and "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." Waterfowl management has been a priority on White River NWR ever since its establishment.

At the same time, the refuge has been identified as a priority conservation site and region by the NAWMP (Yaich 1990) and other continental waterfowl conservation strategic plans (e.g., Heitmeyer 1994). Specifically, the Cache/Lower White River region, which includes White River NWR, is the single most important wintering area for mallards in North America and also supports large number of breeding wood ducks and hooded mergansers (Bellrose 1980). The region also annually hosts large numbers of many other waterfowl species, especially gadwall, American wigeon, green-winged teal, ring-necked duck, snow geese, and white-fronted geese.

The number of waterfowl that historically used habitats on White River NWR is unknown. Certain old photographs and survey records suggest that more than one million mallards regularly were present in the Lower White River floodplain during winter (e.g., Queeny 1946, Meanley 1972). As recently as the 1970s, the Cache/Lower White River ecoregion had annual average peak midwinter populations of almost 500,000 ducks, which was about 45 percent of all ducks counted in Arkansas at that time (Yaich 1990). Individual surveys from the 1970s also counted over one million ducks in this area, including as many as 873,000 mallards. Other banding and migration survey data suggest that historically up to 50 percent of all individual mallards in mid-continental North America used the White River ecosystem near White River NWR at some time during winter (e.g., Bellrose 1968, 1980, Bellrose and Crompton 1970, Nichols and Hines 1987, USFWS unpublished survey and banding data). Recent surveys of waterfowl conducted by the Service and AGFC in the Lower White River region have had sporadic spatial and temporal coverage and were affected by poor visibility of ducks using flooded forests. Recognizing these caveats, aerial surveys in the 1990s and 2000s seldom recorded more than 50,000 ducks in the region, most of which were mallards.

As recently as the 1960s and 1970s, several thousand Canada geese, mostly from the Eastern Prairie Population (EPP), migrated to, and used habitats on White River NWR (Vaught and Kirsch 1966). Numbers of Canada geese migrating to the White River region have declined substantially over the last three decades, and now it is rare for any EPP Canada Geese to occur there (AGFC, unpublished survey data). In contrast, numbers of snow geese, and to some extent white-fronted geese, have greatly increased in number in the region. Despite lower numbers of ducks using the Lower White River ecosystem at present compared to the 1970s and earlier times, this ecoregion still is critically important to provide resources needed to support continental populations, and NAWMP goals, of at least mallards, wood ducks, and hooded mergansers.

Concern over waterfowl population declines in the 1980s resulted in establishment of the NAWMP, which focused the attention of federal, state, and private conservation groups on critical wintering and breeding areas. The LMVJV, which encompasses White River NWR, was selected as one of the wintering habitat focus areas. One of the first tasks faced by the LMVJV was to find a model or decision tool for determining how much habitat was needed, and a method for relating this objective to the population goals of the NAWMP. The solution was to consider wintering areas as responsible for contributing to the spring breeding population goals of NAWMP proportional to the percentage of ducks historically counted in wintering areas (Loesch et al. 1994, Reinecke and Loesch 1996). White River NWR will use guidance from the LMVJV to support wintering waterfowl populations in the LMV.

Strategies:

- Annually review objectives set for White River NWR and compare with actual performance to assure that refuge and landscape-level (e.g., LMVJV) objectives are being met.
- Set waterfowl habitat objectives as an on-going process.
- Maintain accurate records of management actions, plant response, and waterfowl response for each impoundment managed for waterfowl, to enable an adaptive management strategy for management of waterfowl habitat.

- Constantly seek improved management strategies to increase food production and waterfowl use across all habitats of White River NWR.
- Opportunistically survey waterfowl on managed impoundments to gauge success of management actions and consider doing annual aerial surveys on portions of the refuge. Ground surveys are sporadic due to varying water levels which prevents completion of established survey routes.
- Participate in mid-winter waterfowl surveys on the refuge.

Objective 1-2: Migratory Waterfowl Sanctuary – Over the life of the CCP, maintain current sanctuary and explore opportunities to improve spatial distribution of waterfowl refuges/sanctuaries to help meet waterfowl objectives.

Discussion: The refuge's importance as a waterfowl sanctuary has been recognized since its establishment in 1935 under the Migratory Bird Conservation Act which specified "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." High waterfowl harvest rates and hunting activity in Arkansas make sanctuary a critically important function of Arkansas refuges. Activities such as maintaining body temperature, searching for food and roost sites, avoiding disturbance, molting, courtship, and pair bonding are energy consuming activities for waterfowl in winter. The assumed interaction between disturbance, energetic costs, and low survival can at least partially be mitigated by sanctuary where waterfowl can rest and perform these activities with a minimum of interruption. Sanctuary or refuge is critical for waterfowl to conserve energy to survive the winter period and conduct activities preparatory to perform other life functions, particularly reproduction.

Due to its strategic location in the heavily hunted MAV, coupled with the ability of the refuge to manage for a concentrated source of high-quality waterfowl food resources, White River NWR provides critically important waterfowl sanctuaries. These established sanctuaries must remain in place in order to provide areas free from disturbance to wintering waterfowl.

The bottomland hardwoods in the Lower White River ecosystem are historically important to waterfowl, especially wintering mallards, wood ducks, and breeding wood ducks and hooded mergansers.

Strategies:

- Maintain intensive food production areas (moist-soil impoundments and agricultural fields) as inviolate sanctuaries and restrict access to these areas to necessary management activities during waterfowl hunting seasons.
- Keep established (traditional) sanctuaries in place.
- Explore and evaluate the need for additional non-waterfowl hunting areas throughout the refuge, distributed in relatively large blocks (at least 2,000 acres configured with minimal border/interior ratios) along the length of the White River.
- Maintain at least 60 percent of the refuge in non-waterfowl hunting area.
- Restrict access in these refuge sanctuary areas by regular enforcement throughout waterfowl hunting seasons.
- Provide daily temporal refuge in all areas of the refuge by restricting waterfowl hunting to morning only hunting in authorized hunting areas.
- Establish a no-entry policy for these areas after 1 p.m. or some reasonable time.
- Reevaluate access points and routes for hunting and fishing areas to reduce disturbance to interior bottomland hardwood areas, sanctuaries, and key resources.

Objective 1-3: Wood Ducks – Within five years of CCP approval, increase wood duck nesting and brood-rearing habitat through land acquisition and conduct banding activities. Band a minimum of 63 wood ducks annually to support objectives of the Mississippi Flyway Council. To improve banding efficiency, provide and maintain a limited number of strategically placed wood duck nest boxes in areas which banding is to occur.

Discussion: Wood ducks are year-round residents in the forest lands of the southern United States, including White River NWR. Preferred habitats include forested wetlands, wooded and shrub swamps, tree-lined rivers, streams, sloughs, and beaver ponds. Wood ducks forage on acorns, other soft and hard mast, weed seeds, and invertebrates found in shallow flooded timber, shrub swamps, and along stream banks. They loaf and roost in more secluded areas and dense shrub swamps.

Wood ducks are cavity nesters, seeking cavities in trees within a mile of water. Brood survival is dependent upon proximity to water. Due to conversion of forest lands to urban sprawl and agriculture, to forestry practices, and to competition for nest sites from a host of other species, a lack of natural cavities limits reproduction. The extensive bottomland hardwood forests of the White River NWR provide countless natural cavities, and it is unlikely that cavities significantly limit wood duck reproduction at White River NWR. At one time, White River NWR had an extensive wood duck nest box program, however with personnel limitations and the limited need for boxes, this program has ceased. Relic boxes in disrepair are visible on many of the sloughs and water bodies of the refuge. Although nest box programs are recommended on many refuges, this is not a priority at White River NWR.

A recent publication, *Increasing Wood Duck Productivity: Guidelines for Management and Banding on USFWS Refuge Lands* (Bowers 2003), provides well documented guidelines for silvicultural practices and brood habitat that should be used to guide management of wood duck production at White River NWR.

Because wood ducks are secretive birds, it is extremely difficult to estimate populations and survival rates. Therefore, regional banding quotas, which are stepped down from a flyway level to individual states and stations to distribute banding throughout the range of the wood duck, have been established to determine harvest and survival rates. White River NWR has an annual preseason banding quota of 63 wood ducks, including 9 adult males, 12 adult females, 18 immature males, and 24 immature females. Importantly, efforts are currently underway to develop a national harvest strategy for wood ducks. Such a strategy requires that adequate pre-season banding be conducted annually in order to provide crucial information needed to monitor harvest and survival rates. Therefore, it becomes essential that refuges and state agencies continue to meet banding quotas so that this important wildlife resource can be properly managed.

Strategies:

- Allow some beaver ponds to develop and mature, but not to exceed 5 percent of the refuge forested land. Beaver ponds and associated wet scrub/shrub cover provide excellent brood habitat for wood ducks (nesting, brooding, and wintering) and numerous other wetland-dependent species.
- Strive to meet annual preseason wood duck banding quota (currently: 9 adult males, 12 adult females, 18 immature males, and 24 immature females). The quota, by age and sex, should be the goal, not just the total duck (63) quota.
- Seek guidance or assistance from the area migratory bird biologist with banding activities; this biologist may be able to assist with procurement of banding equipment.

- Remove unmaintained existing wood duck boxes. Unmaintained wood boxes provide a poor demonstration to the public on provision of artificial nest cavities for wood ducks.
- Do not re-initiate a nest box program.
- Consider brood survival, especially if broods must travel long distances to suitable habitat. When managing for wood ducks, remember that preferred brood habitat, according to McGilvrey (1968) and Davis (2001), is 30 to 50 percent shrubs, 40 to 70 percent herbaceous emergents, and 25 percent open water, especially if broods must travel long distances to find suitable habitat.
- Maintain overhead cover within 1 to 2 feet of the water surface, which is vital for wood duck broods.
- Optimum habitat should have 75 percent cover and 25 percent open water, with a minimum of 1/3 cover to 2/3 open water. Location of nest cavities in or adjacent to good brood cover will significantly improve duckling survival to flight age.

Objective 1-4: Shorebirds – Over the life of the CCP, through managing the timing of lake drawdowns and flood ups, provide fall migration habitat from July through October to contribute to the objectives set forth in the U.S. Shorebird Conservation Plan, and the Lower Mississippi Valley/West Gulf Coastal Plain Shorebird Management Plan.

Discussion: Counting all four seasons, and including those species which occur only when they are in transit through the refuge during their spring and fall migrations, White River NWR supports about 20 species of shorebirds, including plovers, yellow-legs, sandpipers, dowitchers, killdeer, woodcock, snipe, and Wilson's phalarope.

Shorebird habitat during southbound migration (during the late summer and early fall) throughout the LMV has diminished substantially since occurrence of widespread channelization and extensive water control in the region. Formerly, shorebirds are presumed to have used oxbows and other open waters throughout the valley as water levels dropped in the summer. Today, these species are mostly dependent upon actively managed sites, including flooded fallow fields, catfish ponds, and managed moist-soil units. Managing for southbound migrating shorebirds is very limited at White River NWR and likely tied to a few acres of fallow farm fields or moist soil that have exposed mudflats at the right times (mid-July through early October).

Strategies:

- Within the constraints imposed by water levels and other management capabilities, seek opportunities to flood fallow farm fields and moist-soil units and gradually draw down water on 10-50 acres during late summer and early fall to support southbound migrating shorebirds, while recognizing that the majority of suitable habitat on the refuge occurs on oxbow lakes as water levels drop during summer.
- Strive to integrate provision of suitable habitat for shorebirds with priority provision of habitat for waterfowl by staggering the rotation among the existing moist-soil units. For example, a unit that is disked will provide mudflats for shorebirds during that first year and annual grasses and sedges for waterfowl during years 2 and 3.

Objective 1-5: Marsh Birds – Over the life of the CCP, provide high-quality habitat for breeding and migrating marsh birds, in conjunction with meeting waterfowl habitat requirements where possible, and monitor results of management actions.

Discussion: Marshbirds known to occur at White River NWR include the king rail, Virginia rail, sora, purple gallinule, common moorhen, and coot.

Loss of freshwater emergent wetlands has occurred throughout the Southeast as development pressures have increased. The king rail is thought to have been seriously impacted and there is great concern over inland numbers of this species. In addition, many other marshbird species are of management concern that they may breed at White River NWR, including possibly pied-billed grebe and purple gallinule. The best opportunity for supporting these species would be in the Farm Unit and where moist soil is actively managed for waterfowl. Another possibility is ditches adjacent to the refuge with cattails for king rail.

Strategies:

- Conduct a reconnaissance survey of the Farm Unit or any potential emergent wetlands during April or May that could provide for nesting pied-billed grebes, king rails, and purple gallinules.
- Consider management for marshbird species in conjunction with waterfowl and fisheries management, if identified in refuge habitats.

Objective 1-6: Colonial Waterbirds and Wading Birds – Over the life of the CCP, provide critical habitats for long-legged wading birds and protect all rookery sites from disturbance from March to August (breeding season), to contribute to objectives set forth in the North American Waterbird Conservation Plan.

Discussion: White River NWR provides significant habitat for colonial waterbirds and wading birds, 13 species of which are documented on the refuge, especially post-breeding birds in late summer when water levels tend to drop, concentrating food fish into smaller, shallower pools. Also, the Farm Unit and moist-soil units can provide very important habitats for these species. Although this group of species is not a major management priority for the refuge, management for waterfowl should also provide foraging habitat for these species. In addition to habitat management, surveys should be implemented to identify rookery sites, record breeding bird numbers, and document production. These areas should be protected from disturbance throughout the nesting season.

Strategies:

- Implement surveys to identify rookery locations and monitor nesting activities.
- Provide for protective closures and appropriate buffer zones when colonies of colonially nesting wading birds are found (see Southeastern U.S. Waterbird Conservation Plan).

Objective 1-7: Forest Breeding Birds – Over the life of the CCP, with the aid of additional biological and forestry specialists to assist with planning, implementing, and monitoring, improve, intensify, and expand forest management for enhanced benefit of high-priority forest breeding birds.

Discussion: White River NWR is part of the Big Woods, which consists of approximately half a million forested acres in the MAV in Arkansas. This refuge, along with the Cache River NWR, several state wildlife management areas, natural areas, and forested private lands, is used by a diverse assemblage of both resident and migratory birds during the course of the entire year. The bottomland hardwood habitat of the refuge is particularly essential to forest-dependent birds throughout their life cycle, and provides habitat for breeding, post-breeding survivorship of adults and young, stopover habitat for migratory landbirds, and wintering habitat for many species. In particular,

a suite of breeding forest and forest-interior songbirds has been identified as a high priority and should be considered within the context of forest management activities occurring on the refuge.

The MAV Bird Conservation Plan outlines goals of bottomland hardwood restoration in the MAV to support certain populations of high-priority species such as swallow-tailed kite, cerulean warbler, Swainson's warbler, and prothonotary warbler (Twedt et al. 1999). Table 13 lists the species and recommended minimal patch size for numerous bottomland hardwood birds. It should be noted that Swainson's warbler researchers anticipate that the habitat area objectives outlined below for Swainson's warbler are far too optimistic and that density of birds is lower due to hydrological issues as well as the degradation of the understory in forested blocks of habitat.

In addition to the above recognized species, a partnership of land managers and biologists has developed the Arkansas Wildlife Action Plan (Anderson 2006), which evaluates the status and recommends research and conservation actions for Species of Greatest Conservation Need (SGCN). In addition to the species from the MAV Bird Conservation Plan, the Arkansas Wildlife Action Plan recognizes some additional bird species including: ivory-billed woodpecker, American woodcock, Mississippi kite, chimney swift, and red-headed woodpecker.

Several species highlighted here are of particular importance to the staff of White River NWR. While cerulean warblers appear to be "naturally scarce" within the White River NWR, they are relatively abundant within the nearby batture lands where appropriate habitat persists (batture lands, Big Island, etc.). This species should be surveyed, especially in forests near bluffs. Other species, serving as umbrella species, treated in more detail below, are Swainson's warbler, swallow-tailed kite, American woodcock, rusty blackbird, and chimney swift.

Table 13. Hypothesized forest area (hectares) required to support viable populations of 500 breeding birds within the MAV

Species	Patch Size Recommendation	Habitat Area Objective
Swainson's Warbler	**4,700**	**4,000**
Cerulean Warbler	**8,000**	**8,000**
Swallow-tailed Kite[a]	**40,000**	**40,000**
Prothonotary Warbler	**2,700**	**4,000**
Northern Parula	**3,000**	**4,000**
Hooded Warbler	**2,500**	**4,000**
Kentucky Warbler	**8,400**	**8,000**
Yellow-billed Cuckoo	**6,600**	**8,000**
Wood Thrush	**2,800**	**4,000**
Louisiana Waterthrush	**7,200**	**8,000**

Species	Patch Size Recommendation	Habitat Area Objective
Acadian Flycatcher	**2,800**	**4,000**
Eastern Wood-pewee	**5,500**	**8,000**
Yellow-throated Vireo	**7,900**	**8,000**
Yellow-throated Warbler	**7,800**	**8,000**
Blue-gray Gnatcatcher	**4,000**	**4,000**
Summer Tanager	**6,600**	**8,000**
Great-crested Flycatcher	**7,200**	**8,000**
Red-shouldered Hawk	**57,800**	**40,000**
Red-eyed Vireo	**1,800**	**4,000**
American Redstart	**4,600**	**4,000**
Broad-winged Hawk	**101,000**	**40,000**
Pileated Woodpecker	**19,000**	**40,000**
Cooper's Hawk	**45,000**	**40,000**
White-breasted Nuthatch	**8,600**	**8,000**

Source: Mueller et al. 1999
Based on Cely and Sorrow (1990), a 40,000-ha patch of bottomland hardwood forest would only support approximately 80 pairs of Swallow-tailed Kites. A secure (source) population would realistically have to be based on a regional (southeastern U.S.) population.

Within the MAV, the two greatest issues affecting forest breeding birds are forest fragmentation and stand quality as they relate to forest management activities. The second issue, stand quality, is of particular importance at the refuge, which has a high percentage of forested habitats. For example, without perturbation, such as occurs through active silvicultural management or natural disturbances (e.g., tornadoes), maturing forests tend to develop closed overstory canopies that impede light penetration into lower layers of the forest. Limited light penetration results in sparse ground cover, understory, and midstory vegetation. Many forest birds are dependent on dense understory and ground vegetation for nesting, foraging, and escape cover. Thus, silvicultural harvests that increase light penetration, while maintaining a partial overstory canopy, are beneficial to many forest bird species. Some breeding forest birds such as cerulean warblers (Hamel 2000) and Swainson's warblers (Meanly 1971) are dependent upon canopy gaps that provide complex vertical and horizontal structure for nesting and feeding. Studies in bottomland hardwood forests have shown that many species increase their use of forested habitat during the breeding period, but that many species may selectively choose canopy gaps and gap edges during the non-breeding period and the creation

of small gaps within mature forests may increase species richness (Bowen et al. 2007). Young birds often rely on small openings in the forest that provide patches of dense understory for use during post-fledging (Anders et al. 1998, Vega Rivera et al. 1998), and this understory provides foraging opportunities for transient migrants in spring and fall (Blake and Hoppes 1986).

In reference to this important issue, the LMVJV's Forest Resource Conservation Working Group developed a publication outlining "Desired Forest Conditions." This report, "Forest Restoration, Management, and Monitoring of Forest Resources in the Mississippi Alluvial Valley: Recommendations for Enhancing Wildlife Habitat" (LMVJV Forest Resources Conservation Working Group 2007) reviews the habitat needs of priority wildlife species and proposes "Desired Forest Conditions" at multiple spatial scales (landscape and stand-level) to enhance wildlife habitat. Additionally, the report presents several recommendations for improving reforestation and forest management activities. White River NWR staff was highly involved in this publication, and have committed to implementation of desired forest conditions outlined in the report. Implementation will provide habitat to benefit a wide array of priority wildlife species. Forest management activities occurring within Desired Forest Condition parameters would benefit priority Partners in Flight (PIF) forest birds and Species of Greatest Conservation Need (SGCN) as well as a suite of priority non-avian wildlife species dependent upon forests.

Swainson's Warbler

The Swainson's warbler (*Limnothlypis swainsonii*) is a species that has warranted regional attention. This species, often associated with cane thickets and a dense understory, is discussed in the context of forest management activities which can be implemented to benefit this species of concern. Swainson's warbler research supported by both the AGFC and the Service has occurred on the White River NWR for the past several years. The most recent research began in the late 1990s has resulted in two M.S. theses (Brown 2008, Anich 2008) and one doctoral dissertation (Benson 2008) and has focused on the habitat use, requirements, and productivity in relation to habitat characteristics. Additionally, research has evaluated home range size, nesting in relation to elevation, and causes of nest failure including depredation by various species and parasitism by brown-headed cowbirds (Benson 2008).

Most recently, Benson (2008) completed a very comprehensive dissertation on the habitat use and demography of Swainson's warblers on White River NWR. In addition, both Anich (2008) and Brown (2008) completed M.S. theses in relation to Swainson's warbler ecology and management. Benson found that the Swainson's warbler body condition was better in habitat with less forb cover and greater understory vegetation, suggesting that these parameters indicate high-quality habitat for the species. Additionally, nest sites are characterized by high density of woody stems (especially cane), a well-developed layer of leaf litter, low forb cover, high total canopy and sub-canopy cover, and a dense understory. Success was also lower near agricultural edges and in areas where understory was patchily distributed or overall habitat heterogeneity was higher. He found that the most common nest predators were rat snakes, brown-headed cowbirds, and raptors. He suggests patchy habitats could increase the searching efficiency of these predators.

Benson also found that frequent flooding may lead to significant decreases in otherwise stable populations. Because hydrology greatly impacts the vegetation structure and floods can reduce the understory vegetation, frequent flood events can negatively impact the habitat suitability for a suite of species dependent on dense understory (Christmas 1984, Wakeley and Roberts 1996). Thus, conservation, restoration, and management efforts should focus on relatively higher elevation bottomland hardwoods sites (Graves 2001, Twedt et al. 2006). Focusing on area requirements for this species is not the best approach, as the number of pairs using the White River NWR will be

limited by hydrology and the availability of higher sites. In sum, hydrology must be considered in any effort to evaluate potential habitat available for Swainson's warblers.

With regard to the implementation of the Desired Forest Conditions, a target outlined in the Forest Resources Working group report (LMVJV Forest Resource Conservation Working Group 2007) suggests that a productive goal is to work towards implementing these forest parameters on 35 to 50 percent of the refuge. One option is to concentrate active forest management on higher bottoms—areas that have flood events every 5 to 10 years. Areas such as Rattlesnake Ridge and the northern end of Kansas Lake would be included. This habitat includes sweetgum, Nuttall, water, and willow oaks, among other species (elm, ash), as well as cane habitat. One approach would be to manage 35 to 50 percent of the higher bottoms habitat towards the parameters outlined in the document, which would yield benefits for species such as Swainson's warblers, Kentucky warblers, and hooded warblers.

Uneven-aged silvicultural practices such as thinning, group selection, group selection with thinning, or even aged practices such as shelterwood cuts may promote the development of uniformly dense understory structure beneficial for Swainson's warbler (Graves 2002, Hetzel and Leberg 2006, Twedt and Wilson 2007). Encouraging cane with canopy disturbance may increase expansion of cane into larger stands suitable for Swainson's warblers. However, focusing on cane to the exclusion of other understory plant species would be detrimental to the Swainson's warbler.

Swallow-tailed Kite

Swallow-tailed kites historically occurred in Arkansas and were a breeding species but were extirpated, most likely, in the late 1800s or early 1900s. Beginning in 2000, a pair of swallow-tailed kites has attempted to nest at the White River NWR. A research group from Arkansas State University, in coordination with the AGFC, has studied swallow-tailed kites on the refuge along with studies on the more common Mississippi kite. During the study, swallow-tailed kites have attempted and failed nesting seven times, with causes of failure including storms, barred owl predation, and failure potentially related to camera placement during research activities.

While it is important to support this potential return of swallow-tailed kite nesting in Arkansas, the repeated failures may not be that unusual for this species that suffers low reproductive success throughout its United States' range. The Swallow-tailed Kite Conservation Alliance is an interstate and international group of swallow-tailed kite experts who can review monitoring activities and provide advice to better understand and solve the problems that this nesting pair is experiencing.

American Woodcock

The American woodcock is a migratory game bird that occurs throughout the forested portions of the eastern United States. This species migrates through the refuge in the winter and during the spring. "Peenting" surveys were attempted in 2002 and 2003 to determine what areas were being used on the refuge by this species. It was found in the highest numbers on the Farm Unit and the area called the Surround Field. Throughout the fall and early winter, woodcock are seen in areas such as Jack's Bay and the North Unit where suitable habitat occurs.

White River NWR is within the Central Region used for administrative management. Woodcock populations in this region have declined an estimated 19 percent since 1968, probably due to land use changes associated with land conversion and the maturing of forest habitats. In 1990, the American Woodcock Management Plan was completed, setting an objective to protect and enhance wintering and migration habitat on public lands to increase woodcock carrying capacity. The plan also set objectives to inventory and monitor woodcock habitat and develop management demonstration areas.

Woodcock are closely tied to earthworms as their major food resource and other special habitat conditions (Krementz and Jackson, 1999). Wintering habitat includes moist bottomland hardwood forests with brush and understory, especially when found in close association with agricultural fields and old field succession. These forested sites are typically wet thickets, with a high density of plant stems but relatively open understory below. Typical cover includes privet, cane, and briars that result from openings in the canopy. The scrub/shrub and dense bottomland hardwood habitats created to benefit priority forest interior nesting birds (Swainson's warbler, cerulean warbler, etc.) will also provide good daytime cover for woodcock.

At dusk, most woodcock move to open or brushy fields to forage and conduct courtship activities throughout the night. These habitats include agricultural fields that were not fall disked and sparse grasslands that may have received a cool fall burn to create patchy openings of exposed soil interspersed between grass clumps 1 to 3 feet in height. The grassland and some crop field areas of the refuge provide this habitat preferred by woodcock, as well as for other priority species (e.g., northern bobwhite, dickcissel, and other grassland birds).

Diurnal (daytime) cover and foraging habitat for woodcock includes thickets and shrub areas with high vertical stem density in the understory and fairly open ground cover on spongy wet soil, generally within 0.5-mile of openings, young aforestation and agricultural fields that provide good nocturnal habitat. Diurnal habitat can be created in existing forest stands through thinning and patch clearcuts that also benefit other high-priority bird species.

Rusty Blackbird

While most forested wetland bird species of concern are breeding or resident species, one wintering landbird is in need of attention, the rusty blackbird. This species will benefit from recommendations associated with many other species, including forest management, restoration and maintenance of natural water flow patterns and flood frequencies, and management of GTRs. The main priority unique to managing the rusty blackbird is to cooperate with regional and national research efforts.

Chimney Swift

Historically, chimney swifts have shifted their preferred nest sites to manmade structures such as chimneys. Since 1900, fewer than a dozen reports of this species nesting in natural cavities have been documented in North America (Graves pers. comm. 2008). At the White River NWR, eight instances of chimney swifts nesting in natural tree cavities have been documented in recent years.

Early Successional Species

Scrub/shrub or early successional species as a group have continued to decline in the southeastern United States, and these species could benefit from any restoration opportunities identified at the White River NWR. In particular, species that might benefit from the habitat restoration include painted bunting, Bell's vireo, field sparrow, and orchard oriole. One area to be considered for this management is the Farm Unit, where edge habitat is currently being controlled with annual bush-hogging. Reducing the frequency of bush-hogging to permit some growth of woody vegetation on the hillsides around the unit may encourage growth of patchy scrub/shrub habitat to benefit these species. The use of fire may also be appropriate. Consideration should be given to the size and configuration of habitat managed for early successional species so that "sink" habitat is not created.

Strategies:

General

- Maintain large blocks of forested habitat on the refuge and evaluate any activities that might result in forest fragmentation.
- Implement forest management treatments to provide benefits to various priority forest birds. Where possible, forest stand treatments should:
  - Encourage development of emergent trees that rise above the predominant forest canopy,
  - Retain large diameter class trees,
  - Provide large standing, dead, or dying trees,
  - Contribute coarse woody debris to the forest floor, and
  - Retain large diameter cavity trees.
- Implement guidelines presented in the LMVJV Forest Resources Working Group publication for reforestation, when such opportunities occur.

Swainson's Warbler

- Maintain habitat suitable for Swainson's warblers and other understory-dependent species while actively managing less suitable habitat towards conditions to support these species in the future.
- Strategize application of active forest management to most efficiently, in light of limited resources, apply treatments to areas most productive for Swainson's warblers and other understory-dependent species.
  - Identify refuge-wide, higher bottom sites that are most suitable for these species in relation to hydrology, especially those sites with significant sweetgum and water oak represented in the stands,
  - Focus implementation of Desired Forest Conditions on higher bottom sites, including areas such as Rattlensnake Ridge, to benefit species such as Swainson's warbler, Kentucky warbler, and hooded warbler,
  - Efficiently implement forest management goals by focusing efforts on attaining or maintaining 35- to -50 percent of higher bottom sites in Desired Forest Conditions or within these parameters,
  - Focus on managing areas far from agricultural edges with lower rates of parasitism and higher nest success, and attempting to manage areas away from road edges when possible might be helpful,
  - Continue to manage fairly localized areas where Swainson's warblers are abundant, if possible, without causing abandonment of these areas. Focus efforts on higher sites that are marginal or poor habitat for Swainson's warblers to promote colonization through management efforts.
- Create and maintain dense understory vegetation in a forest with high total canopy and especially sub-canopy cover and, when possible, promote large and dense understory, including cane stands and other understory species, by implementing forest management in an experimental way to evaluate the best methods for cane and understory promotion.
- Emphasize maintaining or enhancing existing forested canebrakes while managing for canopy disturbances that also promote the development of dense vine growth.
  - Consult experts in cane ecology and consider methods to promote cane.
- Consider telemetry studies on both cowbirds (see below) and rat snakes to determine their preferred habitat use and overall impact on priority songbirds.

Swallow-tailed Kite

- Support monitoring and research of swallow-tailed kites as a continued priority.
- Facilitate coordination between researchers and the Swallow-tailed Kite Alliance regarding proposed research and monitoring efforts and specific nest monitoring strategies.
- Suspend current research and monitoring focusing on this species temporarily, until close coordination with the Swallow-tailed Kite Conservation Alliance is established and concurrence on research methods is obtained.

American Woodcock

- Develop and implement forest management plans that provide preferred woodcock habitat.
- Continue to restrict or eliminate fall plowing of crop fields since woodcock feed primarily on earth worms that are greatly reduced by late-season plowing.
- Create and maintain preferred nocturnal habitat in wet agricultural fields (not fall disked) and wet “old field” (aforestation site) or grassland habitats of 5 acres or greater with exposed soil and patchy cover 1 to 3 feet in height created by cool fall burns, as possible in coordination with other priority management actions.
    - Consider that this type of management on the levee systems might reduce use by brown-headed cowbirds and promote use by American woodcock,
    - Manage openings of 5 acres or greater near areas of good diurnal habitat to provide nocturnal foraging habitat for woodcock,
    - Take advantage of rights-of-way and other permanent forest openings to create woodcock habitat.
- Assess and inventory suitable woodcock habitat on White River NWR.
    - Consider conducting peenting surveys every few (3 to 5) years to further an understanding of woodcock distribution and use of refuge lands.
    - Conduct evening flight counts, or spotlight counts, or flush counts at least twice monthly from mid-November to mid-February, to estimate population density, migration chronology, and nocturnal habitat use.

Rusty Blackbird

- Maintain a diverse and productive bottomland hardwood habitat complex.
- Participate in regional and national workshops regarding the conservation of rusty blackbird by maintaining contact with Service’s Division of Migratory Birds.
- Consider continued monitoring activities to determine distribution and abundance of rusty blackbirds at the White River NWR, an important site for this species in the MAV.

Chimney Swift

- Continue to opportunistically document chimney swift nesting trees and cavities on the White River NWR.
- Maintain descriptive and Geographic Information System (GIS) records of documented nest trees (Refuge Lands GIS system recommended).

Early Successional Species

- Evaluate the amount and condition of early successional habitats on the Farm Unit, relative to priority scrub/shrub species.
- Integrate maintenance of some habitats in a scrub/shrub condition with other management objectives on the Farm Unit, to maintain a component of this habitat type on the unit through strategic setting back of succession.
  - Reducing the frequency of bush-hogging to permit some growth of woody vegetation on the hillsides around the unit may encourage growth of patchy scrub/shrub habitat to benefit these species.
  - The use of fire may also be an appropriate method to encourage target conditions.
  - Consider the size and configuration of habitat managed for early successional species so that sink habitat is not created.

Objective 1-8: Threatened and Endangered Species and Species of Conservation Concern – Continue to support the protection and enhancement of threatened and endangered species through research, survey, recovery, conservation, management programs, and where appropriate, habitat restoration.

Discussion: Many species occur on the refuge both year-round and seasonally that are protected or managed for conservation by federal or state laws and regulations such as the Endangered Species Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Arkansas Game and Fish Commission Regulations. Currently, there are four federally endangered species expected to occur within the refuge including: interior least tern, ivory-billed woodpecker, and pink mucket and fat pocketbook mussels. In addition, bald eagles, wood storks, and numerous other migratory birds use the refuge throughout the year and seasonally. There are 43 known state species of concern including reptiles, amphibians, mammals, insects, crayfish, and birds that have also been documented on the refuge. Furthermore, there is the potential that additional species such as the pallid sturgeon may exist on the refuge, but have yet to be documented due to difficulties in sampling, the size of the refuge, and limited numbers.

Least Tern

Interior least terns are seen occasionally on sandbars and feeding over backwaters along the lower White River. However, at this time, there is no known nesting activity or appropriate nesting habitat available on the White River NWR. Depending on water conditions, several colonies are known to nest on the Lower Arkansas River. The connectivity and proximity of the Lower Arkansas River to the White River may allow for these colonies to expand into the refuge river if sufficient habitat exists.

Currently, the COE dredge material spoil pile and the numerous sand point bars are the only locations believed to be minimally suitable on the White River NWR. It is improbable that terns would nest in these locations due to their connectivity and proximity to forested habitats and predators and the high frequency of flooding during the nesting season.

It is not currently known if sufficient habitat existed historically or to what extent these terns inhabited the White River system. However, their nearby presence suggests that there is potential for creation or restoration of habitat that would likely result in colonization. Least terns have demonstrated that they will readily colonize suitable habitats when provided or restored. The current flows, fluctuations, navigation controls, and channelization prevent the formation and maintenance of suitable nesting sand and/or gravel islands. If these habitats once existed on the system, then it is likely that so did the interior least tern.

Ivory-billed Woodpecker

These spectacular woodpeckers once inhabited forested habitats throughout the southeastern United States and Cuba. Although there are little specific population data available, it is likely that European settlement and forest clearing caused the species to decline in the second half of the 19th century. By the mid-20th century, the IBWO was reduced to a very small population that was studied by Arthur Allan and James Tanner at the Tensas River in Louisiana in the late 1930s. The last widely accepted sightings were in 1944 by Don Eckleberry in the Tensas area. Since that time there have been numerous unsubstantiated sightings throughout the historic range of the species. Many of these sightings seemed highly credible but lacked hard evidence.

The IBWO may have been sighted along lower White River in 1920s, 1952, late 1970s, and more recently. There was also an unconfirmed sighting of IBWO on White River NWR in late 1970s by the head forester. The forester's observation led to a distinct and repeated emphasis to retain many older-age class trees. The emphasis on these larger trunks has continued for 30 years and was adopted upon the purchase of the adjacent Cache River NWR and subsequent acquisition of about 55,000 acres of former timber company land from Potlatch. The result is about 200,000 acres of forest managed where very large trees (> 30" dbh) have been favored for retention.

In February 2004, Cornell Lab of Ornithology biologists became aware of a credible sighting of the IBWO on a portion of Bayou DeView, which is located on Cache River NWR just to the north of White River NWR. Subsequently, Cornell University biologists and their partners documented the presence of at least one IBWO in that area. Sixteen sightings of the IBWO were reported deep within the cypress-tupelo swamp of the Bayou DeView in 2005.

Rediscovery of the ivory-billed woodpecker in 2004 on the Cache River NWR was announced in 2005. The larger area of the Big Woods consists of several refuges and state WMAs that are considered to be potential habitat for this species. A great deal of the search activities have occurred on the entirety of the White River NWR, and the refuge's staff have been very involved in search planning and implementation, the development of response plans, and evaluation of forest management activities in relation to the possible occurrence of IBWOs on the White River NWR.

Researchers from Cornell, with assistance from personnel from TNC, AGFC, Audubon Arkansas, the Service, and volunteers have been searching the Big Woods of Arkansas, including the White River NWR, for the last several years. While there have been many reported sightings, intriguing audio, and other supporting data, no additional video or still pictures have been recorded. White River NWR has supported the search teams, including ground and aerial efforts. The refuge forester and wildlife biologist have been conducting IBWO habitat inventory and assessment of the forest on the refuge to determine potential habitat.

The IBWO requires large blocks of forest and an ample food source of large beetles (e.g., cerambycids, buprestids) and larva found in recently dead and dying wood. The IBWO is the initial predator on insects that attack stressed trees and dying trees within the first few years of decay. Another element of habitat crucial to the IBWO is a density of large trees, which furnish roosting and perching nesting habitat, and an element of senescence that promotes development of a food source. Tanner (1942) reported that 49 percent of the IBWO insect foraging that he observed was on trees 12-24" dbh, and 35 percent was on trees 24-36" dbh, although these two diameter classes only comprised 18 percent and 5 percent of the forest, respectively.

The IBWO consumes vegetable matter for a portion of its diet, so it depends on elements of habitat that are open to sunlight and productive in terms of soft mast. Tanner (1942) estimated that the minimum area necessary for an IBWO pair under ideal habitat conditions is approximately 2.5 to 3 square miles, or 1,600-1,920 acres; under less desirable conditions, this area can range much higher, even up to 17 square miles. The IBWO is assumed to be adapted to seeking newly available food sources within its range, or if the range becomes unsatisfactory, then moving to another local food source. In other words, it is nomadic.

The decline in acreage of mature hardwood forest in the MAV has had a direct negative impact on the IBWO. Historically the MAV contained over 24 million acres of near contiguous hardwood forest; now only about eight million acres remain, approximately 600,000 acres of which lie in Arkansas. The pre-settlement forest was subject to natural disturbance from ice storms, hurricanes, tornadoes, drought, and fire, all of which maintained a widespread sporadic cycle of stress and insect infestation, and therefore a potential food source for the IBWO. With abundant contiguous habitat there was much more opportunity for the IBWO to search for and exploit new foraging areas. Also, this cycle of random disturbance promoted development of new forest and shade-intolerant species upon which the IBWO may depend.

Currently the remaining MAV forest is very fragmented and mostly concentrated along large riparian corridors, so now the natural disturbance factors impacting the MAV seldom impact large amounts of forest, and these remaining forest blocks are universally relied upon more heavily by all forest-dependent wildlife. The structure and composition of the forest, more than the age class, are important factors to these species and the IBWO. While some relic bald cypress and tupelo may be as old as several hundred years, the vast majority of MAV hardwoods may live less than 150 years, and will exhibit old age class characteristics in as little as 80 years.

Forest management on White River NWR has sought to increase diversity of habitat structure and composition at the stand level, while diversifying habitat conditions at the landscape level. Management priorities include creating and maintaining a multiple canopied condition on portions of appropriate sites and providing larger, older-aged class trees throughout the refuge. The recurring cycle of disturbance (i.e., forest treatments) is planned to optimize development of desirable conditions, including undulating overstory canopy, patchy understory and/or midstory, senescence (old age and decay), and large diameter class complexity. This management system conforms to similar management recommendations for IBWO habitat enhancement supported by Tanner (1942). Forest treatments are necessary to restore and enhance the refuge forest habitat, as it is now more heavily relied upon by the IBWO and all forest wildlife than ever before.

White River NWR has worked closely with the Service's Ecological Services staff and several other professionals to develop IBWO survey protocol for forest disturbance and conversion activities within IBWO habitat. This is a work in progress that has undergone several drafts and reviews; however, the primary recommendations are expected to require a survey for roost and nest cavities within the footprint of the proposed activity and a perimeter buffer somewhere between 300-660 feet (and up to one mile for conversions). These precautions are designed to preclude take during the process of habitat treatments. Because of the IBWO's presence, this process will require close coordination with Ecological Services. The IBWO survey protocols will be made an attachment to the FHMP and Update for reference in developing consultation documents and developing tailored survey procedures.

While previous refuge forest management and treatments unquestionably provide benefits to target wildlife, the rediscovery of the IBWO does warrant additional enhancements that could be rendered through simple modification. The assumptions are that the IBWO and other wildlife would benefit more from additional standing, recently dead coarse woody debris (snags) and quicker response to

changing conditions and knowledge by a more rapid examination cycle. The current FHMP calls for the retention of large trees, cavity trees, and other trees that provide amenities to wildlife. The physical application of a treatment also produces some senescence as trees are damaged (i.e., tops broken, boles damaged, and limbs broken). However, to supplement the potential food source for the IBWO, additional techniques could be employed.

If there is a need for increased IBWO foraging, normal habitat treatments may be used to incorporate the improvements when possible. When stand inventories indicate a deficiency in senescence some marked trees can be designated to be killed or damaged as a condition of the sale, instead of being removed or cut down. The number of supplemental “damage” trees will be limited and directed towards meeting suggested IBWO foraging needs as developed through ongoing research. Retention and promotion of senescence incorporated through commercial sales can be used, or varied, to benefit other wildlife species dependent on senescent trees. Alternatively, specific small scale tree removals for other habitat objectives (e.g., promotion of cane) could be applied non-commercially and allow retention of standing dead trees.

Pallid Sturgeon

Although there are no current records of the pallid sturgeon (endangered) in the White River, the proximity to the Mississippi River and the presence of shovelnose sturgeon, a close relative within the system, suggest a potential for their presence.

Pink Mucket and Fat Pocketbook Mussels

The pink mucket mussel may occur on the length of White River coincident with White River NWR. However, because of its life history requirements, it is unlikely to occur within refuge-administered waters (i.e., outside of the main stem of the White River), even though large numbers of other species of mussels are present within the lakes, sloughs, chutes, and bayous of the refuge. The pink mucket mussel has been historically identified within the White River drainage and has been widespread, but rare. Fish hosts for this species are largemouth bass, smallmouth bass and spotted bass and required substrates are sand and gravel.

The fat pocketbook mussel has been identified on a few occaisions in the White River, but the closest known common location being in the St. Francis drainage.

Two major threats to mussel species include sedimentation and contaminant-laden runoff from agriculture. Sedimentation has a number of sources, including agricultural runoff, headcutting in fields and drainage tributaries, stream bank erosion, and stream channel instability and degradation. A wide variety of chemicals are used in modern agriculture including pesticides, herbicides, defoliants, and fertilizers. Some of these chemicals can be detrimental to fish and wildlife if they accumulate in large enough quantities in streams and other water bodies. All of these conditions occur within the drainage and likely affect conditions for mussels within the reach of the White River inside the refuge.

Bald Eagle

Arkansas’s nesting bald eagle population declined during the 1960s and 1970s, presumably due to pesticide-induced reproductive failure, habitat loss, and the illegal take of adult birds. The state’s nesting population has rebounded since the mid-1970s, thanks in large part to prohibition of DDT use in the United States, increased environmental awareness, and the efforts of state and federal agencies to preserve and restore habitat, and to enforce wildlife regulations. Bald eagles were

removed from the endangered species list as of June 28, 2007. Although recently removed from the endangered species list, they are still protected by the Bald and Golden Eagle Protection Act.

Mid-winter eagle surveys were conducted annually on the refuge from 1986 – 2007 and were started again in 2009 in conjunction with the mid-winter waterfowl survey. Winter eagle numbers were highly variable, ranging from 1 to 70 birds. The first nesting attempt on White River NWR, and in Arkansas, since the population crash of the 1960s and 1970s was located in 1982. In 2008, there were eight identified nests on the refuge.

Strategies:

General

- Endeavor to use all available information, partners, and cooperating agencies to assist in efforts to indentify locations of listed species, habitats, and potential habitat restoration areas.
- Use GIS, historical information, and landscape data to map and develop species specific objectives and goals to be incorporated into the refuge's comprehensive habitat and species management planning.
- Give highest priority to species and habitats at risk.
- Modify management to promote species and habitat conservation and recovery in addition to preventing harm or take from occurring.
- Where possible and appropriate, restore and maintain habitat to provide opportunity for species expansion or restoration.
- Use historical species data and habitat information to determine restoration potential.
- Identify current and past actions having previously resulted in or continuing to cause loss of habitat and adverse effects to species of concern.
- Require responsible entities to modify their action(s) and/or implement restoration and reasonable and prudent measures as appropriate to avoid or minimize take and to assist in recovery of these species as required by law.
- Identify actions both on and off refuge that could affect listed species and their habitats; once known, evaluate, modify, and/or discontinue as appropriate through regulatory and policy processes in accordance with the ESA, MBTA, Bald and Golden Eagle Protection Act, or other applicable laws.

Least Tern

- Support creation or restoration of natural or artificial nesting habitat in refuge waters as opportunities arise through partnerships with other programs and/or agencies.

Ivory-billed Woodpecker

- Continue to support organized searches for ivory-billed woodpeckers.
- Ensure appropriate protection measures for ivory-billed woodpeckers when conducting management activities on the refuge.
- Implement forestry actions that add forest structure and retain snags and larger trees, in accordance with the Desired Forest Conditions standards at a minimum, and above these standards where consistent with other objectives.
- Conduct tree cavity searches prior to tree removal, as per the Arkansas Field Office (2006).
- Initiate consultation with appropriate federal and state endangered species biologists as per Arkansas IBWO Action Plan to implement protective measures immediately upon location of an active IBWO roost or nest tree.
- Oversee and monitor activities based on approaches that are determined through consultation as most appropriate for the situation.

- Continue to be fully engaged in the IBWO partnership and support the search activities as necessary.
- In light of discovering a roost or nest cavity, refuge personnel will be essential participants in planning and management of this type of discovery.
- Continue to be engaged in the Corridor of Hope Team and develop and distribute educational information regarding the IBWO and bottomland hardwood forests.
- Continue to educate the public on the ivory-billed woodpecker and document any potential reports of sightings.
- Communicate reports of sightings or other potential encounters of the bird on the White River NWR to the AGFC and the Cornell Lab of Ornithology.

Pallid Sturgeon

- Sample appropriate habitat to determine presence of the species in refuge waters.
- Use catch reports under special use permit requirements as an on-going sampling strategy.

Pink Mucket and Fat Pocketbook Mussels

- Conduct surveys for mussels in potentially appropriate habitat for listed species (such as at the White River Chute).
- If such species are found, note the conditions of the habitat being used, determine if similar conditions occur elsewhere on the refuge, and work with the State of Arkansas to ensure appropriate protective measures are put in place.
- Recognize water quality threats to mussels in White River NWR and act to minimize these threats when possible, recognizing that most threats are initiated off of refuge lands.
- Work with state and federal partners to establish mussel refugia (beds protected from collection) within the White River on the length within White River NWR.

Bald Eagle

- Continue to coordinate monitoring of active eagle nests with AGFC.
- Encourage public reporting of bald eagle nests, along with other priority migratory bird species and sites (e.g., bald eagle nests, wading bird rookeries, swallow-tail kite nests).
- Record any bald eagle nest building activity or established nest sites.
- Protect any nesting bald eagles from disturbance that could lead to nest abandonment.
- Maintain refuge nest records, including nest site location and measurements of annual success.

Objective 1-9: White-tailed Deer – Over the life of the CCP, continue active management of forested habitat, early succession open lands, and cropland that incidentally benefit deer, while maintaining a healthy deer herd consistent with long-term habitat capability. Collect and analyze deer harvest data, conduct periodic herd health checks and provide quality recreational opportunities. Use harvest and health check data to adjust hunting practices if and when necessary.

Discussion: From a public use perspective, deer are the most popular game animal on the refuge, with a long history of deer hunting which began in 1956 with the first archery hunt. In 1961, the refuge opened its first gun deer hunt; White River NWR was one of the first refuges in the southeastern U.S. to implement either sex gun deer hunting.

From 1961 through 1992, refuge deer hunts were managed under a single management unit. However, with the acquisition of the Potlatch lands in 1992, the refuge was subjectively divided at Highway 1, to define the separate North and South Units. Management of the two units varied: the South Unit was managed in accordance with existing regulations while the North Unit was to have more liberal seasons until such time as greater information was available on current practices and biological requirements of the area. No new refuge purposes were established with this new acquisition. The North Unit would eventually need to conform to the existing purposes. Since acquisition, the additional bucks-only deer hunts on the North Unit have gradually been reduced, and in 2007, only four additional days were allowed. Archery season continues to be open one month longer on the North Unit than on the South Unit.

In many areas of the South Unit, the forest canopy has become closed, limiting the amount of available browse and reducing carrying capacity of the habitat for deer. By continuing to implement the refuge's Forest Habitat Management Plan, particularly as it relates to providing habitat needs of priority forest-dwelling nongame birds, conditions will be enhanced for maintaining a large, healthy deer population as well. Such active management will provide a diversity and abundance of understory, midstory, and overstory stand components (i.e., complex forest stand structure) to meet the needs of a variety of nongame forest birds and resident wildlife, including black bear and deer.

In addition to collecting deer harvest data directly from hunter-killed deer at manned refuge check stations, browse surveys may be used to monitor the deer herd and evaluate the habitat, and are a useful tool to the manager. The information gathered when conducting browse surveys can indicate herd density and habitat quality. Management decisions may be made based on this information. Other surveys, including annual spotlight surveys at night, can also be useful to gather information on deer abundance, as well as sex ratios and fawn recruitment. Such surveys are considered appropriate to conduct on White River NWR, as staff time allows.

Strategies:

- Implement the refuge Forest Habitat Management Plan to enhance forested habitats for deer.
- Use public hunting as a management tool to meet deer population objectives.
- Set specific harvest objectives, monitor harvest and population trends, and then adjust harvest strategies based on data and in concert with AGFC, to meet deer herd objectives.
- Collect biological harvest data at manned check stations during all gun hunts, of sufficient sample size to make inferences about the deer population.
- Sample at least 25 percent of harvested deer from both the North and South Units of the refuge.
- Conduct periodic browse surveys to monitor the deer herd and evaluate habitat condition.
- Determine population parameters by conducting and analyzing annual spotlight surveys and monitor long-term population trends, as staff time allows.
- Determine current herd condition/densities relative to carrying capacity and past disease history every five years through herd health checks conducted by SCWDS.

Objective 1-10: Eastern Wild Turkeys – Over the life of the CCP, continue active habitat management that incidentally results in enhanced habitat for turkeys and provides quality recreational opportunity. Monitor turkey population status with the aid of additional staff.

Discussion: The primary resident game bird in the ecosystem is the wild turkey. The major factor affecting turkey populations in the White River Ecosystem is the limited acreage of forested lands above the 1- or 2-year floodplain. It should be noted that spring turkey seasons are occasionally closed on the refuge due to excessive high water. Although turkeys will readily roost over water, they require dry land for feeding on acorns and other hard mast during the winter and early spring when flooding is most common. Flooding during the nesting season adversely impacts recruitment by flooding nests which might have already been initiated, and by directly affecting survival of young poults.

Turkey populations in the area have demonstrated the capability to grow relatively rapidly with several successive years of favorable water conditions, but are observed to decrease as a result of late spring and summer flooding, particularly if it occurs in successive years. However, turkeys are not a priority species for forest management on these refuges. Thus, their numbers may not be consistently maintained at optimum levels. However, much of the management that occurs for non-game birds and other priority wildlife does provide benefits to turkeys as well.

Selective forest management can benefit turkeys by increasing the diversity and availability of foods, in the form of hard and soft mast, as well as grasses, sedges and forbs. Nesting habitat is often improved by selective thinning of trees which provides more ground cover for nest concealment. Removal of more than 50 percent of the overstory degrades turkey habitat in the short-term by resulting in extremely rank undergrowth that is generally avoided by turkeys. Continued habitat management through timber harvests, with an objective of provided Desired Forest Conditions for priority wildlife, should increase turkey nesting cover and improve hard and soft mast production beneficial to turkeys.

Strategies:

- Implement the Forest Habitat Management Plan on the refuge to enhance forested habitats for turkey.
- Set harvest objectives, monitor harvest, and adjust as necessary, in coordination with AGFC turkey biologist.

Objective 1-11: Black Bears – With the aid of additional staff, over the life of the CCP, intensify management programs to provide enhanced habitat conditions that would support a healthy and sustainable black bear population and monitor bear occurrence. Use management action results to adjust future management decisions.

Discussion: The American black bear once ranged statewide in Arkansas, but was largely extirpated during the 1940s and 50s. Despite a heavy bear harvest and changes in land use on private lands, a remnant population survived this period in the White River bottoms on White River NWR (what is currently the South Unit). While northern Arkansas was repopulated with bears moved from northern states during the 1950s and 1960s, the White River basin was not supplemented and is considered genetically representative of the historic bears of the LMV in Arkansas. Genetic analysis has shown that this population of bears is more closely related to other non-supplemented populations of the LMV than to those influenced by introductions from the upper mid-west.

Black bears require food, water, escape cover, den sites, and dispersal areas. They are opportunistic omnivores, and food habits often reflect local food availability. Cover (e.g., river cane, palmetto, shrub understory) that limits visibility, slows foot travel, and creates considerable noise when traversed provides necessary security for black bears. Den sites provide shelter and security during the denning season, which generally extends from early December through late April in Arkansas, particularly for reproducing females. Large trees (>36”dbh), with cavities are important for denning.

The bears of White River NWR are highly dependent on tree dens where floodplain hydrology annually inundates forested lands during winter months.

Bears have expanded and are now found on private lands closely associated with the original core population of White River NWR. In general, the South Unit of the refuge is considered more heavily populated and refuge records of hunter observations reflect a much lighter distribution of sightings north of St. Charles. In 2000, the estimated population on White River NWR was believed to be 300 – 500 bears.

The AGFC opened a quota bear hunting season in 2001, largely in response to complaints of damage to property by bears on private lands surrounding the southern unit of the refuge. White River NWR was not opened for harvest at this time. The refuge has long served as a sanctuary for bears, which is how this remnant population survived the de-population that occurred in Arkansas and across much of the LMV during the mid-1900s. With bear populations rebounding across the larger landscape of Arkansas and the LMV, this role continues to have value. As in days past, this core of population can serve as a source for bears, both to maintain bears on neighboring hunted private lands, as well as for other public lands. These core populations ensure survival of females and continued reproduction and recruitment of young animals.

The black bear is a Species of Greatest Conservation Need (Anderson 2006) for the State of Arkansas. It should continue to be a species of attention in management of the refuge, recognizing that active management under objectives of other priority species (e.g., forest breeding birds, waterfowl, ivory-billed woodpecker) and protective management (e.g. protection from harvest, nuisance bear prevention) should be sufficient to support and protect this population for the long term.

Strategies:

- Continue to implement forest management to create site-appropriate forest community and structure, with components including hard and soft mast producing species and a diverse structure.
- In forest management, emphasize retention of large trees and trees with large cavities, within prescriptions designed to address more comprehensive goals of developing appropriate forest composition and structure.
- As time and staffing allows, implement annual hard mast surveys to index annual habitat productivity for bears as well as a variety of other mast-dependent wildlife (e.g., turkey, deer, small mammals, squirrels, and waterfowl).
- Ensure that refuge continues to serve as a sanctuary for bears, providing security for a core group of female bears to ensure long-term population security and to serve as a population source for off-refuge habitats.
- Provide education and facilities to encourage refuge visitors to keep all food sources (e.g., garbage, coolers, and game) in a bear-proof manner, so as not to serve as an attractant for bears and cause habituation of bears to people and human use sites. Such situations can lead both to public safety hazards and bear mortality.
- Issue citations or warnings to visitors that are in blatant disregard of measures intended to keep human food away from bears.
- Continue to participate in and support research and monitoring of black bear as opportunities arise.

Objective 1-12: Furbearers – Over the life of the CCP, continue no active management for furbearers, other than controlling nuisance animals when necessary. Also, identify additional opportunities to expand programs for controlling nuisance animals.

Discussion: Conditions on the refuge are favorable for a variety of furbearers, including raccoon, opossum, striped skunk, river otter, mink, muskrat, beaver, nutria, red fox, gray fox, coyote, bobcat and long-tailed weasel. Opossum, skunk, coyote, foxes, and bobcat tend to be associated with drier forests and agricultural edge sites, while muskrat, otter, beaver and mink are associated with the wetter bottomland, rivers, lakes and bayous. Raccoons are well-adapted to all existing habitats on the refuge.

The raccoon is the most numerous furbearer on the refuge and raccoon hunting remains popular. Although harvest records have not been maintained for over ten years, considerable hunting activity still occurs annually. Raccoon hunting differs from all other refuge hunts in that it allows use of horses, hounds and night hunting.

Refuge regulations allow furbearer trapping by special use permit. All of the above state legal species are included in these seasons and a small number of trapping permits are issued annually. Of the furbearers, only beaver is recognized as having a population level of significant concern. Beaver cause significant habitat damage on White River NWR, which negatively affects forest condition and habitat quality for a variety of other priority species. Beaver, and the impacts of beaver habitat modifications, are actively managed by refuge staff currently and this current management is recommended for continuation and enhancement.

Although it is widely distributed throughout North America, the long-tailed weasel is recognized by the State of Arkansas as a Species of Greatest Conservation Need (Anderson 2006). Management strategies consistent with the objectives of the refuge are expected to continue to provide sufficient quality habitat for the above furbearers. The long-tailed weasel uses a variety of habitats usually closely associated with water. Although expected to reside throughout Arkansas and in the habitats of White River NWR, there are few documented occurrences in the state and the species is noted as of conservation concern due to the lack of knowledge regarding status. White River NWR is unlikely to contribute significantly to the conservation of the species.

Strategies:

- Maintain a diverse and productive bottomland hardwood habitat complex.
- Monitor beaver populations and maintain, through management control, at population levels below that causing significant habitat damage.

Objective 1-13: Small Game (Mammals) – Over the life of the CCP, continue active habitat management to provide diverse habitats (early succession openland, agriculture and bottomland forest) that support healthy populations of resident small game, and provide quality recreational activities.

Discussion: Both species (fox and grey) of squirrels are quite common on the refuge, and squirrel hunting is by far the most popular type of small game hunting. Squirrels tend to have variable annual population levels, and are highly responsive to annual variations in habitat condition (e.g., hard mast, drought) and mortality factors (e.g., predation). Forest management practices consistent with recommendations for deer habitat management would also improve habitat for both the grey and fox squirrels of White River NWR. Squirrels are cavity nesters and any forest management plan developed for the refuge should contain some protection of cavity trees for squirrel den sites in addition to promoting hard-mast producing trees.

The refuge contains both species (cottontail and swamp) of rabbits; however, populations of both species are relatively low, with minimal hunting activity. Rabbit numbers are believed to be affected by the extent of annual spring flooding, as well as limited early successional habitats. Forest management activities, especially in the limited areas of the refuge outside of the 2-year floodplain, will provide some benefits to rabbits.

Strategies:

- Continue to implement objectives of the Forest Management Plan for promoting hard-mast producing trees, and maintaining trees with cavities.
- Continue to allow the hunting of small game populations.

Objective 1-14: Bats – Over the life of the CCP, continue active habitat management that provides a diversity of habitats and supports a healthy, diverse, and viable resident bat population. With the aid of additional staff, perform surveys to document occurrence and habitat use.

Discussion: Bats occurring at White River NWR include the little brown bat, southeastern myotis, silver-haired bat, eastern pipistrelle, big brown bat, red bat, hoary bat, evening bat, and Rafinesque's big-eared bat.

These species, although rarely noticed by the public, are an integral part of the biological diversity and ecosystem function of the bottomland hardwood habitats of the refuge. Of these, the Rafineque's big-eared bat and southeastern myotis are currently recognized as Species of Greatest Conservation Need within Arkansas (Anderson 2006). Ten nights of bat sampling with mist nets in 2002 yielded a minimal species list, including southeastern myotis, Rafinesque's big-eared bat, red bat, eastern pipistrelle, and evening bat. Additionally, Rafinesque's big-eared bats have been identified roosting in an abandoned refuge building. No small mammal surveys have been conducted to date on refuge lands.

Rafinesque's big-eared bat is a resident species recognized as a species of special concern throughout most of its range. Few details are known about the biology and habitat requirements for this species, although it is clearly recognized as associated with bottomland hardwood habitats of the southeastern United States. This species is known to use sizable trees with large cavities in wetland habitats for roosting, particularly tupelo and bald cypress. Trees with basal openings (summer) and top openings (winter) cavities have been identified as roosting sites.

Like other bat species, Rafinesque's big-eared bat feeds on flying insects and is completely nocturnal, feeding at night in habitats associated with daytime roost sites. Conversion of bottomland hardwood habitats and historic removal of large trees within forested habitat contribute to the concern for the species within Arkansas and throughout the range. Rafinesque's big-eared bats also use artificial structures such as abandoned houses, barns and cisterns for roosting, and this flexibility may allow extended habitat use in areas where trees with large cavities suitable for roosting are limited. The extensive bottomland hardwood forests of White River NWR likely provide important habitat for this species within a largely altered landscape, and thus contribute significantly towards the conservation of Rafinesque's big-eared bat.

The southeastern myotis (*Myotis austroriparius*) is also associated with bottomland hardwood habitats, as well as other riparian forests in the southeastern United States. As with the Rafinesque's big-eared bat, life history, habitat use and behavior of this species are not well understood. The southeastern myotis shows similarities to the Rafinesque's big-eared bat with similar nocturnal feeding habits and roost site preferences. The two species are often found in close association,

including sharing common roost sites. White River NWR likely provides significant habitat and contributes towards the conservation of this priority species.

Strategies:

- Maintain a diverse and productive bottomland hardwood habitat complex.
- Protect and enhance existing habitat for bats by promoting large cavity-supporting trees through active forest management.
- Incorporate retention of large trees with large cavities in forest management.
- Retain a strong component of cypress and tupelo during forest management and manage so as to ensure retention of these species in forest composition into the future.
- Conduct bat occurrence surveys as feasible, in order to assess occupancy and use of White River NWR by priority species. Document species occurrence and coordinate reporting with AGFC Natural Heritage program.
- Survey refuge structures/facilities planned for closure or removal for use as bat roost sites before closure/removal. If bats are found using such a structure, coordinate with state and/or Service experts to assess type of use and recommendation for action. Depending on the type and extent of use, site specific recommendations might include simply clearing a structure of roosting bats before acting, retention of a structure as a wildlife resource, or replacement of a structure with an alternate artificial roost site.
- Retain the corn-crib structures on the Farm Unit and conduct rudimentary repairs to maintain the structures as a roost site for Rafinesque's big-eared bats. Conduct repairs during late summer when bats are not constrained by either low temperatures or young.

Objective 1-15: Non-Game Mammals – Over the 15-year duration of the CCP, enhance habitat in support of resident non-game mammals, particularly those recognized as Species of Greatest Conservation Need by the Arkansas Wildlife Action Plan, to contribute to balanced species diversity.

Discussion: The armadillo is one of the nongame small mammals readily seen on White River NWR. Other less visible non-game mammals include insectivores (moles and shrews), rodents, and bats. Those which would be anticipated on refuge lands may include the southeastern shrew, short-tailed shrew, southern flying squirrel, marsh rice rat, fulvous harvest mouse, western harvest mouse, white-footed mouse, cotton mouse, golden mouse, and eastern woodrat.

Strategies:

- Maintain a diverse and productive bottomland hardwood habitat complex.
- Protect and enhance existing habitat for non-game mammals by promoting hard and soft mast-bearing trees and large cavity-supporting trees through active forest management.
- Incorporate retention of large trees with large cavities in forest management.
- Retain a strong component of cypress and tupelo during forest management and manage so as to ensure retention of these species in forest composition into the future.
- Conduct small mammal occurrence surveys as feasible, in order to assess occupancy and use of White River NWR by priority species. Document species occurrence and coordinate reporting with AGFC Natural Heritage program.

Objective 1-16: Reptiles and Amphibians – Over the 15-year duration of the CCP, maintain and enhance habitat for a diverse assemblage of resident reptile and amphibian species, particularly those recognized as Species of Greatest Conservation Need in the Arkansas Wildlife Action Plan.

Discussion: The floodplain forest, sloughs, brakes, and lakes, as well as rare upland savannah and flatwoods habitats of White River NWR harbor numerous species of reptiles and amphibians (herpetofauna). Multiple species of snakes, lizards, frogs, toads, salamanders and turtles occur on the refuge. The refuge herpetofauna species list (Christman 1984) includes 77 species which have been identified or are expected in the four-county area of the refuge.

Given the great diversity of reptile and amphibian species on the refuge, it is challenging to address all species with one objective and similar strategies. However, common management concepts can provide benefits for many varied species in this group. Many reptile and amphibian species use multiple habitats for foraging, reproduction, hibernation or dispersal and require connectivity between habitat types (e.g., lakes and adjacent bottomland hardwood forest, cypress brake and floodplain forest, floodplain forests and adjacent uplands, temporary wetlands and adjacent uplands) in order to meet distinct life cycle habitat needs. Connectivity throughout floodplain forests also allows for important migration and dispersal corridors.

Excessive motorized vehicle traffic can compact and/or disturb soil, increase erosion/sediment, provide corridors for invasive plant species along trails, elevate vehicle-related mortality rates, and disrupt faunal activities. Although some amphibian species may be able to breed successfully in tire ruts and puddles on low-traffic roads/trails, the detrimental effects of soil compaction and disturbances may outweigh benefits. Recommendations for habitat management found in Habitat Management Guidelines for Amphibians and Reptiles of the Southeastern United States (Bailey et al. 2006) should be considered and integrated with other priority management needs.

Many reptiles and all amphibians are closely linked to aquatic habitats and respond positively to various inundation conditions. Water management associated with green-tree and moist-soil management for waterfowl should seek to mimic natural hydrologic patterns, with year to year variation in rates, periods and depth of inundation. Resident reptiles and amphibians should respond well through time as this (managed) natural cycle varies conditions annually to create conditions that benefit a variety of species needs. Within upland sites, isolated seasonal wetlands are a particularly important and rare habitat type for reptiles and amphibians. Isolated seasonal wetlands are fish-free, and have high amphibian productivity when surrounded by complementary upland habitats. These features should be noted and protected, or alternatively restored as appropriate upland sites are acquired within refuge lands.

Baseline inventory data serve to identify the occurrence and status of at-risk as well as common species on a refuge and as such can create recognition of opportunities for effective management and a point of comparison for future assessments. Amphibians are sensitive to a variety of environmental stressors, including chemical contaminants. As such, they can serve as early indicators of environmental health conditions. From 2005-2007, White River NWR participated in the USFWS Abnormal Amphibians Study to document amphibian abnormalities in national wildlife refuge populations. These data indicated that White River NWR had abnormality rates within normal limits.

Several priority species (Species of Greatest Conservation Need) recognized by the State of Arkansas (Anderson 2007) for the Mississippi Alluvial Plain Ecoregion may inhabit refuge lands. These include Graham's crayfish snake, western chicken turtle, mole salamander, and southern crawfish frog.

> Graham's crayfish snake is an aquatic snake that can be locally abundant in riparian lowland areas such as those of White River NWR. Alteration of wetland habitats is considered a threat for this species, which utilizes crayfish as a primary food item.

The western chicken turtle is considered rare in Arkansas; this aquatic turtle uses shallow lakes, ponds and other still or sluggish waters. The many lakes and ponds of White River NWR may provide extensive suitable habitat for this species.

The mole salamander is declining in Arkansas, and is well suited to the habitats of White River NWR. Mole salamanders generally inhabit floodplains and low-lying forested areas, living in burrows or under logs.

The southern crawfish frog is a subspecies of the crawfish frog that inhabits only the extreme southern areas of Arkansas. It is highly retiring and usually found inhabiting crawfish burrows.

Strategies:

- Maintain or restore the natural hydrologic system and community structure, minimizing conversion of habitat types and hydrologic function as possible.
- Seek to mimic natural hydrologic patterns in water management associated with green-tree and moist-soil management for waterfowl, with year to year variation in rates, periods and depth of inundation.
- Maintain connectivity between habitats to allow reptiles and amphibians unrestricted movement between habitats needed for complete life cycles.
- Discourage construction of barriers to aquatic and terrestrial wildlife such as improved roads; seek other alternatives such as road underpasses.
- Use Best Management Practices to minimize erosion and runoff containing sediments, silt, and/or nutrients that alter water quality or hydrologic processes.
- Minimize use of herbicides, pesticides and fertilizer to meet management objectives.
- Minimize impacts of roads and trails through methods including: minimize construction of new roads and trails as possible; discourage off-road/trail use of vehicles; require low-pressure tires and/or limit use to dry seasons; and implement seasonal road closures during non-essential use periods.
- Control invasive plants and animals, particularly aggressive control of feral hogs under an objective of eradication.
- Work with partners (AGFC and State Wildlife Grants, Arkansas Herpetological Society) to conduct a baseline reptile and amphibian survey, targeting various habitat types across refuge lands for a comprehensive inventory.
- Control incidental and illegal take of reptiles or amphibians.
- Be alert for potential illegal commercial collection of reptile species for food or pet trades, particularly alligator snapping turtle and box turtle (eggs or adults).
- Use “in-reach” and outreach to educate both staff and public on the ecological values of traditionally feared species, particularly venomous snakes, and removal of these native species should be discouraged.

Objective 1-17: Fisheries – Over the life of the CCP, maintain and enhance (conserve, restore, and manage) aquatic habitat for a diverse assemblage of fish species, particularly those recognized as species of special concern by State and/or Federal agencies.

Discussion: The conservation, restoration, and management of the aquatic resources (fish and mussels), aquatic habitats, and the terrestrial habitats within White River NWR are all intrinsically intertwined components of this incredibly complex and important ecosystem. The restoration and conservation efforts to restore and maintain bottomland hardwood hydrologic functions can benefit both terrestrial and aquatic species. Emergent wetland (moist soil unit) restoration and management

can benefit waterfowl, shorebirds, fishes, and amphibians and other species when the timing and duration of flooding is optimized for all species. Numerous opportunities exist for management integration and comprehensive planning that will increase our ability to identify and achieve these co-compatible objectives and goals.

The hydrologic fluctuations of the White River affect all species and habitats in White River NWR. As described in Chapter II, in the 20th century these fluctuations were altered by dams, levees, roads, channelization, and numerous other cumulative influences; the multiple long-term and cumulative effects of these alterations on the ecosystem continue at present. The refuge is incapable of predicting or controlling the river and therefore must adaptively manage the resources based on the existing and ever-changing circumstances and provide conservation and restoration within and compatible with these realities and constraints. For practical restoration and conservation to succeed in an altered and artificial system we must adaptively use alternative and artificial techniques and methodologies. Restoring and maintaining natural flows and flooding regimes may not be possible, but constructing and managing water control structures on oxbows and moist soil units can help to mitigate these losses by sustaining flow durations and providing habitat that what would have naturally existed and is necessary to conserve associated species.

The many diverse habitats within the refuge including the river, its tributaries, and over 300 lakes, sloughs, and bayous support high species richness for fish, mussels, and other aquatic species. However, studies have shown that as these habitats have declined due to altered flow regimes in the White River, so has species richness and population densities of some species. This system must be managed to restore and preserve these diverse habitats and their associated species. The first step is to identify these relationships and continually assess and monitor habitat trends and fisheries populations. The fisheries must be managed as a whole, but special consideration and attention should be given to species that serve as indicators of community changes and ecosystem impacts.

Several state and federal special status species have been identified on White River NWR. These include paddlefish, blue sucker, alligator gar, alligator snapping turtle, American eel, Sabine shiner, shovelnose sturgeon and numerous freshwater mussel species that include two federally listed as endangered. Species such as paddlefish may be directly affected by the alterations to both habitat and flow; however, entire fish communities may be affected and restructured by the decline of a top predator such as alligator gar. Historically White River NWR was well known for having many large alligator gar, yet recent fisheries data and the public suggest that there has been a substantial decline in their numbers. The Alligator gar is an apex predator within this system and its decline is an indicator of habitat impacts, suggesting a trend that could affect the entire fish community. Understanding these relationships and their cascading effects are equally important, if not essential, for managing and maintaining the recreational, commercial, and ecological qualities of the refuge.

A 2008 genetic analysis of shovelnose sturgeon has shown that the White River contains a genetically distinct *Scaphirynchus* sturgeon population, as compared to the pallid, Alabama, and shovelnose sturgeon populations within other portions of the lower Mississippi River Basin.

Freshwater mussels serve many ecological roles within aquatic habitats they inhabit. As filter feeders, they clean the water by removing suspended solids, cleaning the water for human and wildlife use. They serve as food for selected species of turtles, fish, mammals and ducks. Since they are sessile organisms generally requiring stable habitat, they also serve as indicators of aquatic health. Anecdotal information suggests that the White River mussel community has declined in both species richness and population density since management of the river was converted from a naturally flowing system to one with numerous upstream dams. In addition, commercial navigation requires the constant removal of substrate to allow barge passage. Both activities cause the habitat

to remain in constant flux, attempting to stabilize. Only areas that contain stable substrate continue to contain dense mussel communities, and even those are diminishing in area.

Strategies:

- Determine hydrologic patterns of the reach of the White River in the refuge pre- and post-alteration.
- Establish a system to identify and track the hydrologic relationships, ecologic functions, biological and recreational values, and habitat characteristics of the numerous lakes, wetlands, and tributaries on the refuge.
- Recognize the cumulative effects of basin-wide changes brought about by various projects and management and develop comprehensive conservation planning to mitigate these effects.
- Characterize and categorize each lake much like forest stands have been by describing their hydrology, habitat, biological characteristics and. recreational values. Once this has been completed we can begin to manage for multi-use habitat optimization, restoration, and conservation and their associated species.
- Manage and/or restore each water body based on the assessment to re-establish each water body as part of the system and to increase diversity of aquatic habitats, hydrologic functions, and species richness.
- Assess and evaluate moist soil units, wetlands, lakes, and oxbows for functionality and prioritize their water control structures.
- Prioritize water control structures for compatible management opportunities with fisheries and construct new control structures where needed.
- Manage water bodies and control structures to mimic natural hydrology while maintaining fish passage and avoiding fish entrainment.
- Seek co-compatible multi-species management and adapt to current situations.
- Maintain and restore riparian buffers, where needed, and monitor roads and camping areas to minimize impacts to riparian areas.
- Apply refuge management according to guidelines outlined by Arkansas Forestry Best Management Practices (2002).
- Maintain and restore fish passage through existing culverts and water control structures. Construct new culverts, ditches, and water control structures where necessary to allow fish passage.
- Identify refuge water rights, baselines, and jurisdictions to allow for the management and conservation of habitats and species. Jurisdictional water levels, hydroperiods, and habitat needs must be established in order to maintain aquatic resources and to identify and prevent losses and damages.
- Use adaptive management methods to address alteration of the natural ecosystem through management to ensure restoration and conservation fitting with ecological trends, habitat succession, and hydrology patterns.
- Assess alligator gar use of refuge habitat and identify priority water bodies and habitat needs for conservation, restoration, and management of the species.
- Assess management regulations; in light of assessment consider appropriate changes to restore and conserve the species.
- Protect areas identified as important for spawning or overwintering of alligator gar; develop regulations to prevent or minimize take during these sensitive times
- Require reporting of alligator gar take under commercial fishing special use permits to aid in monitoring, research, and management.

- Identify impacts to ecosystem functions from past, present, and future projects and seek appropriate mitigation.
- Maintain, prevent, and/or reduce exotic species levels by improving the natural predator/prey populations and restoring hydrology.
- Develop a rapid response plan to introductions/invasions by exotic species and adaptive management policies.
- Evaluate and improve regulations, permits, and creel monitoring to better assess effects of recreational and commercial fishing and allow improved management.
- Assess impacts of public use on resident fish species.
- Establish "Natural Area" lakes, which will serve as controls for comparative assessments.
- Sample appropriate habitat to determine presence of the pallid sturgeon in refuge waters.
- Support research to determine the extent of the White River shovelnose sturgeon species in refuge waters, including collection of individuals for genetic testing and morphometric analysis.
- Conduct further studies, to include a greater number of individuals for genetic testing and morphometric analysis of individuals, to determine the extent of the White River *Scaphirhynchus* sturgeon species.
- Collect a more comprehensive baseline inventory of freshwater mussels in refuge waters. Additional mussel baseline data should be collected in additional tributaries and a monitoring plan developed for the freshwater mussel resources of the refuge.
- Develop a strategy for periodic monitoring of freshwater mussel resources in refuge waters.
- Identify priority habitat areas and/or demonstration areas to provide for intensive conservation, management, and research monitoring. Initiate management changes (i.e. sanctuaries, regulatory closures, etc.) if necessary to improve, conserve, and/or restore fisheries.
- Provide educational information, signage, maps, and brochures to groups, fishers, and schools on conservation, regulations, management, policies, and research.
- Educate the public of necessary changes to management actions (e.g., sanctuaries, new fishing regulations).

HABITAT MANAGEMENT

Goal 2: Manage and conserve the functions and values of the bottomland hardwood forest ecosystem and associated habitats of the Lower White River to achieve refuge purposes, wildlife population objectives, and benefit migratory birds and other wildlife.

Discussion: White River NWR contains nearly 160,000 acres of prime bottomland hardwood habitat located within the floodplain of the lower White River. Much of this forest is flooded seasonally for weeks or months at a time, forming a large, deep swamp. The refuge also manages open lands, including levees, cropland, and moist soil areas. Open waters, wetlands, and other aquatic habitats, including the White River itself, larger tributaries, lakes, ponds, and sloughs, are an integral part of the refuge. Understanding and working within the constraints of the White River's and the refuge's complex hydrology is crucial to managing wildlife habitat on the refuge.

Objective 2-1: Open Lands Under Passive Management (levees, fallow fields and right-of-way's) – Over the life of the CCP, maintain open lands to provide a complex of habitat types primarily suited to benefit migratory birds and resident wildlife. Explore opportunities to increase efficiency of current open lands and maintain or increase acreage of habitat to be included in integrated open land management. Monitor vegetation and wildlife responses to treatment and implement adaptive management.

Discussion: Open lands on White River NWR are currently under a variety of management objectives and/or constraints. Permanently maintained open lands under right-of-way or easement restrictions include power lines (400 acres), gas pipeline (190 acres), highways (140 acres), levees (710 acres) and canals (430 acres). Other permanently maintained open lands include portions of the Farm Unit (111 acres), Surround field (60 acres) and portions around the Visitor's Center/Upland Walking Trail (6 acres).

Considerations in the habitat management of open lands for a variety of wildlife needs include the most effective use of the site characteristics, competing habitat needs, ability to apply appropriate management, and constraints on management (e.g., easement or right-of-way restrictions). These permanently maintained open lands are generally lacking on the refuge and serve to increase habitat diversity while providing habitat for a suite of wildlife species not otherwise supported by other refuge habitats (i.e., eastern cottontail rabbit, eastern meadowlark and a variety of other resident wildlife species). For example, the Farm Unit and Surround field should be considered for management under objectives for scrub/shrub birds, woodcock, or grassland/savannah restoration. Additionally, the Surround field should be considered for management under objectives for forest breeding birds and cane restoration, based on site specific evaluation of factors. Permanently maintained open lands such as powerlines and gas right-of-way easement areas should be considered as areas with potential to improve for species such as wintering grassland birds, wild turkey, or American woodcock. The refuge will oversee the work with that energy and gas companies conduct in needing to maintaining rights-of-way by only allowing them to work in these areas in such a manner so as they that does not negatively impact the wildlife benefits of this type of habitat (i.e.. chemicals and work to be done must be approved by the refuge through the issuance of a special use permit).

Levee Management (grazing and haying)

In 1938, the refuge issued an easement to the White River Levee Board to build the levee on refuge property. The levee was managed by either haying or mowing, but in 1967 the refuge entered an agreement with the Levee Board allowing them to issue permits for grazing, as long as the wildlife interests of the refuge were protected. Currently, there are approximately 500 acres of refuge property in the levee easement that are maintained by either haying or grazing. The present management strategies promote use by brown-headed cowbirds (*Molothrus ater*), a brood parasite that lays its eggs in the nests of host species and can adversely impact the productivity of a number of species, including high-priority neotropical migratory birds nesting in nearby forested habitat, such as Swainson's warbler, prothonotary warbler, and Acadian flycatcher (Benson 2008, Gannon 2005).

The brown-headed cowbird has been found to significantly reduce the reproductive success of neotropical migratory birds of conservation concern by at least four different studies conducted on White River NWR. Gannon (2005) documented significant impacts of cowbird parasitism on both nesting Acadian flycatchers and prothonotary warblers in the interior of the refuge. This study and Cooper et al. (2009) documented that cowbird parasitism decreased within the interior of the White River NWR as distance from the levee increased.

Benson et al. (2010a) found that 36 percent of Swainson's warbler nests, a species of extremely high conservation concern, were parasitized by cowbirds in the White River NWR. This rate of parasitism was substantially greater than reported rates in all other nesting studies of this species throughout the southeast. This study also demonstrated the cowbird parasitism reduced number of Swainson's warbler fledglings from 2.27 to only 0.60 in successful nests with the most important variable predicting whether a Swainson's warbler nest would be parasitized was the edge-density within 1 km of the nest site (levee-forest refuge edge). Additionally, Benson et al. (2010b) documented regular cowbird predation events far from forest edges within the White River NWR.

The brown-headed cowbird prefers habitats with trees scattered among grasslands, including woodland edges, pastures, and old fields (Lowther 1993). Forest interior species, historically more isolated from parasitism prior to the fragmentation of forests, have become increasingly negatively impacted by parasitism during the breeding season (Brittingham and Temple 1983). Cowbirds are ground foragers and are often found in association with ungulates which disturb insects (Lowther 1993) and reduce grass height.

Thompson (1994) observed cowbirds in Missouri and Illinois using agricultural fields to forage in and this would likely cause parasitism rates to increase near agricultural edges. Thompson (1994), however, suggested that cowbirds were utilizing recently tilled lands and feeding on the exposed soil invertebrates. These types of habitats are likely depleted before the majority of forest-breeding birds begin nesting because the majority of tillage occurring around the refuge occurs more than 60 days before the forest-breeding bird season. Forest interior roads and trails are also recognized as a factor in providing access by cowbirds to interior forested habitats, as cowbirds tend to fly long distances to interior habitat and often use roads and trails for access. However, under the assumption that each factor is additive in contributing to the strong negative effect which cowbirds have on forest breeding bird productivity, the refuge should emphasize those factors over which it has management control and minimize conditions which promote cowbirds whenever possible. This would include modifying the current management of the levee to detract from its suitability for cowbirds.

In the summer of 2010, Arkansas State University conducted pilot surveys along portions of the refuge on the White River levee where grazing is currently allowed. Data from 11 road counts conducted between May 17 and August 18, found the average number of cowbirds encountered during a road count to be 189 individuals. Significantly higher densities of cowbirds were observed in pastures with grazing cattle (24.8 cowbirds/km) than pastures with no cattle present (8.2 cowbirds/ km; M. Howard and J. Bednarz unpubl. data). In addition, cowbirds were most often seen in shorter grass that had been hayed or cut. Compared with grazing, Morris and Thompson (1998) documented that grass height was of secondary importance to foraging cowbirds and recommended maintaining grass at higher levels to make habitat less suitable for cowbirds.

While the primary concern addressed by the biological review team regarding the White River Levee was minimizing impacts of brown-headed cowbirds, consideration should also be given to its ability to provide resources for migratory and resident species such as American woodcock, wintering grassland birds, and wild turkeys. Management that is within levee board constraints, yet can provide habitat for trust species, will be given priority consideration.

Strategies:

- Restrict or eliminate fall plowing of crop fields to provide for American woodcock.
- Create and maintain preferred woodcock nocturnal habitat in “old-field” or grassland habitats; consider this management on permanent open areas such as rights-of-way, levees, and other permanent openings.
- Evaluate early successional habitats on the Farm Unit.
- Integrate scrub/shrub priority species with other management objectives on the Farm Unit.
- Reduce bush-hogging frequency to encourage growth of patchy scrub/shrub habitat.
- Evaluate the use of fire as a method to create target native warm season grass, scrub/shrub or grassland/savannah conditions.
- Consider the size and configuration of habitat managed for early successional species.
- Manage open lands so to minimize use by brown-headed cowbirds.

- Maintain a portion of the refuge in a variety of early successional areas in ecotonal sites as critical nesting and brood-rearing sites for resident wildlife reproduction. These areas, along with forests that have been thinned, will serve as areas with soft mast production to help mitigate effects of drought and lack of hard mast availability during the year.
- Burn (wherever possible), strip disk (on the thirds principle), or herbicide (spot treat as needed) old fields to set back natural plant succession, and increase nesting and brood rearing habitat in larger areas not reforested in oak seedlings.
- Refrain from mowing levees, powerline/pipeline rights-of-way, and roadsides until August 1. These are the only reproduction areas for resident ground-nesting birds.

Levee Management

- The refuge will work with the White River Drainage District to eliminate grazing activities on the levee based on the compatibility considerations (providing habitat that negatively impacts neotropical bird species), and instead mow or hay outside of the March to August breeding dates. This would assure that woody encroachment on the levees is minimized.
- Significantly reduce the habitat suitability of the levee for use by brown-headed cowbirds.
- Optimal management would establish conditions in which grass and herbaceous growth is not inhibited or removed between March and August annually. To avoid disruption of the nesting season of neotropical migratory songbirds in the adjacent refuge forest and to prevent creating suitable brown-headed cowbird habitat during the nesting season, haying will not be allowed until August 1, to prevent creating suitable cowbird habitat during the nesting season.
- Modify road and trail management to minimize cowbird access to interior forested habitat, including potential modifications to current strategies of “daylighting” roads, roadside mowing, and road and trail distribution.

Objective 2-2: Open Lands under Active Management (cropland and moist-soil) – Over the life of the CCP, expand and intensify active management of open lands to provide a complex of habitat types primarily suited to benefit migratory birds. Explore opportunities to increase efficiency of current open lands and maintain or increase acreage of habitat to be included in integrated open land management. Monitor vegetation and wildlife responses to treatment and implement adaptive management.

Discussion: Considered as a proportion of the entire refuge acreage, actively managed cropland and moist-soil impoundments consist of less than 0.5 percent of the refuge (750 acres) and have a history of heavy waterfowl usage. The largest portions of the refuge with water management capabilities exist in the form of bottomland habitat (greentree reservoirs or GTRs) without active habitat management. These bottomland habitats are heavily used by waterfowl but have a history of prolonged flooding that is likely damaging the vegetative integrity of these impoundments. As the habitat management plan for the refuge is developed, it is likely that some of these GTRs will forgo flooding in future years to emulate natural wet-dry cycles that have been removed by the manual flooding of these GTRs every year from October till March. Actively managed open land habitats can remain flooded for longer portions of the year without negatively affecting the health of the wetland, unlike flooded timber wetlands, and therefore provide foraging and roosting habitat to other wetland dependant wildlife such as shorebirds and wading birds. These impoundments will be even more important during years that some of the GTRs are not flooded.

Most importantly, these actively managed impoundments are located in areas closed to hunting and serve as reliable sanctuaries capable of providing food, cover and loafing habitat. Even though a large portion of the refuge serves as waterfowl sanctuary and provides many acres of water in the form of oxbow lakes and greentree reservoirs, the sanctuary habitat that exists on the refuge during dry years provides little or no foraging habitat (i.e., oxbow lakes). Without these actively managed impoundments, the number of waterfowl that the refuge can support is drastically reduced, especially during years in which the river does not overflow its banks.

The high seed production of moist-soil plants and their value as waterfowl foods have been known since at least the 1940s (Low and Bellrose 1944). However, managing seasonally flooded herbaceous wetland impoundments or "moist-soil units" only became a widely accepted practice after many years of research in southeastern Missouri (Fredrickson and Taylor 1982, Fredrickson 1996). Today, more than 20,000 acres of moist-soil habitat are managed in more than 300 impoundments on state and federal lands in the LMV (Unpublished data, LMV Joint Venture). The recently distributed *Moist Soil Management Guidelines for the U.S. Fish and Wildlife Service, Southeast Region* (Strader and Stinson 2005) should be used to manage and evaluate the refuge's moist-soil management program.

Unharvested grain crops are a critical ingredient of waterfowl foraging habitat needs, and if not available, the attractiveness of a refuge for waterfowl is decreased. Grain crops should continue to be provided on the Farm Unit as a concentrated food source, particularly for mallards and white-fronted geese. Grain crops including milo, rice, corn or millet should be utilized as the grain crops of choice. The Farm Unit currently contains 334 acres of crop fields, approximately 25 percent of which are left unharvested. In addition to the farm fields at the Farm Unit, crops should occasionally be rotated within the Demonstration Unit and Dry Lake moist-soil impoundments to set back succession and provide sources of high-energy foods.

In order to contribute ducks to spring breeding populations, wintering areas must provide sufficient habitat to ensure adequate winter survival. To quantify winter habitat requirements, the LMVJV had to identify limiting factors and they assumed foraging habitat was most likely to limit waterfowl populations in the LMV (Reinecke et al. 1989). In simple terms, one objective of the LMVJV is to provide enough foraging habitat (in duck-energy days or DEDs) to meet the calculated sum of the following factors: 1) the continental duck population goal of NAWMP; 2) multiplied by the proportion of ducks typically wintering in the LMV area; 3) adjusted for ducks that die during winter but requiring habitat before they die; 4) multiplied by the average number of days ducks are present; and 5) multiplied by the amount of food required per day. These calculations generate the need for millions of DEDs of foraging habitat. Research indicates that foods used by mallards, pintails, wood ducks and other species emphasized by NAWMP generally are obtained in 3 primary habitats: seasonally flooded natural (moist-soil) areas, croplands and forested wetlands. The abilities of these habitats to provide DEDs of foraging habitat have been summarized (Reinecke et al. 1989, Loesch et al. 1994, Reinecke and Loesch 1996) and are used by the LMVJV to calculate the acres of various combinations of habitat needed to satisfy population goals.

Currently, the refuge is capable of providing 2,759,963 DEDs on 6,348 acres through both actively managing habitat and water levels in a given year (Table 14). DED objectives were calculated by multiplying the acreage objective by the assumed DED standard developed by the LMVJV for that habitat type. Table 15 depicts the current DED foraging capacities accepted for various foraging habitat types.

Table 14. Managed waterfowl units and habitat target and objectives for a typical year

Unit	Habitat Objective	Acres	DED/Acre	Total DEDs (Ac. x DED/Ac.)
Functioning Units				
Demonstration (Lower and Middle)	Moist-Soil	140	1,868	261,520
Demonstration Upper	Open Water	50	50	2,500
Dry Lake	Moist-Soil	200	1,868	373,600
Water Storage Area[1]	Open Water	440	50	22,000
Cook's Lake Reservoir[2]	Open Water	76	50	3,800
Farm Unit	Unharvested Crop[3]	47	23,833	1,120,151
	Japanese Millet	30	5,203	156,090
	Harvested Rice	231	138	31,878
Frazier Lake GTR	Bottomland	262	203	53,186
Prairie Lake GTR	Bottomland	400	203	81,200
Thomas Bayou GTR	Bottomland	412	203	83,838
Levee A Impoundment	Open Water	1640	50	82,000
Levee B Impoundment	Bottomland	1800	203	365,400
Duck Rest Levee	Bottomland	600	203	121,800
Poorly Functioning Units				
Surround Pond	Open Water	10	50	500
Kansas Lake	Open Water	10	50	500
Totals		**6,348**		**2,759,963**

[1] Area can be managed for moist-soil but will not be managed for moist-soil again until 2012 to prevent willow encroachment in reservoir.
[2]Attempts to band wood ducks on this reservoir will be made and if successful, water draw-downs will likely not occur on annual basis.
[3]DED estimates in this table are based on unharvested rice although some of this acreage is typically composed of unharvested corn, milo or millet.
[4]Should be noted that these impoundments are hunted 4 days/week from mid-November until late January.

Table 15. Carrying capacity of selected foraging habitats (expressed as duck energy days/acre) of dabbling ducks wintering in the LMRJV

	Habitat Type	Carrying capacity (DEDs/ac.)
Unharvested cropland	Moist Soil	1,868
	Rice	23,833
	Soybean	4,677
	Milo	18,046
	Corn	28,591
	Millet	5,203
Harvested cropland	Rice	138
	Soybean	36
	Milo	480
	Corn	505
Bottomland Hardwoods	30% red oak	109
	40% red oak	156
	50% red oak	203
	60% red oak	250
	70% red oak	297
	80% red oak	345
	90% red oak	392
	100% red oak	439

Step-down objectives and capabilities for White River NWR were last updated in 2003 and do not accurately depict current capabilities of wetland habitats on the refuge. Also conspicuous in the foraging habitat allocation for White River NWR, even though the refuge managed a cooperative farming program during the time of the latest allocation was the absence of an unharvested crop objective. Complicating the reliability of the DED objective is the need for a review of the step-down process to further refine the process based on more up-to-date information.

Even though the current DED capability numbers appear to effectively meet overall goals or management needs of the refuge, it should be noted that only impoundments located on the Farm Unit are capable of reliable water manipulation and/or management. The remainder of the impoundments is continually influenced by river levels from either the Mississippi or White Rivers. When a flood event from either of these rivers occurs it can, (1) deeply flood the majority of the refuge during winter months, making much of the habitats too deep for foraging waterfowl and (2) saturate impoundments so that soil manipulation is not possible during spring and early summer, thereby reducing the quality and abundance of moist-soil plants at both the Demonstration Area and Dry Lake.

Strategies:

- Develop a means for flooding these areas during dry years (i.e., irrigation wells).
- Manage moist-soil impoundments to support seasonal herbaceous vegetation.
- Integrate agricultural crops into moist-soil management to provide soil disturbance, control woody vegetation, and provide high-energy waterfowl food. Disturbance and/or crops should be integrated into moist-soil management on a 3- to 4-year rotation.
- Retain agricultural fields with pumping capability in annual rotational agricultural production.
- Emphasize use primarily by mallards and white-fronted geese in management of agricultural crops.
- Do not manage agricultural areas for Canada geese.
- Seek opportunities to integrate late summer shorebird management in moist soil and agriculture units.
- Create and maintain preferred woodcock nocturnal habitat in wet agricultural fields.
- Because of the current inability to reliably flood and disturb high-waterfowl use areas such as the Demonstration Area and Dry Lake, assess any acquired lands for flood and management capabilities and consider making them (or portions of them) an actively managed moist-soil and crop area.
- During years of late summer backwater flooding that prevents growing of beneficial crops or moist soil plants for waterfowl, consider using these impoundments for southbound shorebird migrations. This would involve exposing mudflats from mid-July through early October.

Objective 2-3: Forested Habitats – Over the life of the CCP, through active forest management achieve Desired Forest Conditions on 40 percent of the refuge to protect, manage, and restore the values and functions of the refuge's forestland to sustain the biological needs of native wildlife and migratory birds.

Discussion: The objectives of the Forested Habitat Management Plan for White River NWR are to:

1. Manage the forest to provide essential habitat components for migratory birds and other wildlife native to the Lower White River ecosystem.

2. Strive to achieve and maintain the composition and condition of the forest in accordance with Desired Future Conditions developed as directed by the CCP.

Desired Future Forest Conditions have been taken further by the Final Report of the Forest Resource Conservation Working Group formed under the LMVJV Forest Resource Conservation Working Group 2007. This report uses indicators of habitat structure for determining Desired Forest Conditions. It states:

"Forests within suitable landscapes should provide vertical and horizontal structural diversity in terms of tree species, size and age classes, and growth forms (e.g., trees, shrubs, and vines) within a heterogeneous forest canopy comprised of gaps and a complex layering…"

The Working Group identified landscape and stand level parameters intended to guide and facilitate management actions that result in desired forest conditions that benefit priority wildlife species. These parameters are represented as a range of values, which provide flexibility to modify stand prescriptions to meet overriding habitat needs within local landscapes and among different forest types.

These parameters are:

Primary Management Factors	Desired stand structure
Overstory canopy cover	60 – 70 %
Midstory cover	25 – 40 %
Basal Area	60 – 70 ft^2/acre
Tree Stocking	60 – 70 %

Secondary Management Factors	Desired stand structure
Dominant trees	> 2/acre
Understory cover	25 – 40 %
Regeneration	30 – 40 % of area
Coarse woody debris (>10" diameter)	> 200 ft^3/acre

The White River NWR FHMP Update of 2007 accepted the Desired Forest Conditions as fully compatible with the Desired Future Conditions of the original FHMP.

The LMVJV Desired Forest Conditions publication recommends that "Managers should strive to ensure that 35-50 percent of all forested habitat is within desired stand conditions at any point in time." A fair assumption is that a forest treatment or thinning will put a stand in desired conditions for up to 15 years; past this point the productive White River bottomland forest will grow out of the desired conditions. To perpetuate this condition on 150,000 acres of forest the refuge would have to treat 3,300 to 5,000 acres per year. In recognition of the inability of the refuge to apply this level of forest management under current staffing levels, the Biological Review team emphasized the importance of focusing efforts on priority higher elevation sites (i.e., cherrybark oak, native cane, and sweetgum sites). These sites comprise several thousand acres of the refuge and are most often found as narrow natural levees or along the base of the escarpment on the west side.

Other sites deserving emphasis are the higher elevations that are just lower than cherrybark, but with cane and/or sweetgum in addition to the other species. These sites have better drained soils and higher productivity; therefore, they seem to respond more quickly and with greater growth than poorer sites above or below them. These sites can be especially beneficial, when in desired forest conditions, to suites of species such as the Swainson's warbler that utilize less frequently flooded areas. The Review team also recognized that the effect of the treatments or desired conditions will be realized on a landscape scale (i.e., 10,000 acres) rather than site by site or within a single stand. That is to say that within any given 10,000-acre block, some areas will exceed aspects of the desired conditions while perhaps being deficient in others but will rely on adjacent blocks within the 10,000 acres to meet the desired conditions. The net result is that within a 10,000-acre block on the refuge, 35 to 50 percent of the forest will be in desired conditions at any given time.

The Biological Review team recognized the importance of native cane and recently dead and dying or stressed trees for priority wildlife species. Management for these two components can be integrated with treatments. It is important to release cane found within treatments. The emphasis should be on 1) increasing density and condition of existing cane patches; and 2) expanding the extent of existing patches. Two main techniques can accomplish these objectives: 1) overstory removal by logging (severing cane); and 2) deadening by girdling (cane left uncut). Adaptive management strategies will determine the best technique at any given site. Cane research should be promoted through coordination, planning, and other available methods.

The stressed tree component can be further enhanced by replacing cull tree removals with other treatments (i.e., girdling, chemical injection, or purposeful logging damage) that would leave the trees in place to yield stressed tree benefits over a longer period. Groupings of dead and dying trees are not a necessary factor; trees may be treated in the frequency in which they stand. (Note that this will generally be made up of sawtimber size trees, with a potential for a 10 percent increase in dead and dying tree volume across the landscape).

As discussed in Chapter II, refuge-designated Natural Areas (White River NWR 2007) are spread throughout the refuge, although to a lesser degree on the North Unit (former Potlatch grounds). They represent a range of habitats totaling 10,890 acres in all. These Natural Areas should: 1) include management necessary to protect system health (such as hydrologic management/beaver control); 2) be included in monitoring and assessment conducted in similar fashion (methods, period) to that in areas in which active forest management is applied; 3) be continuously reassessed and reevaluated comprehensively across the entire refuge; and 5) reassess opportunities for natural areas, assessing the role of natural areas as research controls and shared roles with other refuge objectives. All Natural Areas should receive close evaluation and monitoring to this end.

Seasonally flooded forested wetlands – green tree reservoirs (GTRs) – provide food for waterfowl in the form of acorns, moist-soil seeds, and invertebrates, as well as cover where ducks can rest and form pair bonds with minimal disturbance. In addition to forest quantity, forest quality will determine the amount of waterfowl that will use an area. Forest features such as species composition (percentage red oaks), age of dominant trees, and stand densities are some factors that will affect mast and moist-soil production.

As a general rule, the overall health and vigor of GTRs are maintained when hydrology is managed to closely mimic that of natural forested wetland systems. Such natural flooding regimes are varied in nature, depending upon rainfall and water conditions from one year to the next. Frequent early (November) and late (March) flooding of GTRs, as well as frequent prolonged flooding is in most cases damaging to forest health, and leads to increased tree mortality, reduced production of hard mast as food for waterfowl, and shifts in plant species composition through time. Management of the forest structure and composition through active forest management complements appropriate water management to provide a healthy and productive GTR.

The refuge annually conducts seasonal flooding of its mixed oak and scrub/shrub GTRs (5,680 acres), generally with a target date between December 15 and January 30, to be at maximum pool level. Drawdown is generally initiated on February 1, if backwater water levels are low enough to access the floodgates. At this time of year, water levels vary over a wide range due to heavy late winter rainfall or occasionally, a scarcity of rainfall. During a dry winter, the structure may not be opened until a later date. The ability to influence water levels in the forest can provide significantly enhanced habitat for wintering waterfowl. However, early spring flooding has been shown to adversely impact the health of trees, particularly red oaks, and inhibit survival of tree seedlings.

Large beaver populations have undue impacts on the refuge's bottomland forests. Currently, it is estimated that beaver are impacting or have created over 6,000 acres of dead forest. Historically (at least in the 20th century) the beaver population may have been low in the White River bottoms, but now population density is high and concentrated. Refuge staff expends excessive time and resources removing impoundments and controlling beaver every year. While there are benefits to a certain low level of beaver populations, there is a critical need for more beaver control efforts to reduce the current level of impact. In the past the refuge has hired a seasonal beaver specialist to implement beaver control with measurable success.

While the frequently flooded forests of White River NWR are generally not overly susceptible to invasive plants, they have become established in a few areas. Chinese privet is the species of most concern at White River NWR, while kudzu and Japanese honeysuckle can also be problematic. Privet generally invades when seeds distributed by birds become established in the understory. When the canopy has been opened up by disturbance from windstorms, drought, or forest thinning, the seedlings grow rapidly and shade out other vegetation. To prevent further spreading, privet present in or adjacent to areas to be thinned could be controlled. Areas with kudzu, Japanese honeysuckle, or other invasive plant should be inventoried, and the refuge should prepare and implement a control plan specific for those infestations.

Wildfire is infrequent at White River NWR, and for the most part is detrimental to the bottomland hardwoods. However, prescribed fire has great potential to be used to accomplish habitat goals in savannah, grassland, and other fire adapted habitats. The refuge has an approved Fire Management Plan that includes the use of prescribed fire on much of the upland areas that could be could be managed for savannah, and on the Farm Unit or levee for grassland management. Additional funding, equipment, and staffing are needed to fully develop and implement an adequate prescribed fire program.

Strategies:

- Conduct Annual Habitat Work Plans following the FHMP and 15-year evaluation/ treatment cycle, focusing on higher elevation sites and stands with critical needs across the refuge landscape. When a new Habitat Management Plan is prepared, consider a 5-year evaluation/treatment cycle to better facilitate management actions on priority areas.
- Follow management guidelines consistent with Desired Future Conditions of the current FHMP and Update and the Desired Forest Conditions (LMVJV Forest Resource Conservation Working Group 2007), which promote forest structure, retention of larger trees, snags, stressed trees, and cavities, among other characteristics, for support of wildlife such as waterfowl, Swainson's warbler and other forest songbirds, American woodcock, ivory-billed woodpecker, wild turkey, white-tailed deer, black bear, bats, and other wildlife.
- Ensure that forest evaluations and application of treatments as prescribed in the current FHMP are carried forth as a priority.
- Apply silvicultural treatments to meet the desired forest conditions of the 2001 FHMP and 2007 Update, considering the overall needs of the refuge ecosystem, individual site characteristics, habitat conditions, geomorphology, degree of past disturbance, and hydrology.
- Secure funds and means to hire seasonal laborers to assist with marking of treatments.
- Develop and refine prescriptions that can be applied effectively with little or no marking (e.g., reverse diameter limit).
- Strategize application of forest management to most efficiently apply treatments to areas most productive for understory dependent migratory birds.

- Conduct post-treatment monitoring for adaptive management and to ensure that objectives are met.
- Maintain the Continuous Forest Habitat Inventory (CFHI) system on a 10-year-cycle and develop tools to analyze and track refuge habitat and site conditions over time.
- Develop ways to streamline data collection while maintaining useful measurements.
- Note unique habitats/species such as cane, corkwood, pondberry, etc. as encountered in CFHI surveys for aid in future botanical surveys/research.
- Develop, implement, and refine techniques to improve existing cane patches, incorporated through normal silvicultural treatments.
- Provide opportunities for forest management demonstration, education, and research on the Cooks Lake Unit. Manage the various habitat types of the unit as a small scale representation of management being conducted on similar habitats refuge wide.
- Further define Natural Areas in the FHMP to provide for:
  - management necessary to protect system health;
  - inclusion in monitoring and assessment in similar fashion to that in areas in which active forest management is applied;
  - continous reassessment and evaluation
- Conduct Forest inventory and CFHI monitoring on Natural Areas, for comparison to areas under silvicultural management.
- Secure funds and means to contract beaver control and possibly summertime impoundment removal. This is an immediate short-term, as well as a long-term, need.
- Supplement beaver control through wintertime shooting and trapping, and summertime impoundment removal.
- Develop a spatial database (GIS) to systematically track occurrences, beaver impoundments, control measures, and control efficacy over time.
- Continue wildfire suppression relying on local fire departments and the Arkansas Forestry Commission for suppression.
- Update and implement the refuge Fire Management Plan.
- Develop a controlled burning (prescribed fire) program to restore and maintain appropriate upland sites to shrub/scrub, cane, oak savannah, and grassland. These areas should be appropriately located on sites identified from the latest geomorphologic maps.
- Do not apply prescribed fire to wetland sites.
- Secure funds and means to prepare burn plans and implement controlled burns.
- Closely monitor forest health of GTRs and devise plans for beneficial flooding/dewatering.
- Initiate a comparison of forest health in GTR impoundments and naturally flooded areas of the refuge either through research with a University or establishing sampling plots in these areas to begin taking measurements of forest condition. Use results of this to guide future management of GTRs.
- Following a timber harvest in a GTR, consider altering flood regime so that tree regeneration is not damaged by early or prolonged artificial flooding.
- Incorporate basic tenets of best management practices for GTR management to ensure long-term forest health, including:
  - Do not impound water until after trees are dormant for the winter season (hardwood leaves dropped) to maintain aeration to actively respiring tree roots. Generally this date does not occur until the end of November for White River NWR and impounding of water under live trees should normally not occur until on or after December 1.

- Vary duration and depth of impoundment flooding annually, incorporating both very wet and very dry treatment years occasionally in addition to more regular medium treatments, to reflect natural variation in flooding regime in the LMV floodplain system.
- Attempt to ensure that the unit is de-watered annually during late spring, summer and fall to the degree possible through management, recognizing that high natural floods may nullify or overwhelm active water management on occasion.

- Identify potential areas for cane restoration, through consideration of site characteristics including geomorphology, hydrology, and soil type.
- Maintain current canebrakes and encourage expansion and establishment of new canebrakes, with a focus on forest interior cane.
  - Focus on opportunities where restoration could succeed at a minimum scale of 2 to 3 acres,
  - Accomplish by implementing forest management activities within the context of Desired Forest Conditions or by recognizing special opportunities through identification of compartments with high cane density and application of forest management in that compartment.
- Recognize opportunities to implement management techniques and evaluate response of cane to different regimes including thinning, cutting, and transplant, which may best be done through a research grant.
- Coordinate research and management efforts with personnel from Mississippi State University and the University of Memphis, which have ongoing research on cane.

Objective 2-4: Aquatic Habitat Management – Over the life of the CCP, improve and restore the aquatic habitats of lakes, sloughs, and bayous on the White River NWR to fulfill its mission and purposes.

Discussion: The refuge has over 300 lakes, sloughs. and bayous. Some lakes have water control structures on them that have been used for waterfowl habitat management purposes. Some of these water control structures are no longer functional and should either be refurbished and managed appropriately or removed, thereby allowing some hydrological restoration benefits. The Mossy and Parrish Lake system is an example of where a nonfunctioning water control structure in Parrish lake along with White River channel migration have resulted in these lakes no longer maintaining fishable water levels during low White River stages. A rip-rap plug was used to close a river channel migration cut that was draining the lake in 1989, but this plug washed out in 2003 allowing the lake to drain. Altered hydrology on the lower White River is causing these types of accelerated channel migrations and headcutting which in turn impact nearby lakes, sloughs and bayous. Although these are somewhat natural processes, the frequency and rate at which they are occurring appear unnatural. Where these processes are impacting refuge lakes, a thorough review of the causes and possible remedial actions are needed. In some cases allowing the geomorphological changes to occur may be the appropriate course while in other cases some type of engineered fix may be more appropriate.

Very little work has been done to inventory or monitor the aquatic habitat of refuge lakes. Efforts should be made to restore connectivity between refuge lakes and the floodplain and reduce unnatural sediment depoisition rates where possible. Some refuge roads lead to camping areas and lakes or along lake-sides. Care should be taken not to allow camping areas or roads to encroach too far into riparian zones.

Strategies:

- Work with the partners (e.g., COE) to establish a mechanism to allow Parish Lake to hold water again.
- Inventory and monitor river channel migration and associated impacts on refuge lakes, sloughs and bayous.
- Develop appropriate engineered infrastructure to protect some priority refuge lakes while allowing natural river processes to either drain lower priority lakes or create completely new oxbow lakes across the floodplain.
- Inventory and monitor aquatic habitat to assess sediment deposition and connectivity
- Monitor roads and camping areas to ensure that they do not encroach into riparian areas.
- Use Best Management Practices (Arkansas Forestry Commission 2002) in refuge management and operation.

Objective 2-5: Refuge Hydrology – Over the life of the CCP, restore and/or mimic hydrologic patterns (i.e., timing, frequency, duration and extent of flooding) and habitats associated with particular hydrologic characteristics on-refuge and cooperate in inter-agency efforts to restore and/or mimic a more natural hydrograph on the White River.

Discussion: Hydrology is the driving force behind all ecosystem processes and functions of the lower White River ecosystem. Understanding the relationships and forces that govern this complex hydrology is vital to addressing long-term conservation of the lower White River ecosystem. A thorough understanding of the historic hydrology is needed to fully assess how river engineering and landscape alterations have affected the timing, duration, and extent of overtopping events as well as in-channel processes, and thus, ecosystem function. However, attention to current hydrologic conditions provides the context and direction for management of the public lands within the ecosystem.

The White River originates in the Boston Mountains of northwest Arkansas, flowing north into southern Missouri then back south into Arkansas. It emerges from the Ozark Highlands into the Mississippi Alluvial Plain at Batesville, Arkansas (White River Mile 300) flowing south to its confluence with the Mississippi River approximately 50 miles south of Helena, Arkansas. Being situated at the lower end of the 27,765 mi^2 White River basin, the hydrology of the White River NWR is influenced both by upstream discharge and Mississippi River stage. In addition, the hydrology of the river is further complicated by its interaction with the Arkansas River, which approaches within approximately one mile of the White River near White River Mile 10.

The Mississippi River is the major force governing the hydrology of the lower White River. The Mississippi's mean annual flow at Helena, Arkansas, is 480,000 cubic feet per second (cfs) (McCabe 1990), it but can exceed 1.5 million cfs, whereas the mean annual discharge for the White River at Clarendon (RM 99) is 30,787 cfs (less than $1/10^{th}$ of the Mississippi's mean annual discharge), with a maximum discharge of 190,000 cfs (Arkansas Soil and Water Conservation Commission 2000). In addition, the Mississippi River stage can fluctuate by as much as 57 feet in the vicinity of the mouth of the White River (U.S. Army Corps of Engineers 1988), and its influence can be seen for a considerable distance upstream.

The White River floodplain was historically connected to the Mississippi River floodplain on the eastern side, but is now separated by over 100 miles of levees which extend intermittently from Newport, Arkansas (White River Mile 255) to approximately RM 11. In most cases these levee segments are very close to the river, sometimes less than 35 yards from the channel. The White River is bounded by the Grand Prairie terrace to the west, which has an elevation that is

approximately 20 to 40 feet higher than the White River floodplain (Saucier 1994). The prairie terrace extends approximately 90 linear miles along the White River and ranges from zero to a maximum of 14 miles from the White River channel. For approximately 45 miles, the terrace does not get farther than 1.5 miles from the river.

The refuge has no control over hydrology of the White, Arkansas, or Mississippi Rivers. However, it is vital that refuge staff recognize the influences of dams/reservoirs on northern portions of the refuge, the influence of Mississippi and Arkansas Rivers on the southern portions of the refuge, the cumulative effects of basin projects, and the likelihood of future battles over water supply and demand. Effective management of the refuge's wildlife resources depends on learning and tracking hydrologic trends, even as water allocation demands are increasing and minimum river flows and water levels are debated. Demands for water from the White River and its tributaries are becoming more intense. Dam operations greatly affect water levels in the northern parts of the refuge. Large diversion projects planned for the middle extending from DeValls Bluff upstream would withdraw large quantities of water from the White River and are capable of reducing stage by up to one foot during lower flow periods. Awareness and concern over water availability, management, and use within the state are increasing, which could lead to future changes to state water laws. Therefore, it is vital that the refuge determine water needed to maintain the resource and establish a federal water right to ensure that the refuge water rights are not usurped.

The effects of river engineering, habitat alterations throughout the basin, and continuing development along with climate change and the continuing adjustment of channel morphology will result in continuing changes to frequency, timing, and duration of low flow, high flow pulses and flood events. Altered hydrology will affect not only habitat characteristics and quality, but also habitat availability for migratory birds. Only with knowledge of the changes in hydrology will refuge staff be able to apply adaptive management.

Establishing baseline data is necessary to identifying essential needs for maintaining habitat functions. The forest communities that occur under a given hydrologic regime are generally known and have been documented in scientific literature. However, how this has been affected by hydrologic changes in the basin is less well documented. Knowledge of forest health, community composition and potential changes in response to hydrology is needed for sustainable management of forest resources. Additional resource and habitat monitoring information is needed to establish critical, minimal or optimal requirements for maintaining system integrity as well as specific existing habitats.

The long-term sustainability of bottomland hardwood forest communities in the White River floodplain corridor, and specifically on White River NWR lands, will be dependant upon the protection, enhancement, and restoration of more natural channel and floodplain water flow patterns and regimes. This includes: 1) physical pattern of flows (both flooding and drainage); 2) timing, depth, and duration of river discharges and overbank flooding; and 3) water quality and sediment loading in the river and its drainages.

Strategies:

- Track and monitor hydrologic patterns and apply adaptive management to compensate for a changing ecosystem.
- Establish baseline data to identify essential needs for maintaining habitat functions.
- Identify water rights of the refuge.
- Restore more natural flow and hydrological regimes in the river channels and floodplains.

- Work with all entities to reduce hydrological impacts from surrounding private lands, and offer opportunities for reforestation and restoration of natural flow and flooding patterns.
- Carefully monitor and evaluate past, present, and proposed alterations to determine how, or if, restoration to more natural hydrology can be achieved.
- Where possible, use “low-water crossings” instead of pipes at road crossings to allow natural flows and reduce beaver impoundment problems.
- Evaluate influences of off-refuge physical and hydrological developments to hydrology on the refuge.
- Identify distribution and proportions of existing habitats for assessing and evaluating the impacts of proposed projects.
- Identify impacts to ecosystem functions and options for appropriate mitigation.
- In coordination with Service partners, inventory and evaluate all lands within the White River floodplain corridor for: 1) past and current habitat types, 2) past and current hydrological condition, 3) water management if any, 4) influences on flow pattern and duration on refuge lands, 5) land uses and potential contributions of sediment and contaminants, and 6) ownership issues.
- Understand and carefully monitor larger, system-wide issues such as: 1) proposed cleaning of blockages, 2) diversion of river water for agriculture or other uses, 3) channelization or restoration of formerly channeled areas, and 4) wetland development (e.g., Wetland Reserve Program) or management changes.
- Incorporate more holistic hydrogeomorphic analyses of community structure, functions and values within the context of the entire White River Basin of Arkansas and Missouri into strategic plans for White River NWR.
- Seek archaeological data as well as geomorphic data to support habitat goals and management needs. Archaeological and geomorphic data provide valuable clues to historic conditions, including spatial location of resources. They will help support habitat goals and management needs.

Objective 2-6: Water Control – Over the life of the CCP, improve functionality of water control structures and create more natural water regimes, while providing important resources for wetland-dependant wildlife.

Discussion: White River NWR embraces extensive lands along the White River corridor and includes a diversity of geomorphic, soil, topography, and hydrological conditions. Generally, management of the refuge should seek to protect, maintain, and restore natural physical features, ecological processes, hydrological regimes, and vegetation communities endemic to the region. If this conservation can occur, management can assist restoration and provide key functions, values, and resources to plant and animal communities, especially certain species of concern and refuge establishment priority.

A primary thrust of the refuge should be to encourage a natural pattern of overbank flooding and drainage along naturally occurring flow paths such as sloughs, side channels, swales, and meandering valley train networks. Water control structures should be constructed and maintained only in sites and units where intensive management is desired and possible (e.g., areas with moist-soil or GTR impoundments). Areas with water control structures should be managed to take advantage of natural hydrologic patterns whenever possible.

Water management plans are needed for all land units, and fields/areas within each unit. These plans should understand the vegetation community that naturally occurred on that site related to geomorphology, soils, topography, and hydrology, and what restoration plans are being implemented

or can be planned for each area. Each existing water-control structure should be evaluated and monitored to determine its functions and capabilities related to management objective.

Refuge lakes have varying connectivity with the White River. Some lakes have water control structures that historically were used to manage lake water levels, but which are currently non-functional, whereas other lakes do not have structures, but would benefit from the added management capabilities provided by structures. Evaluating connectivity, lake aquatic community assemblages and habitat characteristics will allow refuge staff to prioritize lakes with control structures for compatible management opportunities.

Strategies:

- Develop and maintain water-control infrastructure to assist restoration of bottomland hardwood forest floodplain communities and intensively manage moist-soil impoundments, agricultural fields, GTRs, and other wetland units.
- Develop a detailed water management plan for each unit of White River NWR that includes both intensive, purposeful, water management and provision for natural overbank flooding and subsequent drainage.
- Where possible, replace or eliminate water-control structures to meet objectives of more natural water regimes and intensive management (e.g., moist-soil) objectives.
- Assess and evaluate wetland-lake areas for functionality and prioritize those with control structures for compatible management opportunities.

Objective 2-7: Water Quality (aquatic resources) – Over the life of the CCP, establish and implement management actions to protect and improve water quality on the refuge while not interfering with activities associated with habitat management.

Discussion: The quality of water flowing onto and through the refuge has been affected by the many anthropogenic changes imposed on the landscape since Euro-American settlement. Extensive clearing of bottomland hardwood forests and conversion of the land to agricultural production, combined with intense drainage that was accomplished by ditching natural streams, and removal of vegetative buffers along waterways have altered runoff patterns, increased the velocity and volume of water reaching the river via tributaries. More sediment is carried to receiving streams, thereby increasing turbidity, total suspended solids (TSS), and sediment deposition (sedimentation).

The Arkansas Department of Environmental Quality (ADEQ) has 11 water quality monitoring stations on and slightly upstream of the refuge located both on the mainstem White River and tributaries. There are two ambient water quality monitoring stations on the mainstem White River and two ambient water quality monitoring stations on tributaries. The remaining seven stations are roving water quality monitoring stations. There is one station on the Arkansas River at Dam 2 that is used to assess the last 52-mile segment of the main stem of the Arkansas River. Aquatic life samples were collected between July 2002 and June 2007 from Boat Gunwale Slash and Big Creek as part of ADEQ's watershed assessment surveys, ecoregion based indices of biotic integrity and support determination sampling.

For the most part, waterbodies running through the refuge meet all designated uses including fish consumption, aquatic life use, primary contact (swimming), secondary contact, drinking water use, and agriculture and industrial use. However, three waterbodies did not meet all designated uses. Boat Gunwale Slash and Prairie Cypress Creek did not meet the aquatic life use due to inadequate dissolved oxygen. Agriculture was identified as the primary source of the problem. Big Creek did not

meet its agriculture and industrial use designation due to chloride and total dissolved solids. Agriculture was identified as both the primary and source and secondary source of the problems. These stream segments have been listed in Category 5d on the 303(d) list of water quality limited waterbodies which indicates that additional field verification is needed to determine the accuracy of the assessment (ADEQ 2008).

The White and Arkansas Rivers are both designated as “least altered Delta Ecoregion streams.” Least altered streams support diverse communities of native or adapted species of fish and other aquatic biota, and fish communities are characterized by an insignificant proportion of sensitive species (Arkansas Pollution Control and Ecology Commission 2007). In addition, the lower Arkansas River from Dam 2 to its confluence with the Mississippi River is designated as an Extraordinary Resource Waterbody (Arkansas Pollution Control and Ecology Commission 2007) and is also listed by the National Park Service on the Nationwide Rivers Inventory (NRI). The NRI is a register of rivers that may be eligible for inclusion in the National Wild and Scenic River System. Rivers are listed on the NRI based on the degree to which they are free-flowing, the degree to which the rivers and their corridors are undeveloped, and because they possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. The lower Arkansas River was listed on the NRI because it is free flowing and possesses outstandingly remarkable scenic, geologic, and wildlife values (National Park Service 2003).

All water quality monitoring stations located in the refuge had numerous pesticide detections. Metolachlor, molinate and bentazon were responsible for 33% of the detections. The station on Big Creek (WHI37) had the highest number of pesticide detections recorded during the most recent reporting period. This monitoring station is located in western Lee County and was sampled on two occasions. Rice, soybeans, and cotton are the primary crops grown in this area (ADEQ 2008).

In response to concerns about the impact of contaminants on fish and wildlife in the Lower Mississippi River ecosystem, the Service commissioned a study of chemical exposure and potential for adverse biological effects at the 26 National Wildlife Refuges in this ecosystem (Shea et al. 2001). Field sampling included collection of water, sediment and fish tissue. The mean DDT concentration in fish samples collected on White River NWR exceeded that Predator Protection Level (PPL) of 1,000 ng/g (nanograms per gram, or parts per billion; 1,000 ng/g equals one part per million). DDT was banned in the United States in 1972, but it is a persistent organic compound, and its residue lingers on in soils and sediments. Mean concentrations of toxaphene detected in benthic fish and predator fish on the refuge exceeded the lowest biological effects value of 400 ng/g; however, it was well below the federal action level of 5,000 ng/g. High concentrations of these chemicals detected in the study are associated with historical cotton production in lands adjacent to the refuges. The concentrations of these chemicals were higher than historical data, but this was not surprising to the study authors because sampling for this study was biased towards areas known or suspected to be most contaminated. The authors also noted that maximum values reported in this study were consistently lower than historical data.

The mean concentration of DDT in sediment was well below the probably effect concentrations (PEC); however, maximum values on the refuge exceeded the PEC for DDE (a breakdown or daughter product of DDT). Exceedance of the PEC is a reliable indicator of toxicity of organochlorine pesticides (OCP). Estimated concentrations of OCP in water sampled on the refuge were well below the EPA Water Quality Criteria for the protection of aquatic life. Fifteen currently used pesticides were detected in water samples collected on the refuge; all but azinphos-methyl and trifluralin were at levels below the aquatic life criteria or lowest LC50 value. Concentrations of PCBs, Polycylic Aromatic Hydrocarbons and mercury were all well below the levels of concern.

The results of the study of chemical contamination on the LMRE refuges are not predictive of chemical exposure or ecological risk quantitatively, but are useful for assigning relative hazards and prioritizing problems. None of the samples collected on the White River NWR exceeded the thresholds or exhibited toxicity for PCBs (polychlorinated biphenyls) and PAHs (polycyclic aromatic hydrocarbons), and therefore, are unlikely to pose any hazards. However, maximum residue values for OCPs, currently used pesticides and mercury, exceeded a threshold or exhibited toxicity and were therefore given an uncertain hazard determination.

Strategies:

- Avoid increased siltation by following BMPs in all refuge actions, including farming, timber harvesting, moist-soil management, construction, road maintenance, etc. whether done by a contractor or by the refuge.
- Document the location of all culverts and water control structures on the refuge, especially those repeatedly dammed by beavers. Where the structures are not necessary, replace them with rock-lined fords to maintain vehicular access, discourage dam construction by beavers and reduce blockage of structures by debris, thereby facilitating drainage.
- Work with Service private lands biologists, AGFC, ARNC, ADEQ, and NRCS to develop incentives for local farmers and land owners to encourage the use of filter strips and other BMPs to limit sediment laden agricultural runoff.

Objective 2-8: Inventory, Monitoring and Research – Within five years of CCP approval, prepare, maintain, and start to implement an Inventory and Monitoring Plan (IMP) and use results to implement adaptive management.

Discussion: It is Service policy (701 FW 2, Inventory and Monitoring of Populations) that each refuge prepares, maintains, and implements an IMP. The need for significantly increased emphasis on inventory and monitoring is closely linked to the process of adaptive management to better achieve objectives. Adaptive management is a system of adjusting management efforts using the best available knowledge and constantly seeking feedback from frequently monitoring resource response to management actions relative to stated objectives. The effectiveness of management decisions to meet refuge objectives can be determined via monitoring and subsequent evaluation of results.

These processes should be a priority at White River NWR. Particular emphasis should be placed on adaptive management associated with waterfowl and forest management. White River NWR has a long history and has been the site of extensive research, monitoring and some basic inventory. However, additional needs should be addressed strategically. Surveys and inventories are only useful if the data are analyzed and available, and future management actions have much better results if prior actions and results are clearly documented. Documenting and archiving survey methods and results are essential to efficient and effective land management; GIS and database tracking are recommended.

Baseline inventories as a mechanism to understand the components of the refuge ecology are fundamental to developing a framework for an ecosystem approach to management. As cumulative habitat modifications, species declines, and global climate change across North America become more dramatic in the 21st century, it is increasingly important for national wildlife refuges, which often act as habitat anchors for wildlife species, to recognize and assess the status of a diversity of flora and fauna in addition to priority species defined by refuge purposes. Baseline inventory data serve to identify the occurrence and status of at-risk as well as common species on a refuge and as such can create recognition of opportunities for effective management and a point of comparison for future assessments. For these reasons, particular focus should be placed on baseline inventories on water

quantity and quality and lake characteristics as well as species occurrence for mussels, herpetafauna, fish, and bats.

Strategies:

- Prepare, maintain, and implement an IMP in accordance with Service policy 701 FW 2, Inventory and Monitoring of Populations. As a part of the IMP, incorporate and prioritize surveys and inventory protocols to meet refuge needs as well as contribute to state, regional, and national programs.
- Use a working group approach to use expertise of staff and partners in identification and prioritization of inventorying, monitoring, and researching needs.
- Research should serve to support NWRS mission, refuge purpose and system goals.
- Be proactive in assessing research needs and promoting research which coincides with these needs.
- Assess and strategically design a limited scope of high priority monitoring efforts using a working group strategy, and commit to implement them through time.
- Assess current and potential monitoring programs using outside sources such as North American Bird Conservation Initiative (NABCI) and others for appropriateness and validity.
- Consider State priority needs as outlined in the State Wildlife Plan (2007) which complement NWRS mission, refuge purpose and system goals when assessing refuge priorities and opportunities.
- Recognize the potential for change in the local ecosystem associated with global climate change, and strongly consider implementation of monitoring that will help, locally and/or regionally, in documentation and assessment of that change.
- Use standardized monitoring methods when reasonable, to increase comparability of data through time, across refuges, within state, and across region.
- Provide refuge with adequate staff, equipment and funding to support development and implementation of an IMP.
- Enhance refuge inventory and mapping capabilities through the use of GIS, especially use capabilities shared with the LMVJV Office, and develop GIS data layers depicting occurrence/abundance of plant and animal species (e.g., roost sites, vegetation cover maps, rookeries, bear den locations) and management activities (e.g., forest management compartments, water management units).
- Coordinate closely with researchers active on White River NWR, encouraging communication with refuge staff as well as researcher coordination in regional working groups and partnerships and partner agencies. Provide oversight on research by non-Service personnel through the special use permit process.
- Explore opportunities for cross-program and interagency coordination, as well as other partnerships.
- Carefully and consistently document and track active management and research and monitoring methods.
- Refer to Appendix I of the Biological Review for specific suggested inventorying, monitoring, and research programs, to be assessed and prioritized in the IMP.

Objective 2-9: Global Climate Change – Within five years of CCP approval, design and begin to implement long-term monitoring which has potential to track and assess changes due to global climate change. As possible, coordinate these efforts with larger regional monitoring efforts.

Discussion: Over time, global climate change is likely to produce significant effects on the natural system of White River NWR; however, many of these potential effects are unknown at this point, or not predictable with any specificity. There may be: changes in the hydrology of the system (e.g., flood timing, frequency, severity, and depth; rainfall patterns; changes in aquifer); range shifts in resident native wildlife and plants; range and timing of use shifts in migratory native wildlife; and range shifts in invasive wildlife and plants. These are the sorts of broad changes that may be expected under conditions of global climate change. None of these shifts and changes in ecosystem components would occur in isolation, and interactions between them could push the system in different and unexpected or counterintuitive directions, or toward greater instability.

At the same time, the Service recognizes that the refuge is already in a period of accelerated change; some of this change may be associated with global climate change but other factors such as human population growth and associated development are also causal in system changes. Potential responses to this accelerated change (regardless of causal factor) include more actively engaging on water rights and regional water planning to mimic more natural hydrologic processes in the system, acquisition of additional (drier) lands to compensate for lands within the current boundaries that will become more wet with time and result in loss of currently represented habitat types, management to maintain some current "drier" conditions in a "wetter" system, and engaging in coordinated monitoring to assess and track changes to the natural resources of the refuge.

The primary role of White River NWR in light of future change associated with global climate change and other anthropogenic factors is maintenance of a functioning ecosystem for native wildlife and fisheries, and monitoring to contribute to an understanding of the ongoing changes and potential for mitigation through active management. Monitoring has an important potential role for White River NWR, and monitoring of keystone species in particular (e.g., Nuttall oak, alligator gar, wintering waterfowl) might contribute to identification of shifts in population status or distribution. Monitoring of range expansions of invasive or exotic species, and monitoring of composition, distribution and health of forests are also potentially valuable efforts, particularly if in coordination with broader (cross program and regional) efforts.

Strategies:

- Engage more actively in establishing water rights specific to the refuge and in water resource planning in the White River drainage.
- Design and implement long-term monitoring which has potential to track and assess changes due to global climate change. As possible, coordinate these efforts with larger regional monitoring efforts.
- Consider relative elevation (higher, drier lands) as a factor in prioritizing refuge land acquisitions.

RESOURCE PROTECTION

Goal 3: Work with partners to minimize impacts from threats to the refuge's natural and cultural resources.

Discussion: The resource protection goal acknowledges that the refuge's natural and cultural resources face a variety of risks and threats over time. Refuge management must be vigilant to protect these resources from damage or degradation. The integrity of cultural resources may be impacted vandalism, theft, or simple neglect. Land acquisition is one method by which the Service attempts to protect natural and cultural resources.

Invasive species are one of the most pervasive, widespread threats to indigenous biota on this and other refuges. Introduction and establishment of invasive species can have substantial impacts on native species and ecosystems. Invasive species capable of spreading and invading into new areas are typically generalists that can easily adapt to new environments and are highly prolific and superior competitors and/or predators. Some are very specialized and more efficient and effective than their native competitors at filling a particular niche. They compete for resources, alter community structure, displace native species, and may cause extirpations or extinctions. Invasive species often benefit from altered and declining natural ecosystems by filling niches of more specialized and displaced species with limited adaptability to changing environments.

Objective 3-1: Cultural Resources – Within 10 years of CCP approval, develop and begin to implement a Cultural Resources Management Plan. Until such time, the refuge will follow standard Service protocol and procedures according to Section 106 of the National Historic preservation Act.

Discussion: Cultural resources include historic properties as defined in the NHPA, cultural items as defined in the NAGPRA, archaeological resources as defined by ARPA, sacred sites as defined in Executive Order 13007, *Protection and Accommodation of Access To "Indian Sacred Sites"* to which access is provided under the AIRFA, and collections. As defined by the NHPA, a historic property or historic resource is any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP, including any artifacts, records, and remains that are related to and located in such properties. The term also includes properties of traditional religious and cultural importance (traditional cultural properties), which are eligible for inclusion in the NRHP as a result of their association with the cultural practices or beliefs of an American Indian tribe. Archaeological resources include any material of human life or activities that is at least 100 years old, and that is of archaeological interest.

Archaeological and historical investigations on and near the refuge have been sporadic ove the past century, though in recent years this trend has been changing. The refuge has several archaeological and historic sites that are documented and receive full protection. Many of these sites date back to the Late Archaic period and are associated with Native American occupation. Recently, the Quapaw Tribe has indicated the Lower White River is their ancestral homeland. In addition, there are National Historic Register eligibilite sites associated with Civil War St. Charles battle and CCC buildings and structure.

Strategies:

- Complete a Phase I archaeological inventory of the non-flooded areas of the refuge by qualified personnel, as a necessary first step in cultural resources management.
- Conduct a Phase II investigation if archaeological resources are identified during the Phase I survey. In this second phase, the eligibility of identified resources for listing on the NRHP is evaluated prior to any disturbance.
- Conduct a Phase III data recovery if the resources identified in Phases I and II are determined to be eligible. This will recover data and mitigate the adverse effects of any undertaking.
- Prepare a Cultural Resources Management Plan (CRMP) for the refuge.
- Follow procedures outlined in the CRMP for consultation with the Service's Regional Historic Preservation Office, the State Historic Preservation Office, and American Indian tribes.
- Follow procedures detailed in the CRMP for inadvertent discoveries of human remains.
- Ensure archaeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings.
- Develop a step-down plan for surveying lands to identify archaeological resources and for developing a preservation program.

- Peserve and maintain all Depression Era CCC buildings, structures, engineering drawings, historic photographs and narratives.
- Complete and submit National Historic Register nomination for all eligible refuge properties.

Objective 3-2: Invasive Terrestrial Animals – Over the life of the CCP, intensify and expand prevention and control programs, including development of a database to track occurrences and control measures. Within five years of CCP approval, develop and implement a Nuisance Animal Management Plan which details objectives and methods for nuisance animal control.

Discussion: At White River NWR, three species of invasive terrestrial animals are noteworthy: feral hogs (swine), beavers, and nutria. Two of these three (hogs and nutria) are exotic or non-native species, while the third, beaver, are native, but potentially invasive and problematic nonetheless.

Domestic swine are commonly introduced into the wild in Arkansas, creating populations of feral hogs. These hogs are also commonly live captured and moved from occupied to unoccupied areas to create new hunting opportunities. Feral hogs are prolific, with reproductive rates four times that of native ungulate species (Taylor et al. 1998). Feral hogs jeopardize the refuge mission by damaging habitat and impacting native plant and animal species. They have been documented to cause soil erosion, leaching of minerals and nutrients, habitat destruction, native plant species destruction, exotic plant species invasion, and changes in vegetative succession rates. Feral hogs also impact native wildlife through predation of native amphibians, reptiles, mammals and ground-nesting birds and direct competition for food resources of native species, most notably including game species such as deer, bear and squirrel.

The spread of feral hogs to almost all habitats in the Southeast constitutes a real threat to wildlife habitat, including that of White River NWR. There have long been sporadic reports of wild hogs on the refuge, however no efforts were made to collect actual locations until 2005, when deer hunters were asked to report and document locations of wild hogs.

Feral hogs are susceptible to long duration flooding occurring on the refuge and this is no doubt one of the reasons why the species has not gained a strong foothold. Several local residents occassionally release hogs onto the refuge, which will eventually make control difficult. Feral hog control methods available include shooting, trapping, and public hunting. Shooting can be done by refuge staff, hunters, or an agency or private business specializing in such activities. General public hunting may be used to help manage swine populations, but is generally ineffective in significantly reducing populations or damage. Removal of live hogs should never be allowed under such programs, as it has been evidenced repeatedly in other locations has shown that hogs removed from refuges alive often end up introduced on other public lands. Trapping can be done with large cage traps and corral traps. In areas with black bears, such as White River NWR, baited traps should always be constructed with an open top, which will allow bears to escape while holding hogs. White River NWR currently allows public hunting of hogs as an incidental species take during hunting seasons for other species, as a method of control.

Beavers are native to Arkansas but were extirpated from the area in the early 1900s. They reestablished in Arkansas in the late 1900s and have since reached a level at which they are often considered a nuisance species. Modified hydrologic conditions, minimal trapping pressure due to low demand for fur, minimal natural predation, and decreases in forested lands on a landscape scale have contributed to the nuisance impacts of beavers in current times.

Although beavers can provide additional beneficial wetland habitats in floodplain forests, habitats it is often necessary to implement some form of beaver control to reduce their negative impacts and the extent of habitat modification they cause. The beaver's natural behavior of building dams and the associated flooding of forested areas can provide beneficial wetland areas, but such extended flooding also kills trees. In the constrained landscape of a national wildlife refuge, such creation of dead tree stands can accumulate to undesirable levels, as live tree stands cannot be replaced within a reasonable time scale. In particular, beavers build dams which hold water during summer months, when trees are not adapted to flooding. This causes stress and ultimately mortality to individual flooded trees and flooded stands of trees. Moreover, areas ponded by beavers can collect large silt loads during high water events, which change the substrate conditions and impact aquatic habitat characteristics.

Controlling the beaver population, preventing water control structures from becoming blocked and inoperable, and removing beaver dams to allow drainage of ponded water are critical to maintaining healthy forest conditions. Beaver damage is easy to recognize from the air and on the ground in the form of flooding as a result of dam building activities, and groupings of girdled and stressed or dead trees. Beaver activity and potential damage to forest resources should be continually assessed and beavers and dams removed if negative impacts are unacceptable within other management objectives. Individual beavers may be lethally removed by trapping (conibears, legholds, snares, etc.) and/or shooting. Beaver dams may be removed with heavy machinery, manually with hand tools, or with explosives.

The impact of beavers on forested habitats is severe on White River NWR and constitutes a significant threat to the forest health and survival. There are currently almost 500 beaver dams on the refuge and roughly 6,710 acres (5 percent) in dead timber and wetland scrub/shrub habitat as a result of these dams. These habitats are not expected to return to a forested condition in the short-term and the current trend indicates that an additional 200-300 acres may be converted by beavers annually without increased beaver control efforts.

Currently, refuge staff conducts all beaver damage management activities on White River NWR. Management includes annual breakage of existing dams, usually with explosives, and removal of beavers through trapping and shooting. Dam removal occurs from mid-June through August and population control primarily during the fall and winter months, with an average annual removal of 336 beavers.

Nutrias are herbivorous, aquatic rodents. They are most problematic in coastal zones where they contribute to coastal erosion and marsh loss by eating the roots of marsh plants. In interior wetlands, they tend to incur less dramatic impacts; however, they do cause adverse impacts to natural vegetation. Nutrias are extremely prolific breeders and therefore their numbers are often difficult to control.

Nutrias occur at low levels on White River NWR and the population will likely fluctuate based on annual reproduction and as reduced by severe winters. Probable negative impacts from this species include exclusion of the native muskrat through competition, removal of emergent vegetation by herbivory on roots and stalks, and weakening of levees through burrowing behavior. Nutrias are present in moderate numbers, particularly on the south unit near Jack's Bay. They are routinely shot during beaver control operations, but at this point they are not causing any observable problems with habitat or with native aquatic mammals.

Strategies:

- Develop a nuisance animal management plan which details objectives and methods for nuisance animal control.
- Give control of feral hogs and beavers a high management priority, as both species have the potential to significantly and adversely impact the wildlife and habitats potential of the refuge.
- Control hogs through lethal removal with the object of eradicating them from the refuge.
- Manage beavers with the object of controlling them to a level at which habitat impacts are acceptable.
- Assess the validity of incidental public hunting of feral hogs, recognizing the limitations of this method for decreasing or eradicating populations while providing an incentive for maintaining a population and for continued illegal stocking.
- Use outreach to educate the public to the potential similarity of appearance between black bears and some hogs, and caution careful target identification when hunting feral hogs.
- Use staff to lethally control hogs as possible. Opportunistic shooting of hogs should be encouraged as well as strategic trapping and shooting efforts.
- High water events or when hogs are found otherwise localized can provide highly effective and relatively efficient opportunities for lethal control.
- Consider contracting lethal hog removal, by methods including trapping and/or targeted shooting. Such contracts should be carefully constructed and overseen to ensure that impacts on other wildlife species are minimized and hogs are killed on site.
- Construct and set hog traps used on the refuge so that black bears can escape unharmed.
- Increase control of beaver populations and habitat modifications.
- Seasonally assess forest damage potential, remove dams to decrease summer flooding, and lethally remove associated beavers to discontinue dam building.
- Recognize that population control is the most direct option to minimizing dam creation and habitat modification, while removal of dams should be recognized as a necessary stop-gap procedure to alleviate on-going flooding when populations are not well controlled.
- Control nutrias through opportunistic lethal removal.
- Selective trapping and shooting by staff is likely to be the most efficient method to control nutria populations.
- Low fur prices make a public trapping control program unfeasible in most situations, but might be investigated as an option if damage becomes significant despite opportunistic removal by staff.

Objective 3-3: Invasive Aquatic Animals – Within five years of CCP approval, develop a Rapid Response and Prevention Plan for invasive aquatic animals and a Nuisance Animal Management Plan which details wider objectives and methods for control of all nuisance animals.

Discussion: Presently, at least eight invasive or exotic aquatic animal species occur within White River NWR: four species of Asian carp, zebra mussel, and Asian clams. Other species may soon invade or may have already, but have not yet been detected or the threat has not been realized. One of the first challenges with invasive species is recognizing the threat exists in order to develop prevention and response planning. In the absence of such knowledge general invasive species and rapid response planning is essential to provide a foundation for safeguarding against introductions and invasions and to provide a framework for rapid response if and when it occurs.

Determining and establishing adequate planning and management is particularly difficult on White River NWR, considering the vastness of the watershed, numerous human influences, and the free flowing proximity, navigability, and connectivity to the lower Mississippi River basin and the Gulf of Mexico. Introductions have been both incidental and intentional and mostly difficult, if not impossible, to predict or prevent. Despite these difficulties there are options for preventing or minimizing the likelihood of future introductions and limiting or managing those that have already occurred.

Four carp species have been identified within the White River NWR. Species such as the common carp and grass carp are well established and the effects of their introductions have long since been assimilated into the ecosystem. Two other carps, the bighead and silver, are more recent introductions and have not yet fully established populations within and throughout the watershed. The potential impacts of these species are just now being realized in other waters around the United States. As the densities and range of these species expand within the White River NWR watershed there will likely be substantial effects to native species. These carps have been shown to be highly prolific reproducers which quickly dominate similar niche species, out competeout compete them for resources, indirectly alter water quality, and significantly impact prey populations.

In early April 2008, AGFC identified northern snakeheads in an agriculture ditch off of Big Piney Creek in Lee County, Arkansas, near the town of Monroe. Following that find, approximately 100 adult snakeheads were killed in the ditch by rotenone, with several additional fish being taken by electrofishing in the main channel of Big Piney Creek some distances apart. These fish are believed to have escaped an aquaculture facility nearby in 2000 or 2001; multiple age classes and distribution suggest they comprise a reproducing population. Big Piney Creek is a tributary within the lower White River watershed, and if unchecked, this species will eventually spread into and throughout White River NWR.

If Asian carp and the northern snakehead become established in the White River NWR, it is unlikely that eradication is possible; however, planning and management may help to limit their spread, numbers, and influence on adjacent water bodies. Water control structures, water body management, regulations, public education, and harvest incentives may be used to control their numbers and minimize the extent of their effects. Assessment and monitoring of the species and their response to management actions will be necessary to provide adequate adaptive management response.

Asian clams have been well-established and their effects assimilated into the White River ecosystem for many years. Eradication and management of this species at this point are unlikely and impractical.

Zebra mussels are a relatively new introduction and are currently not well or fully established within the White River ecosystem. Limited navigation has aided in preventing and/or minimizing their establishment and upstream expansion within the White River and its tributaries. The adverse effects of zebra mussel introduction and establishment throughout the world are well documented. They are a highly prolific and quickly dominate the benthic community, overwhelming native species in both mass suffocation, competition for resources, and alteration of water quality. Zebra mussels suffocate and/or starve native benthic and planktonic foraging species physically and competitively by attaching and covering all solid substrates.

Due to their high numbers and filter feeding zebra mussels remove substantial amounts of forage and sediment from the water column. Native mussels are suffocated and/or starved as their shells are colonized and they are prevented from filtering. Filter-feeding fish are also starved as the forage base substantially declines. Finally, with the reduction of suspended plankton and sediment, water clarity increases, causing increased light penetration which results in changes to water quality,

habitat, and increased growth of macrophytes (aquatic or hydrophytic plants growing in or near water, which are emergent, submergent, or floating).

Specific policy and management can prevent the spread and establishment of zebra mussels by opposing, restricting, or prohibiting actions that could result in introductions. Policies, management, projects, and actions affecting the refuge that could contribute to the introduction or spread of zebra mussels should be examined and altered to comply with federal and state laws, regulations, policies, and the presidential Executive Order 13112, concerning invasive species. Individuals or agencies responsible for damages resulting from negligence and/or intentional introductions in violation of these laws, regulations, policies, and the executive order should be held accountable and required to provide mitigation for the effects.

Strategies:

- Develop a Rapid Response and Prevention Plan as soon as possible to address such issues as policies for avoiding and minimizing the potential introduction and spread of invasive species; communication and coordination processes for distributing information and responding to introductions; educating the public on the dangers of invasive species and importance of prevention; and developing an action plan for containment and eradication.
- Restore and manage aquatic ecosystems to maintain community balance, restore natural processes, and fortify species. Healthy ecosystems and populations are less susceptible to introductions and establishment of invasive species.
- Develop management plans and incorporate adaptive management options for invasive species interdiction, containment, and prevention actions to promote and optimize habitat for competitors and/or predators. Actions for disrupting and limiting the movements and reproduction of invasive species are possible with timely and targeted resource management.
- Identify and prevent potential introductions by reviewing and assessing refuge, federal, state, and public activities that could result in introductions.
- Recognize actions both on and off of the refuge that can result in introducing invasive species; require them to comply with federal and state laws and mitigate or compensate for impacts resulting from liable acts.
- Evaluate and improve regulations, permits, and monitoring to better assess effects of invasive species and to allow for improved and adaptive management.
- Implement regulations and policies to increase invasive species introduction prevention, containment, and/or eradication.
- Conduct education and outreach by providing educational information, signage, and brochures to groups, fishers, and schools on conservation, regulations, management, policies, and research.
- Educate the public of potential impacts of invasive species and the importance of preventing introductions. Provide information related to invasive species management and eradication efforts.

Objective 3-4: Invasive Plants – Within five years of CCP approval, develop and implement an Invasive Plants Plan for coordinated control efforts when infestations are encountered and a database to systematically track invasive plant occurrences and treatments.

Discussion: Invasive and or exotic terrestrial plant species may present significant problems for the refuge in the future if such infestations are left unchecked. Currently, widespread but low occurrence problems include European or Chinese privet and Japanese honeysuckle along forest edges and in reforestation sites (e.g., the Farm Unit) and some harvested stands. Other problem species are mimosa, chinaberry, and non-native pine occasionally found in restored fields; and in localized pockets, exotic bamboo and kudzu. Control of privet and honeysuckle has not yet been implemented, but it is advisable to survey treatment (logging) areas beforehand and implement control in advance of the logging to prevent further spread. Mimosa, chinaberry, and other sporadic exotics should be spot controlled when encountered. Nonnative pine can be controlled during the normal course of logging operations through biased removal. Exotic bamboo and kudzu will likely require several years of treatment utilizing mechanical and chemical control.

It is likely that there are other unforeseen terrestrial invasive/exotics. The refuge should track all known invasive/exotics through a database that would include species occurrence and treatments. The database should be tailored to meet the needs of the refuge and should be a useful tool to organize control operations. The database could be developed as the forest compartments are evaluated and/or in concert with the Continuous Forest Inventory cycle. This would allow for re-assessment of infestation sites and evaluation of control measures. Additional measures, such as requiring contractors to pressure wash all equipment before entering the refuge, posting educational signs, and making pamphlets available at the visitor center, should be taken to prevent the introduction or spread of invasive/exotics.

Aquatic invasive plants are also an issue on the refuge. While the routine and long duration of flooding has kept many invasive plants from being established, invasive/exotic aquatic species have been documented. The two species in particular that have been documented are water hyacinth and didymo.

Water hyacinth is an exotic species native to South America. A free-floating plant, it can also root and survive in moist soil environments. This plant can reproduce both asexually and sexually. It reproduces asexually by means of stolons, which produce daughter plants. Water hyacinth can also produce large quantities of seeds through sexual reproduction that are viable for up to thirty years. This plant is a very vigorous grower and can double its population in two weeks. These are the aspects of this plant that make it very invasive and allow it to completely cover large areas. Boating and fishing become nearly impossible in areas covered with water hyacinth. Dissolved oxygen concentration also decreases in areas covered by water hyacinth, which can lead to fish kills and a decline in the aquatic community. The one positive aspect of this plant is that it is highly susceptible to Rodeo (i.e., the herbicide glyphosate) and can be controlled through spraying the plant with this chemical.

Didymo is a single-celled algae called a diatom. This diatom was thought to be restricted to low nutrient waters, but has recently been found in nutrient-rich streams and rivers. The problem with this diatom is that it is capable of producing a stalk that it uses to attach itself to the substrate. This stalk, which can be up to two feet long, can remain long after the diatom has died. When a nuisance bloom of this organism occurs, large benthic mats of this stalk material are formed. The mats can actually end up covering 100 percent of a streambed in some areas. These mats impact the aquatic community by reducing the area available for aquatic invertebrates and fish spawning. Unfortunately, there aren't any evaluated controls available for didymo at this time. The best course of action is to reduce the spread of this organism.

Strategies:

- Develop a database to systematically track invasive plant occurrences and treatments.
- Integrate data management system with GIS to retain spatial information. The Refuge Lands GIS data structure is recommended for this purpose.
- Record terrestrial occurrences identified during the course of the normal FHMP evaluation cycle.
- Record terrestrial and aquatic occurrences found during the course of normal operations and include all staff in effort.
- Educate all field staff on identification of invasives and exotics, to facilitate identification and tracking of occurrences.
- Document treatment efforts, and track success to apply adaptive management to increase effectiveness of control.
- Eradicate small infestations immediately upon identification.
- Develop and implement a plan for coordinated control efforts when large infestations are encountered.
- Require contractors to pressure wash all equipment before entering the refuge.
- Educate the public regarding invasive and exotic plants.
- Post educational signs at key locations where spread of invasive/exotics are a particular concern.
- Post educational signs at all boat access areas to remind people to disinfect and clean equipment to stop the spread of aquatic invasive species.
- Distribute pamphlets describing the negative impacts of invasive/exotics and provide information to the public on how they can prevent spread.
- Control the spread of water hyacinth by spraying plants with an effective herbicide.

Objective 3-5: Dredge Spoil Sites – Within one year of CCP approval, complete the Partnering Agreement with the COE that seeks a long term dredge spoil disposal alternative.

Discussion: The COE has authority for maintenance of the White River channel for commercial navigation. The Service has granted a special use permit to the COE to deposit dredged material on two sites totalling 170 acres of land located near the south end of the refuge. The Kerr-McClellan Navigation Canal has been under permit since 1964; 545 acres were converted to a canal system connecting the Arkansas River with the White River. Since the project started in 1964, an additional lock and dam was constructed at the mouth of the White River. Montgomery Point Lock/Dam was installed to allow barge traffic to enter the White River during periods of low flow in the Mississippi River. Dredging has been required to help maintain the 12-foot minimum depth where the White River and the canal join and due to the differences in flow, silt deposition has made annual dredging operations necessary. All of the dredge material has been deposited on two refuge spoil areas that were permitted for disposal of dredge material.

Strategies:

- Work with specialists within the COE and the Service to thoroughly investigate the pros and cons of various long-term spoil disposal alternatives.
- If long-term spoil disposal alternatives are found not compatible with refuge purposes, spoil disposal on refuge property will need to be eliminated in an expedient manner.
- Practice adaptive management, which entails methodical monitoring the effects of dredge spoil and changing aspects of the practice that may be causing avoidable environmental problems.

Objective 3-6: Refuge Land Acquisition – Working with partners, acquire priority lands within the approved acquisition boundary from willing sellers that would enhance the conservation values of the refuge; over the long term consider acquisition boundary expansion to ensure the protection of bottomland hardwood habitats and enhance landscape conservation.

Discussion: In the lower White River watershed, the natural system has been significantly altered from historic conditions. The greatest impediment to natural ecosystem function is the current hydrology, which has been modified tremendously from historic patterns, largely through long-term structural impacts from flood control, navigation, and drainage. The alteration of natural processes, such as hydrological systems, results in lands and waters that are not sustained in the manner in which they evolved and thus are subject to ecological stressors to which they are not adapted. Conserving lands through refuge acquisition positively affects the integrity of the landscape, thus protecting and insulating existing refuge habitats from the impacts of ecological degradation.

Not all lands within the approved acquisition boundary for White River NWR have been obtained by the Service. If funds and willing sellers become available, the Service will attempt to acquire these lands in accordance with Service policy.

Prior refuge expansions through all-or-none package land deals have resulted in the acquisition of 13 isolated parcels totalling 2,106 acres located outside the established refuge boundary. Similarly, the refuge acquisition boundary encompasses but does not include several out-parcels within the refuge boundary. Land trades involving insular refuge parcels outside the core refuge boundary for interior out-parcels should be considered and pursued. Such strategic parcel trades along with the use of cooperative agreements to manage specific tracts as part of Trusten Holder WMA would help to consolidate and streamline management actions that are now fragmented as a result of disjunct (unconnected) refuge parcels. Additionally, trades of outside parcels for outside but adjacent parcels should be considered in strategic areas such as Big Island, outside of the levee on the east side of the refuge, and the Grand Prairie area on the west side of the refuge near the Farm Unit. Similarly, areas of concern due to refuge impacts from adjacent but off-refuge activities, such as agricultural run-off or hydrological alterations, should be considered in future landscape planning efforts with conservation partners.

Strategies:

- Within available means, pursue the acquisition of strategically important privately owned in-holding properties within the approved acquisition boundary
- Consider relative elevation (higher, drier lands) as a factor in prioritizing refuge land acquisitions.
- Pursue strategic land trades that exchange isolated out-parcels for insular parcels interior to the refuge.
- Over the long term (i.e., the 15-year span of this CCP and beyond), consider expansion of the refuge acquisition boundary in response to the need for additional conservation of important wildlife habitats within the larger landscape.

Objective 3-7: External Threats – Promote communication, cooperation, and partnerships between other agencies, land managers, and private citizens to minimize impacts from external threats to the functions and values of the refuge's wetland ecosystems.

Discussion: The habitats and wildlife of White River NWR are threatened by a number of off-refuge actions and trends, among them the following:

- Navigation on the White River
- Flood control on White River
- Navigation on the Arkansas River and Arkansas Post Canal
- Upstream reservoir operations
- Eastern Arkansas White River irrigation projects
- Irrigation water runoff from adjoining private land
- Minimum stream flow establishment
- Sedimentation
- Hydrological headcutting in the White River and tributaries
- Invasive plant and animal species

The refuge needs to stay abreast of potential public and private projects, make recommendations, and take action to minimize their negative impacts on refuge resources. Public projects in the White River watershed have the potential to drastically impact the ecological conditions of White River NWR. The White River NWR staff should participate in the project planning and permitting process at every opportunity on projects within the White River watershed, as these projects are very likely to affect system processes such as hydrologic function, and thereby the vegetative communities and wildlife populations of the refuge. Staff should evaluate future proposed projects to assess their implications for the refuge.

Current projects that merit awareness and engagement by refuge staff include:

- The White River Navigation Project: This project would enlarge the navigation channel on the White River to provide a 9-foot-deep by 125-foot-wide channel available 95 percent of the time through construction of a series of wing dikes and continued dredging. Implementation of this project could negatively impact the extent of the Cache and White River drainages.

- Upstream Reservoir Operations: Management of upstream flood control reservoirs has significantly affected downstream hydrology of the White River. The dam-altered hydrology has caused more flooding during the growing season (especially June-September) when flooding stresses trees, and lower flows during the winter and early spring (especially January-March) when wintering ducks and spawning fish require forested wetlands. Monitor impacts associated with reservoir operations and fully participate in any review and/or revisions in the COE's reservoir operating plans.

- Arkansas-White River Cutoff Project: The COE continues to study various projects for addressing the potential for cutoff development between the Arkansas and White Rivers in the vicinity of the Historic Cutoff which was closed during construction of the McClellan-Kerr Arkansas River Navigation System. Closing this cutoff is a primary contributing factor in development of severe headcuts, erosion, and terrestrial habitat damage on the White River NWR. Several years after construction of the Historic Cutoff Closure structure, the rivers began trying to reestablish a cutoff, which led the COE to construct a series of new structures to prevent a cutoff between the two rivers from reforming. The close proximity of the White, Arkansas, and Mississippi Rivers in this area contributes to the hydrological perturbations. Before further projects are initiated to address cutoff reformation, a comprehensive Three-Rivers Study needs to be completed.

- White River Minimum Streamflows: The Ankansas Natural Resources Commission (ANRC) is mandated to set minimum flows for all state streams and has completed for the White River between Bull Shoals Dam and the Mississippi River. While the minimum flows identified in the White River Allocation plan are acceptable to maintain resource values over short periods of time, they are not optimum. The fish and wildlife resources need the natural variety provided by the White River system over the seasons and from year-to-year. White River NWR's establishment under the Migratory Bird Conservation Act sets forth the need to ensure the minimally sufficient amount of water to carry out the refuge's purpose. The Service needs to fully participate in all monitoring and minimum streamflow activities to ensure adequate quantities of water to support refuge purposes.

- The Grand Prairie Irrigation Project: This project will distribute water diverted from the White River to about 867 farms in the Grand Prairie area for agricultural irrigation. Potential impacts to refuge habitat, fish, and wildlife resources should be monitored.

Strategies:

- Participate in public engineering project planning processes and represent the refuge lands in assessment of potential impacts due to changes in hydrology and stream flows.
- Seek to avoid or mitigate potential negative ecological impacts of pending projects in the planning stages and maintain involvement through implementation and mitigation stages.
- Participate in landscape level planning efforts that will directly impact the White River NWR lands and regional ecosystem.
- Continue to cooperate and work with other resource agencies and conservation programs to expand the natural habitat base through acquisitions, easements, conservation programs, and planning.
- Provide input and planning assistance in order to influence the effective distribution of conserved lands by emphasizing lands that serve to maximize ecological benefits by expanding blocks of existing habitat and providing corridors between existing blocks of habitat.

VISITOR SERVICES

Goal 4: Provide opportunities for compatible, wildlife-dependent public uses that promote an understanding and appreciation of fish, wildlife, habitat conservation, and the Refuge System.

Discussion: White River NWR provides all of the Service's priority wildlife-dependent recreation uses to the public: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. In addition, the refuge has traditionally allowed for certain activities that are not usually permitted on other national wildlife refuges, including ATV use, houseboat use and mooring, horseback riding, commercial duck guiding, and camping. White River NWR is considered one of the premier hunting and fishing destinations in the Refuge System. The refuge is also famous for large concentrations of wintering waterfowl, and a multitude of other game species including, turkey, deer, waterfowl, and many species of fish.

Objective 4-1: Visitor Services and Public Use Management – Promote, manage and improve appropriate and compatible public uses with the recruitment of additional visitor service staff, preparation of a Visitor Services Plan and better access and improved facilities.

Discussion: The refuge has a Comprehensive Management Plan dating to 1996 when the Potlatch Land Exchange was completed. Other than this document, the refuge did not have an up-to-date visitor services step-down plan. Hunting and fishing plans will need to be updated after completion of the CCP, along with the visitor services step-down management plan.

Currently, there are 41 access points around the refuge boundary where the public can enter refuge roads, lakes, ATV trails, and compartments on the refuge. While the refuge does not have entrance signs or sub-entrance signs at most of these entrances, the refuge boundary itself is properly marked and alternate boundary signs, such as open and closed area signs are used as appropriate. The visitor center has a number of interactive exhibits and a small book and souvenir store. Campgrounds include ten sites that are open all year and fourteen campgrounds that are only open from March 1 to December 15 each year. Peak use of these campgrounds is during refuge quota deer hunts, fishing, archery deer season, squirrel seasons, and furbearer season. The Visitor Services Program on the refuge is coordinated by a full-time Visitor Services manager with support by other refuge staff.

Strategies:

- Following the CCP, develop an up-to-date Visitor Services Plan that reflects current legislation, director's orders, initiatives, policy, and the mission of the Refuge System and the Service, as well as the purposes, goals, and objectives of the refuge.
- The Visitor Services Plan will also address the current and future visitor services and recreation needs of refuge visitors.
- Provide Ambassador Training for all staff.
- Provide customer service training for the staff and volunteers that meet and greet the public.
- Install additional directional signage along access routes leading to the refuge and standard sub-entrance signs at the key entry points.
- Improve signage to direct visitors to the refuge from surrounding communities.
- Place a cooperative management sign at the entrance to Cook's Lake.
- Develop a landscape plan for the visitor center that reduces the area of mowed lawn.
- Close 6 campgrounds by 2014, and close 3 more permanently and 3 seasonally by 2016.
- Reduce the current 407 miles of forest management roads and trails open for hunting and fishing related ATV access by 50 percent due to associated habitat degradation and the refuge’s inability to properly monitor and maintain the roads and trails.
- Continue working with local community groups and volunteers to provide trail maintenance and litter clean-up.
- Remove all facilities at camping areas (e.g., picnic tables, fish cleaning stations).
- Add an additional Visitor Services park ranger position..
- The second park ranger should serve as a volunteer coordinator.
- Consider alternative staffing options such as Visitor Service SCEP, interns, STEP, and term and seasonal employees.
- Work toward staffing the visitor center with at least two people (could include volunteers and friends members) when open to the public.
- Close the visitor center on Sundays until increased visitor use justifies otherwise.
- Seasonally adjust the Visitor Service manager’s work schedule to Tuesday through Saturday.

Objective 4-2: Hunting – Within five years of CCP approval, develop a new Hunt Plan to improve hunting opportunities, while ensuring safe, compatible, and quality experiences. Efforts will be made to develop more consistent hunting seasons and regulations on the North and South Units. Public use impacts will be monitored and adjustments will be made as needed to protect resources.

Discussion: Biologically sound hunting is a legitimate activity on national wildlife refuges and is one of the six priority public uses identified in the Improvement Act, to be given enhanced consideration over other uses as long as it is found to be compatible with refuge purposes. White River NWR is open to the public for hunting – hunters are allowed to hunt anywhere not posted as "Area Closed or No Hunting," abiding by annual seasons, means, and bag limits developed in coordination with AGFC. Currently, access is allowed via walking, motor vehicle, ATV, bicycle, motorboat, canoe, and kayak. All vehicles, including ATVs and bicycles, are restricted to designated roads, trails, and parking areas. Public access to hunt areas may be closed at any time necessary to protect refuge resources or visitors. Allowing ATVs for hunting helps distribute hunters throughout the refuge on an extensive system of forest management haul roads and facilitates the transport of tree stands, decoys, and harvested deer. Horses/mules are prohibited. Mobility-impaired hunters may apply for a special use permit, to allow specialized access by ATV. The refuge participates in an annual hunt coordination meeting with the AGFC.

As noted above, White River NWR is one of the premier hunting and fishing refuges in the entire Refuge System. It is celebrated for the abundance of its wintering waterfowl populations, as well as game species such as turkey and deer. The refuge offers a wide range of hunting opportunities, including seasons for archery, muzzleloader, and modern gun, as well as special opportunities for youth and mobility-impaired hunters. The refuge is famous for producing numerous Boone and Crocket and Pope and Young class white-tailed deer, as well as quality waterfowl hunting in the flooded bottomland forests. Deer hunting remains the most popular season, followed by waterfowl, squirrel, furbearers, and turkey. On average, approximately 114,000 visitor-use-days of hunting are logged each year. White River NWR hunters may also harvest beaver, nutria, muskrat, and feral hogs, incidental to any hunt with weapons that are legal for that particular hunt.

The refuge is divided into the North Unit and the South Unit. Hunting seasons on the North Unit generally coincide with the statewide seasons, with only minor exceptions, while the South Unit seasons are more restrictive to accommodate waterfowl sanctuary needs. A cooperative agreement between the Service and AGFC authorizes hunting on approximately 1,490 acres of refuge out tracts located south of the Arkansas Post Navigation Canal to be managed by AGFC as part of Trusten Holder WMA. All other outlying tracts are open concurrent with statewide seasons/regulations, with the exception of black bear hunting, which is closed on all refuge tracts including those managed under cooperative agreement at Trusten Holder WMA.

Gun (modern and muzzleloader) deer hunting on the refuge is conducted through a quota system, with typical quotas ranging around 3,000 and 1,000 permits issued for the South and North Units, respectively. Additionally, youth and mobility impaired deer hunts are conducted in partnership with AGFC at the Cook's Lake area.

Waterfowl hunters are restricted to two locations. The Jack's Bay section, located on the South Unit, is open to waterfowl hunting Saturday, Sunday, Tuesday, and Thursday, while the North Unit is open to waterfowl hunting each day of the statewide season. Waterfowl hunters in both locations must not enter the hunt area earlier than 4 a.m., with waterfowl hunting closing at 12 noon and hunter exit required by 1 p.m. Hunters wishing to hire guides can do so, as the refuge allows five commercial waterfowl hunting guides access to five specified areas of the refuge.

Furbearer hunting for raccoon with dogs is only allowed from sunset to sunrise. Squirrel hunters are allowed to hunt with dogs beginning December 15 until the end of the season.

Strategies:

- Ensure that the Hunt Plan is up-to-date and accurately reflects the current hunt program.
- Ensure that CFR accurately reflects the current refuge hunt regulations.
- Work with Regional Fee Coordinator to determine appropriate amount for quota hunt fees.
- Review and make changes where appropriate to address user conflicts between archery hunters and dog hunters. Consider season dates, hunt time, and designated areas as ways to reduce conflict.
- Continue current youth and mobility-impaired deer hunts at Potlatch Conservation Education Center at Cook's Lake and explore with AGFC opportunities to expand hunting opportunities for these two groups at the Cooks Lake area.
- Improve consistency of hunt regulations on North and South Units.
- Continue to allow the use of ATVs for daily hunting access (ATVs may not be left overnight on the refuge) on designated ATV trails with provisions for seasonal closure for natural resource protection.
- Reduce the miles of ATV trails by 25 percent by 2014 and 50 percent by 2016.
- Maintain water access sites and promote boat access to more remote hunting locations.
- Monitor ATV hunting access and modify as needed to mitigate any negative impacts to refuge habitats, infrastructure, and visitors in compliance with Executive Orders 11644 and 11989.
- If necessary, use time/zoning restrictions to reduce user conflicts.
- Work with Regional Office/contractor to develop an improved method to process quota hunt applications. This could be a credit card payment online quota system with point system.
- Continue to explore the possibility of purchasing at a reasonable cost, the perpetual hunting/fishing rights from the owner in the North Unit.
- Consider closing to hunting those trails that are more non-consumptive use (i.e., Cypress Tree trail), or implement hunting setbacks.
- Monitor hunting activities and ensure the hunt program is administered in a compatible manner; modify practices as warranted.

Objective 4-4: Commercial Duck Guiding – Within one year of CCP approval, modify guide program to provide fair equitable hunting opportunities that foster a safe ethical hunting experience, reduce commercial guides' ability to monopolize the most easily accessible quality hunting sites, and minimize conflicts between nonguided hunters and hunting guides. Reduce the number of commercial duck guiding permits from 17 to 5 and eliminate availability of 10 additional guiding permits during specified flood conditions.

Discussion: White River NWR is one of the few national wildlife refuges in the country to allow commercial guiding for waterfowl hunting. Although it has been allowed since 1993 under a special use permit, it was not until 2003 that the numbers of guides were restricted.

To reduce conflicts, beginning in 2003, the refuge began to limit commercial waterfowl guides to seventeen permitted guides per year. This number was a first attempt at developing sufficient guide permits to allow the public who so desired to acquire guide services, and limit conflict between guided and unguided hunts. After meeting a list of minimum standards, the guides are included in an annual drawing for designated sections of the refuge. Successful guides are then granted the privilege to

guide hunters in assigned zones of the refuge. The objectives of this proposal are to provide the opportunity for a quality waterfowl hunt for that segment of the public lacking the knowledge and/or equipment required to hunt in flooded bottomland forests, reduce conflicts among hunting groups, and assure refuge compatibility.

During the ensuing 8 years since the most recent commercial waterfowl guiding program was initiated, the refuge has monitored the overall waterfowl guiding program and interactions with non-guided hunters to determine if program objectives were being achieved and the program was able to maintain compatibility requirements. The waterfowl guiding program has averaged 12 guide permits per year, with approximately 61 percent of the average annual permits utilized and 18 percent of the guides being unable to meet the requirement to utilize greater than 25 percent of their available slots during the season. Guides who do not obtain and certify the 25 percent utilization criteria are ineligible for a guiding permit the following year. Conflicts between non-guided hunters and commercial guides, as well as among the guide services, continue to be a problem each year. The most common conflict occurs when a commercially guided party arrives at a certain location to hunt and finds it occupied by other hunters. This situation often results in heated arguments, profanity, and threats. Other complaints reported to staff include sinking of boats, overcrowding, and commercial guides occupying the same choice lake hunting sites every day throughout the waterfowl season. The levels of controversy and complaints between guides and non-guided hunters have become so common place and well-known that it is causing non-guided waterfowl hunters, particularly those mentoring youth hunters, to either reduce or totally discontinue waterfowl hunting at White River NWR.

Although the commercial waterfowl guiding program was implemented to provide hunters who lack the necessary equipment, skills, and knowledge an opportunity to hunt waterfowl in the refuge's difficult-to-access flooded bottomland hardwood forests, the waterfowl guides' daily use of easily accessible hunting locations and recent advances in the equipment and technology available to assist non-guided waterfowl hunters efforts for a safe, quality waterfowl hunting experience, has raised concerns regarding the need for waterfowl guides and the program's overall ability to maintain compatibility requirements.

Based on the refuge's experience with the commercial waterfowl guiding program over the last 8 years and our sound professional judgment, the guiding program is being revised to meet program objectives, minimize conflicts with non-guided waterfowl hunters, and comply with guiding compatibility requirements. Guides will be selected through a random drawing of individuals who meet established requirements. They will be allowed to guide through issuance of a special use permit, with special conditions designed to meet the above objectives, provide liability protection to the government, and to collect guided hunter use and harvest data. The annual fee for the permit will be computed by using the prevailing rate method of computation established by policy in section 5RM 17.5 of the Refuge Manual.

Strategies:

- Annually monitor performance of commercial duck guiding program to determine if it is providing a valuable service to the public, while minimizing any conflicts with non-guided priority public users.
- Use annual performance evaluation to determine the number of special use permits and which guides will be eligible for a special use permit the following season.
- Develop guiding regulations and special conditions as necessary to provide a safe ethical hunting experience for guided hunters and minimize conflicts with non-guided hunters.

- Guiding will only be allowed by one guide in each of the five commercial waterfowl guide zones on the refuge. Each guide and guide assistant can only guide 4 hunters per day. Only one party may be guided per day.
- Guides and hunters may enter the refuge no earlier than 4 a.m., and all waterfowl guiding equipment including decoys, blinds, boats, motors, and ATVs must be removed from the refuge daily.
- All waterfowl guides and assistants operating motorized boats on the refuge must possess a current vessel operator license issued by the U.S. Coast Guard.

Objective 4-5: Fishing – Within five years of CCP approval, develop a new Fishing Plan to improve fishing opportunities, while ensuring safe, compatible, and quality experiences.

Discussion: Public fishing is an extremely popular recreational activity on White River NWR. Fishing on the North Unit is open year round (January 1 through December 31) in conjunction with Arkansas fishing regulations (including size restrictions and limits). On the South Unit, fishing is open on refuge waters from March 1 through November 30, but closed from December 1 to February 29, to eliminate disturbance to wintering waterfowl. Commercial fishing and sport bow fishing for rough fish is permitted annually by special use permit only.

The refuge currently has over 300 lakes and bayous. Several of the larger lakes are accessible to vehicles and boats using established boat ramps. There are many more isolated lakes which are not accessible by vehicle but can be accessed by ATV; many anglers on the refuge use ATVs to pull smaller boats into these isolated lakes and bayous. Many of these boats are left for months or years at a time, and some have been abandoned. Allowing fishermen to use ATVs enables access to a large number of refuge lakes that are only accessible by an extensive forest management haul road network of trails. Fishermen use ATVs to transport small boats and associated fishing equipment to these remote locations. Fishermen can also use boat ramps that are open all year at a limited number of sites with year-round gravel road access open to vehicular travel. Anglers have opportunities to catch largemouth bass, crappie, catfish, and sunfish.

They are also allowed to take frogs and crawfish. Sport bow fishing is allowed for rough fish only. The refuge youth fishing derby is a popular event with local residents and typically takes place during June at a stocked lake on the Farm Unit.

Commercial fishing activity has been used as a management tool for many years as a way of utilizing excess numbers of nongame fish such as buffalo, carp, drum, and catfish. All commercial fishing is authorized under a special use permit, with special conditions governing open waters and legal fishing tackle.

Strategies:

- Consider development of ADA-accessible fishing dock at Moon Lake or other accessible lake.
- Explore options for providing fishing and fishing related training to youth and mobility-impaired individuals at the Potlatch Conservation Education Center at Cook's Lake in cooperation with AGFC.
- Evaluate and improve regulations, permits, and creel monitoring.
- Assess impacts of public use on resident fish species.
- Use catch reports under commercial fishing special use permits to track presence and take of priority species.

- Continue to allow the use of ATVs for daily fishing access (ATVs may not be left overnight on the refuge) on designated ATV trails with provisions for seasonal closure for natural resource protection.
- Reduce the miles of ATV trails by 25 percent by 2014 and 50 percent by 2016.
- Monitor ATV fishing access and modify as needed to mitigate any negative impacts to refuge habitats, infrastructure, and visitors in compliance with Executive Orders 11644 and 11989.
- Allow small boats under 16 feet to be left on the refuge from March 1 to October 31 at designated areas. Initiate systematic removal of all abandoned boats found on the refuge outside of this timeframe. Consider developing a registered fee system for boats left on the refuge.
- Monitor fishing activities and ensure the fishing program is administered in a compatible manner; modify practices as warranted.

Objective 4-6: Wildlife Observation and Photography – Improve and expand wildlife observation and photography opportunities, while ensuring safe, compatible, and quality experiences.

Discussion: A large variety of wildlife may be observed and photographed throughout the refuge. The auto tour route is seasonally opened and provides opportunities for wildlife observation and photography and limits disturbances of wildlife and habitat. This route exposes visitors to a representative sample of refuge habitats. However, there are no vehicle pullouts for viewing wildlife.

One observation tower at the Demonstration Area provides the public with viewing opportunities from March 1 to November I. It is closed during waterfowl season and flood events. This 2-story tower is partially inundated during flood events and may be closed parts of the year. The tower is not universally accessible.

The refuge publishes a bird checklist. Information about wildlife observation is also found in the general brochure and public use brochure. The refuge web site describes hiking trails including Upland, CCC, Big Island Chute, Champion Cypress Tree, and Observation Tower Trail. These facilities are placed to provide good wildlife observation and photography opportunities while limiting disturbance to wildlife and habitat.

Strategies:

- Provide additional information on best viewing times, viewer etiquette, ways to minimize impact on wildlife and habitat, access point information, and management concerns.
- Provide information regarding wildlife observation opportunities, watchable wildlife species, or wildlife photography opportunities in universally accessible formats (e.g., large print, audio tapes, open caption on videos, etc.).
- Develop a name for the Fraser Lake wildlife drive.
- Put mile markers on the wildlife drive(s).
- Place temporary road closed sign at start of Fraser Lake Road near the visitor center to give visitors a safe turn-around opportunity.
- Develop a turn-around point at gate to wildlife drive.
- Put a gate with walk-in access at the trail head to the Cypress Tree trail and provide key access as required for accessibility.
- Place additional benches on the Cypress Tree trail.
- Put distance markers on the Cypress Tree trail.

- Provide birding training to staff/volunteers. Work with representatives from the Birding Initiative team to determine how interested birders are in White River NWR.
- Continue to promote the refuge to birding organizations and photography groups.
- Develop the bottomland hardwoods trail behind the visitor center.
- Consider designating the North Unit entrance road as a wildlife drive. Include signage and interpretive panels.
- Work with staff to determine options to conduct special tours to the wildlife observation tower during closed season.
- Have staff person attend the "Balancing Nature and Commerce in Areas Adjacent to Public Lands" course at NCTC.
- Explore opportunities for placing a "duck cam" in the demo area.
- Investigate grants from Scenic Byways to develop visitor facility enhancements.
- Encourage public reporting (and report as appropriate) of potential sightings of ivory-billed woodpecker, bald eagle nests, and other priority wildlife sites.

Objective 4-7: Environmental Education and Outreach – Improve and expand environmental education and outreach opportunities, while ensuring safe, compatible, and quality experiences; recruit additional visitor services staff to develop a series of standard environmental education programs for visiting school groups, and training for teacher-led discovery field trips.

Discussion: The refuge offers several curriculum-based environmental education programs, ranging from animal adaptations to habitat management, to hundreds of students each year. The refuge partners with the educators at the Cook's Lake Conservation Education area, which overlays the refuge. The refuge also assists with teacher workshops taught in conjunction with Cook's Lake and the Southeastern Arkansas Interpretive Team.

The refuge offers visiting schools a variety of equipment to use during their visit: binoculars, dip nets, bug boxes, microscopes, plus forestry supplies, and waterfowl banding equipment, etc. School groups enjoy the use of the classroom in the Visitor Center, plus the exhibit area and nearby Upland and Bottomland Hardwood Trails.

Strategies:

- Evaluate environmental education options in surrounding area and determine the contribuition White River NWR can make.
- Work closely with Cook's Lake Conservation Education area to provide education programs and include information about White River NWR in the programs.
- Develop a series of standard environmental education programs to offer to school groups that visit the refuge.
- Work with partners to develop and provide a "Field Day" experience focused on one grade level.
- Develop teacher-led discovery field trips in which teachers go through a summer training program that then gives them access to equipment and materials to use when visiting the refuge.
- Work with a contractor (i.e., a summer teacher) to develop a series of programs that focus on key resource issues and tie the programs to key state science standards.

- Consider the following staffing options for providing environmental eduction programs:
  - Education interns
  - Volunteers
  - Part-time or seasonal staff
  - Contractors
  - Resident volunteers
- Evaluate all outreach activities and determine how much time to allocate to them and which activities have the “best return on investment.”
- Continue to provide talks to community service organizations as appropriate.
- Provide tours/media days to local community officials.
- Develop a portable display about White River NWR.

Objective 4-8: Interpretation – Over the life of the CCP, improve and expand interpretation opportunities, while ensuring safe, compatible, and quality experiences; within five years of CCP approval, develop and install a display that explains the forest management program and desired forest conditions, and develop forest demonstration plots and interpretive panels at wildlife drive pullouts.

Discussion: The primary themes and messages interpreted on the refuge are bottomland hardwood ecology, forest disturbance, animal adaptations, species interdependence, the Refuge System, and refuge management. These themes and messages help visitors understand the key resource issues related to the Service, the Refuge System, and the refuge. The exhibits in the visitor center are designed to provide interpretive information about refuge habitats and management.

Strategies:

- Add information to the Visitor Center’s forest succession display to explain what the tree photographs represent.
- Develop a display that explains the forest management program and the desired forest conditions.
- Develop demonstration plots to illustrate the refuge's forest management program.
- Develop interpretive panels at pullouts along the wildlife drive.
- Cover the same topics as in environmental education above for interpretive panels/programs.
- Remove the "do not touch" signs on the tree display in the Visitor Center.
- As the mounts need replacing in the exhibit area, replace them with carvings.

Objective 4-9: Public Access – Over the life of the CCP, maintain existing public access in a safe and environmentally appropriate manner to support wildlife-dependent priority public uses. Within two years of CCP approval, reduce the number of miles of ATV trails by 25 percent and within five years of CCP approval develop an Access Plan which will reduce the number of miles of tertiary ATV trails by approximately 50 percent; utilize seasonal closures as necessary to minimize resource impacts and ensure the quantity and quality of access necessary to provide compatible wildlife-dependent priority public uses.

Discussion: The refuge maintains an extensive network of roads, ATV trails, and hiking trails to facilitate wildlife-dependent recreation. There are 95 miles of graveled roads and 3 miles of asphalt roads. The refuge road system provides public access for a variety of wildlife-dependent recreational activities. The public access roads provide access to some 24 designated campgrounds and 18 boat ramps on refuge lakes, bayous, or the river. There are five designated hiking trails providing three miles of access for wildlife-dependent recreational activities.

In addition, the refuge currently has approximately 357 miles of forest haul roads open to hunting and fishing related ATV use plus another 50 miles of trails that are used solely for hunting and fishing related ATV use. These forest haul roads are actually multi-purpose trails and were developed primarily for periodic refuge forest management access, but may also be used by the public for designated hunting and fishing related ATV use or foot travel, as long as the user is actively engaged in a wildlife-dependent priority public uses.

The network of forest management haul roads are categorized as primary, secondary, or tertiary depending on their frequency of use and maintenance in the forest management cycle and corresponding physical demiensons. The primary and secondary forest management haul roads are improved dirt roads that receive more frequent forest management related maintenance and are therefore better suited for ATV use. The tertiary forest management haul roads are fairly narrow trails that will only be utilized as haul roads approximately 1 year out of 15, and consequently receive no forest management related maintenance in the interim. The forest management program will be utilized to provide the majority of all maintenance necessary on the haul roads that are also designated as ATV trails.

The forest haul roads and ATV trails provide user access and help disperse hunters, particularly during refuge quota deer hunts. In recent years, the refuge has begun to inventory and map all trails and associated ATV useage. Some trails have been closed through this process, but increasing ATV trail useage and associated trail damage warrants further reduction in the number and amount of ATV trail useage. Ultimately, the refuge will need to reduce the amount of ATV trails and limit some to seasonal use only, because of associated habitat degradation and the required costs to adequately maintain them, which are significant and divert critical funding from other high-priority trust resource management needs. The majority of all trail maintenance will need to be provided by logging contractors through the forest management program. Trail maintenance demands beyond that provided by the forest management program are limited by the amount of staff time and budget available for trail work without impacting the refuge's priority wildlife habitat related maintenance needs. Interim trail maintenance by refuge staff and equipment will be limited primarily to downed tree removal on an infrequent basis, as necessary to prevent excessive trail go-a-rounds. Ultimately, the refuge will need to use more ATV trail seasonal closures and permanently close up to 50 percent of the tertiary forest management haul roads to ATV use. Trails open to hunting and fishing-related ATV use need to be located on better drained sites with trail crossings at drainage ways carefully designed utilizing BMPs and the use of rock and geotextile materials as necessary.

Although not easily quantified, other impacts of roads and trails relate more directly to fish and wildlife resources and should be considered in design and maintenance of roads and trails. Roads and trails may contribute to biological issues such as:

- distribution of brown-headed cowbirds into interior areas of the refuge, resulting in negative effects on migratory breeding bird reproductive success;

- creation of "edge" habitat throughout the refuge, speculated to promote species such as black rat snake, opossum, and raccoon, which may negatively impact migratory breeding bird reproductive success;

- rutted ATV trails perhaps causing population sinks for amphibians;

- changing hydrologic flow and drainage in the bottoms;

- siltation and water quality impacts from roads and trails located adjacent to or through water courses or bodies;

- encouraging human activities in an evenly distributed fashion throughout the refuge (i.e., limiting areas of lower disturbance and qualities of "remoteness" for native and migratory wildlife).

Strategies:

- Reduce impacts of existing roads and trails through methods including:
  - minimizing construction of new roads and trails as possible;
  - discouraging off-road/trail use of vehicles;
  - requiring low-pressure tires and/or limit use to dry seasons;
  - implementing seasonal road closures during extreme wet conditions or during non-essential use periods.
- Improve primary and secondary trails by following BMPs for trail and drainage way crossing construction and maintenance.
- Monitor roads and trails to ensure that they do not encroach into riparian areas.
- Using GIS tools, map the refuge road network in relation to key resources and recreation opportunities, as well as maintenance constraints, to provide a basis for informed decision-making when it comes to determining which roads and trails will be closed and which will remain open and maintained to ensure accessibility.
- Promote boat access on the refuge's many available waterways rather than the use of ATV trail access for hunting and fishing related activities.
- Hold one or more meetings with the public to solicit input while preparing the Access Plan.
- Map out primary and secondary trails that will provide priority access and develop criteria to determine which tertiary trails are the least important for needed access. Target closing 25 percent of the ATV trails by 2014 and 50 percent by 2016.
- Reevaluate access points and routes to reduce disturbance to interior BLH areas, sanctuaries, and key resources.
- Assess roads and trails in light of the impact of competing demands for maintenance resources on refuge habitat management programs. Ensure that habitat management needs are met.
- Initiate seasonal ATV trail closures as necessary to minimize wet weather trail damage.

Objective 4-10: Camping – Evaluate camping program and if found essential to support priority public uses given current demand and availability of alternative private campgrounds, then adjust the number of camping areas, locations, capacity targets, and periods of use accordingly. Camping will be restricted to designated areas and the minimal area necessary to meet priority public use needs. Promote use of surrounding private campgrounds by refuge users and encourage development of additional private campground sites.

Discussion: Although not one of the recognized priority public uses of national wildlife refuges, camping is a traditional use at White River NWR. The refuge attracts visitors from all over the state and the country, who come primarily to experience the great hunting and fishing opportunities found here. Due to the remoteness of the refuge and lack of nearby camping or lodging facilities, allowing camping has become essential in order to accommodate the current level of hunting and fishing related public use. The refuge has 24 designated camping areas which basically have year-round access via a gravel road and a delineated boundary. Most of these camping areas are located at a refuge lake on the South Unit or North Unit, south of the gas pipe line and have some type of boat

ramp, but no other amenities, such as toilets, picnic tables, fire rings, or trash receptacles are provided. Dispersed undesignated camping has been allowed on the North Unit north of the gas pipeline since this area was acquired as part of the Potlatch land exchange in 1994.

Camping on a national wildlife refuge does, however, promote behaviors which may have substantial negative biological impacts. Camping promotes night use of the refuge and related impacts. Camping also promotes overnight and extended stays on the refuge and necessitates disposal of waste. This leads to the potential for: 1) inappropriate placement/disposal of human waste leading to unsanitary conditions on land and compromised water quality, and 2) inappropriate storage or disposal of garbage, leading to nuisance wildlife behavior and the biological impacts of that behavior.

Strategies:

- Monitor campsites and campgrounds to minimize impacts to riparian areas.
- Sources of human-associated foods, including groceries, game, and waste which are most often associated with overnight camping, should never be available to wildlife.
- Provide educational and interpretive material to inform the public about preventing bears from developing a taste for human food.
- Manage human waste (sewage) associated with overnight camping so it does not impact refuge resources.
- Evaluate all campsites and campgrounds for their popularity and level of use, their impacts on surrounding resources, and the maintenance demands they impose on refuge staff and resources. Results of this evaluation will inform decision as to which camping areas to close and which to maintain open and in good condition.
- Eliminate non-designated camping on the North Unit.
- Close 6 of the less utilized campgrounds by 2014 and an additional 3 campgrounds by 2016. Designate 3 other campgrounds for seasonal (quota hunts) use only.
- Promote the use of private campgrounds in the surrounding area and the development of additional private campground sites as demand justifies.

Objective 4-11: Houseboat Mooring – Continue to gradually eliminate existing permitted houseboats according to Houseboat Management Plan and prohibit the attachment of non-permitted houseboats to refuge property. Work with other state and federal agencies to ensure all remaining houseboats are in compliance with marine sanitation regulations.

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Discussion: Houseboats have been a presence on the White River for many years. They are typically moored with cables or ropes to trees on the banks of the White River or tributaries. Since 1962, the refuge has regulated houseboats, because of their environmental impactst and refuge management, first by restricting them to designated areas of the refuge and then through a 1985 Houseboat Management Plan intended to phase out all houseboats over time by grandfathering some 34 then-current owners and not authorizing any new houseboats. Presently, three houseboats remain out of the 34 that were granted life permits. Additionally, there are ten unpermitted houseboats currently or periodically moored to the refuge in the North Unit along the White River. Houseboats moored to the refuge tend to generate litter on the shore, monopolize hunting and fishing sites, lead to increased illegal hunting and fishing activities, and typically are out of compliance with state and federal marine sanitation requirements. The refuge plans to continue pursuing the removal of all unauthorized houseboats and eventually all houseboats over time.

Strategies:

- Continue to monitor and permit grandfathered houseboats following special conditions requiring maintenance and marine sanitation..
- Provide notification to all unpermitted houseboats on the need to remove houseboats from refuge property.
- Work with houseboat owners to remove all associated litter and comply with marine sanitation requirements.

REFUGE ADMINISTRATION

Goal 5: Obtain and apply sufficient resources and support toward achieving the refuge's purposes and the goals and objectives of this document.

Discussion: Both the Biological Review and the Visitor Services Review teams specified additional staffing and facilities/equipment needed to implement the refuge's purposes, vision, goals, and objectives identified in this Draft CCP/EA.

Objective 5-1: Staffing – As resources become available, strategically add 14 staff positions that will improve the capacity and capability of White River NWR to achieve its legislated purposes and accomplish management goals and objectives in this Draft CCP/EA.

Discussion: Staffing changes over the course of White River NWR's 75-year history are indicative of workforce changes within the broader Refuge System and challenges faced by the current refuge staff. During the 1968-1988 timeperiod, the refuge contained 112,000 acres and had an average workforce of 4.4 full-time management positions (FTEs) and 10.7 full-time field positions (FTEs). This workforce was supplemented with an average of 0.1-part-time management position (PTE) and 2.1 part-time field positions (PTEs) for an overall average workforce of 17.3 positions.

By comparison, during the 1989-2008 time period the refuge workforce averaged 3.9 management FTEs and 7.8 field FTEs. This workforce was supplemented with an average of 1.3 management PTEs and 0.9-field PTE for an overall average workforce of 13.9 positions. As the refuge acreage increased by 43 percent to 160,000 acres, the average overall workforce decreased by 20 percent.

Compounding the workforce shortcomings is a change in workforce composition and the addition of a new 10,000-square-foot office/visitor center complex in 2003, and associated public use facilities. During the earlier timeperiod, the refuge staff was composed of a greater number of field positions and a management staff that had the time and ability to provide more field assistance as needed. For example, during the mid-1980s the refuge had on average 13 FTEs, composed of a manager, two assistant managers, three foresters, six maintenance workers, and one secretary. Since that time, the workforce has become more specialized as evidenced by the current refuge staff composition.

The 42,000-acre Potlatch addition and new 10,000-square-foot office/visitor center has added additional roads, parking areas, facility maintenance, boundary marking, and overall habitat management needs to an already stretched operation and maintenance capability. Consequently, all refuge operations and maintenance work has to be prioritized in an attempt to protect trust species and habitat resources, enhance forested habitat via thinnings, maintain basic infrastructure, and provide wildlife-dependent public use opportunities. Waterfowl habitat management operations have been curtailed at several areas, wildlife and habitat surveys have been discontinued or reduced, and overall deferred maintenance needs are slowly increasing each year.

Currently, the refuge's greatest staff deficiencies are in maintenance and biological positions (forestry and wildlife emphasis). The refuge only has three maintenance positions at the present time. These three positions are responsible for maintaining all refuge assets and equipment, while also conducting habitat management activities. The refuge is too large and has far too many assets and habitat management needs for just three maintenance workers. Consequently, other staff has to be taken away from their primary work responsibilities to assist with maintenance work, or as more often has been the case some work, such as maintenance of water control structures and moist-soil units is not completed. An additional full-time maintenance position is a high priority for this large, complex 160,000-acre refuge.

Another major staff deficiency is in the forest management program. The FHMP Update recommends achieving Desired Forest Conditions (DFC) on 35 to 50 percent of the refuge forest, which means some 3,500 to 5,000 acres of the refuge forest should be thinned annually. The refuge currently has three forestry FTEs, which enables us to complete all the necessary inventory, planning and administration required to thin approximately 1,500 acres annually, or achieve 10 percent DFCs in 10 years. One of the greatest obstacles to accomplishing forest management on White River NWR is the periodic and mostly seasonal flooding that limits field work to periods of low water. Less than 6 months are available most years, usually July through November, or about 100 work days. In order for the refuge to achieve 50 percent DFC, it would need to conduct forest thinning on approximately 5,000 acres annually. To accomplish the inventorying, planning, and administration required to thin 5,000 acres annually, the refuge would need to add one additional full-time forester, two additional full-time forestry technicians, and three seasonal forestry technicians.

Major staffing needs related to the refuge's overall biological program are two biological technicians to assist with all aspects of on-the-ground habitat management and monitoring, as well as conducting various wildlife inventories and nuisance animal control. The refuge has over 6,500 acres with water management capability that require monitoring, operation of some 37 water control structures, and various habitat manipulations. Providing quality flooded habitat is dependent on adequate monitoring and subsequent timely management actions. Two biological technicians are needed to assist the refuge biologist with these critical needs.

The other major staffing needs are in the areas of visitor services, administrative support, and law enforcement. The refuge has an excellent visitor center, with a state-of-the-art environmental education classroom and multi-media exhibits and displays. In addition, the 160,000-acre refuge offers unsurpassed opportunities for natural and cultural history interpretation, wildlife observation and photography, and environmental education. With only one visitor services park ranger, the refuge's public use facilities and programming potential are currently underutilized. Adding an additional full-time park ranger (Interpretation) and upgrading the administrative support assistant from a term to full-time position would enable the refuge to greatly expand the full range of refuge public use opportunities. Additional refuge law enforcement officers should be hired to match the deployment model for a refuge of this size and level of use.

The Service established 14 Land Management Demonstration Areas (LMDAs) to serve as centers of habitat management excellence following recommendations of the Fulfilling the Promise document, a vision for the Refuge System. White River/Cache River NWRs were selected as the bottomland hardwood site for a LMDA. Unfortunately, this site has never been funded or staffed with a LMDA biologist. Establishment of a LMRD position at White River NWR would help the Service advance Strategic Habitat Conservation throughout all bottomland hardwood refuges in Region 4 and would further assist the refuge in its habitat management efforts.

In summary, White River NWR has a significant staff shortage that is contributing to insufficient annual application of forest management towards management plan objectives, deterioration of other habitat management capabilities including water management on associated wetland habitats, failure to conduct important monitoring and apply adaptive management, underutilized visitor service facilities and programming, a continual loss of bottomland hardwood habitat from beaver damage, and a growing list of habitat management deferred maintenance needs.

Strategies:

- Continue to support existing staff positions on White River NWR and re-fill these positions as they are vacated.
- Fill field-based forestry and biological positions dedicated to habitat management application and associated needs.
- Hire maintenance staff with expertise in construction and heavy-equipment suitable to conduct habitat improvements and maintenance.
- Hire a LMRD biologist stationed at White River NWR.
- Hire a second 0.25 park ranger and use second park ranger as a volunteer coordinator in addition to other duties.
- Hire a full-time administrative support position to help with administrative functions and provide visitor service support.
- Consider the following staffing options: visitor service SCEP, Interns, STEP, Terms, and Seasonals.
- Close the visitor center on Sunday until increased visitor use would justify having it open.
- Change schedule of visitor services Manager to Tuesday through Saturday.
- Ensure that visitor center is always staffed by at least two people (could include volunteers and Friends members) when open to the public.

Objective 5-2: Facilities, Infrastructure, and Equipment – Maintain existing facilities, water management infrastructure, and equipment necessary to perform habitat management, restoration, and improvement on the refuge, in addition to maintaining essential infrastructure, such as roads, levees, and water control structures. With the aid of additional staff and equipment, improve facilities and infrastructure that facilitate management programs for trust species, access for management purposes and visitor use, and facilitate visitor services.

Discussion: In 2003, the refuge opened its new visitor center and administrative offices on Highway 1 in St. Charles. This 10,000-square-foot facility contains a bookstore, environmental education classroom, and interpretive exhibits that focus on bottomland hardwood forests, prehistoric animals, the Civil War, and Native American history.

Heavy equipment such as excavators, backhoes, road graders, bulldozers, dump trucks, and tractors are essential for active habitat management and maintenance of infrastructure on national wildlife refuges. The refuge currently has a fairly adequate supply of heavy equipment, habitat management tools and implements, trucks, boats, and various off road vehicles. Equipment needs are supplemented on an as-needed basis by renting or borrowing from other refuges. Most refuge equipment is stored in the maintenance compound at the Farm Unit. The maintenance compound has a modern shop, fuel storage facilities, and open equipment storage facilities. Other equipment and vehicles are stored at either the St. Charles headquarters parking area or the historic St. Charles sub-headquarters site. Additional vehicle and equipment storage and fueling facilityfacilities are available at the Levee building on the refuge's remote southeast side. Additional covered equipment

storage facilities are needed at the centrally located maintenance compound to adequately store all refuge boats and heavy equipment.

Strategies:

- Keep all machinery, equipment, facilities, and infrastructure in good working order by regular upkeep and maintenance.
- Annually update and maintain the Equipment Priority Index (EPI) report to identify station heavy equipment needs.
- Construct a heavy-equipment washing pad area, which is environmentally compliant, adjacent to the existing equipment storage shed.
- When feasible, share equipment with other refuges in Arkansas and surrounding states to minimize need for additional equipment purchases.
- Replace heavy equipment within the guidelines and time frames established by the regional heavy equipment coordinator.
- Recruit an additional engineering equipment operator and a maintenance worker to assist with implementation of habitat management, visitor services, and maintenance projects, and maintain facilities, infrastructure, and equipment.

Objective 5-3: Transportation Infrastructure – Maintain existing transportation infrastructure necessary to perform habitat management and resource protection on the refuge. With the aid of additional staff and equipment, improve transportation facilities and infrastructure that assist management programs to enhance habitat and protection for trust species, access for management purposes, and visitor use.

Discussion: Based on the latest GIS mapping data, the refuge has 3 miles of paved roads, 95 miles of graveled roads, 15 miles of primary dirt truck roads, 29 miles of secondary dirt truck lanes, 477 miles of tertiary dirt truck trails (all used primarily for periodic refuge forest management, but some 357 miles are also currently available for hunting/fishing related ATV access), and an additional 50 miles of ATV trails used solely for hunting/fishing related access. Paved and graveled roads are maintained to provide suitable access by registered passenger vehicles. The primary dirt truck roads provide access to three or more forest management compartments, while the secondary roads provide access to two compartments. The tertiary roads are within a single compartment. A 2001 Federal Highway Administration White River NWR Transportation Study evaluated the paved and graveled refuge roads and parking areas, summarizing roadway and parking conditions at the refuge – 76 percent of surface conditions were rated as "fair" and 17 percent as "poor."

None of the paved or gravel roads were rated as "failing." A typical graveled road on the refuge is a single lane with a width of approximately 18-20 feet. Dirt roads are all single lane with a width of approximately 18-20 feet for primary, 14-18 feet for secondary, and 10-14 feet for tertiary roads. The hunting/fishing ATV trails are also dirt with a width of about 8-12 feet. Any of the dirt roads may have hardened low water crossings using various geotech materials and/or rock to reduce rutting during low water, yet maintain hydrologic connectivity during periods of overflow.

In order to achieve refuge habitat and wildlife objectives, forest management is imperative and requires this network of vehicle transportation. All of these routes were constructed for silvicultural purposes. It is anticipated that rehabilitation and maintenance of the dirt roads will be conducted primarily through the forest management program. Contractors using roads for logging are required to maintain those roads following the terms and conditions of their special use permit. Following completion of each forest management operation, the dirt roads and trails utilized for that operation

are refurbished following Best Management Practices (BMP). Most of the primary and secondary dirt roads remain open for hunting/fishing related ATV access, while a significant number of the tertiary trails are closed to hunting/fishing ATV use, but remain open for foot travel. These trails will need some occasional maintenance to remove downed trees and maintain low water crossings.

By definition, primary truck roads are used for forest management at least three times per 15 year cycle, secondary roads being used twice, and tertiary roads used once in that cycle. When roads are rehabilitated or maintained for a forest management action, applicable BMPs are used to minimize adverse impacts to the environment while providing safe travel for the intended traffic using cost-efficient methods. Following logging and trail rehabilitation, it is common that at least half of the tertiary roads are closed to motorized vehicles. Visiting members of the public use these closed roads for foot trails, while refuge staff may use them occasionally with vehicles for refuge management. The other tertiary roads are often marked for use by the public to access that portion of the refuge for hunting or fishing, allowing low impact vehicles that meet the refuge's definition of an ATV. Any and all roads may be seasonally closed to motorized vehicles when wet conditions may result in rutting, erosion, or other degrading conditions.

The many waterways on the refuge cannot always be avoided and must have a road crossing in places. Where possible, low water crossings with hardened bottoms are used to allow vehicle passage during dry weather without excessive rutting or erosion, while also minimizing impediments to hydrologic flows. Occasionally, larger culverts are used when the elevation change is too great or water depth too deep for a low water crossing. When possible, a bridge is used in place of a culvert to further reduce adverse impacts to hydrology and fish passage. Paved and gravel road bridges are permanent. Bridges on primary or secondary dirt truck roads are considered temporary, but may be left in place over multiple years while in use or when forest management use is planned for the following year. For instance, a primary dirt truck road may provide access to five or more compartments where forest management actions are planned in one or more of those compartments practically each year through the end of a 15-year management cycle. Although the bridge is classified as temporary, its use for forest management is over a multi-year time span. Tertiary dirt roads would have temporary bridges in place for logging, with the bridge removed after logging is completed. Roads are developed to the lowest level necessary for safe passage of the expected traffic, considering seasonality and local weather patterns.

Currently, multi-year bridges are present across Lost Lake, East Bayou, and Maddox Bay Runout. Inspections of those bridges rated East Bayou and Maddox Bay Runout to have a load rating lower than needed for logging. These bridges need modification to ensure sufficient load capacity to not impede safe use by fully loaded trucks or equipment. Modification is likely to require the use of additional in-stream supports to sufficiently reduce the length of free-span.

One other such bridge is expected to be needed where there presently is no crossing in order to access across Muscle Shoals, Green River, or Walker Cypress, depending upon where dependable access from a public road to the refuge is obtained. A need is also recognized to restore hydrologic connectivity of streams in a number of locations where dirt fills or small culverts were used. A multi-year bridge for traffic would allow less restricted flow of water through these channels in 10 known areas. Another 9 streams are expected to be crossed with temporary bridges on a tertiary road. These plans are preliminary, subject to revisions as further details are discovered.

There is a need for additional access to refuge property from public roads, particularly in the area of Holly Grove, Arkansas. Presently, from county roads only private roads lead to the 10,000+ acres of refuge in this area, including landmarks such as the Crooked Lakes, Green River, and Walker Cypress. Obtaining refuge access through land acquisition or road right-of-way easements from willing adjoining private landowners should continue to be a high priority transportation infrastructure pursuit.

Natural Areas on the refuge typically don't have roads or trails open to motorized vehicles including ATVs. With a total of about 11,000 acres, these areas can be used by members of the public that prefer areas without seeing or hearing vehicles or ATVs.

The existing road/trail network is mostly adequate for forest management of the refuge, exceptions being the above issues including crossing Muscle Shoals, Green River, or Walker Cypress, replacement of restrictive fills and culverts with bridges, and obtaining legal access to the Crooked Lakes area. Upgrading dirt roads to gravel roads is neither necessary nor planned for forest management. Refuge staff will need to provide occasional maintenance on some of the forest management roads, particularly those trails with frequent hunting/fishing related ATV use when no forest management activities are planned for that area in the immediate future. However, refuge trail maintenance will be dependent on staff and budget availability and cannot impede priority habitat management work.

Strategies:

- Use refuge forest management to rehabilitate and maintain refuge roads used by logging.
- Obtain legal access to areas of the refuge not currently served by public roads.
- Develop roads to the lowest level necessary to provide safe access for the traffic expected.
- Apply appropriate Best Management Practices when rehabilitating or maintaining roads and stream crossings.
- Remove artificial fills and culverts where possible and replace with less obstructing crossings such as hardened low water crossings or adequate bridging.
- Modify or replace bridges with low load ratings to provide adequate transportation routes for refuge forest management.
- Continue to permit limited, seasonal public use of some refuge roads to provide quality outdoor recreational experience.
- Continue to close to motorized vehicles many or most of the tertiary roads used for forest management, converting them to hiking-only trails.

Objective 5-4: Volunteers, Partners, and Friends – With the aid of additional staff, expand the volunteer program and cooperation with the Friends Group and other cooperative partnerships.

Discussion: The refuge volunteer program includes approximately 40 volunteers managed by the Visitor Services Manager. They average about 3,000 hours per year. A thorough Volunteer Handbook is used for training and reference for all volunteers. Ongoing training provided to update current volunteers includes CPR, PowerPoint, and all required DOI training. Ample workspace, materials, and equipment are provided to the volunteers so that they can safely and properly do their jobs.

Two recreational vehicle (RV) pads are furnished to volunteers. Uniforms, an annual dinner, achievement awards, recognition and thanks are also provided. The refuge receives limited volunteer funds each year. Volunteer funds are spent on uniforms, awards, housing, reimbursement,

safety PPE, and training. The refuge spends much more on volunteers than the annual volunteer funding provided from the regional budget.

There is a need for a full-time volunteer coordinator to manage a full spectrum of volunteer jobs, including maintenance, forestry, and biological programs. The volunteer program manager should attend volunteer training and advanced training at NCTC. Additional support is needed to run the volunteer program as a full-time endeavor rather than as a collateral duty.

Community partners program include Phillips Community College, University of Arkansas, Friends of White River, Arkansas Game and Fish Commission, Arkansas State Parks, National Park Service, City of St. Charles, Wild Turkey Federation, Bass Pro Shops, Arkansas Bow Hunters Association, Entergy Power Company, 4-H Shooting Sports, and DeWitt Bank and Trust.

Some of the projects planned by partners to assist the refuge staff in the near future include developing a boardwalk trail behind the visitor center; business of birding; increasing wildlife observation and photography on the refuge, and special events.

White River NWR currently has a Friend's Group with a recent Cooperative Agreement. They have approximately 50-60 members and a core group of volunteers who provide dedicated assistance to the refuge for a variety of events and projects. The Friends run the bookstore in the visitor center and pay for it to be staffed on weekends. They also sponsor a soda machine on the deck outside the visitor center. The Friends assist with National Wildlife Refuge Week activities and the annual Youth Fishing Rodeo. The potential for support to the refuge by the Friends Group is very high once the basic building blocks of organization and management are in place.

Strategies:

- Focus the station volunteer program beyond just a visitor services volunteer program and to more of a station wide volunteer program.
- Work with staff to create a current “To Do” list of jobs in all programs that volunteers can do or assist with.
- Improve volunteer recruitment to get volunteers for specific job.
- Consider having one staff person serve as the Friends liaison and another staff person serve as the volunteer coordinator.
- Expand the recreational verhicle volunteer program at the refuge to provide volunteers to assist with a variety of programs at the refuge.
- Construct additional recreational vehicle pads across Highway 1 next to the refuge housing.
- Develop a resident volunteers "community center" in the old refuge office building.
- Host equipment training (including volunteers) at White River NWR as needed.
- Develop housing for interns.
- Put a Friends' donation box in the Visitor Center.
- Discuss the possibility of giving "10 Hour" volunteers a free one-year membership in Friends Group.
- Have Friends Group re-develop mission, goals, objectives, 501 (c) (3) articles of incorporation (for tax-exempt status with the IRS), and by-laws.
- Refuge manager, visitor services manager, and Friends Board should work together to identify 2-3 key projects that are feasible and that the Friends Group can do for the refuge over the course of a year.

- Celebrate the completion of each project and include an article in the local newspapers and news releases to all local media.
- Project Leader should attend board meetings and regular Friends Group meetings as often as possible.
- Follow-up on mentor requests.
- Form a bookstore committee to work with the refuge on operation of the bookstore.

V. Plan Implementation

INTRODUCTION

Refuge lands are managed as defined under the Improvement Act. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges. National wildlife refuges, unlike other public lands, are dedicated to the conservation of the Nation's fish and wildlife resources and wildlife-dependent recreational uses. Priority projects emphasize the protection and enhancement of fish and wildlife species first and foremost, but considerable emphasis is placed on balancing the needs and demands for wildlife-dependent recreation and environmental education.

To accomplish the purpose, vision, goals, and objectives contained in this plan for White River NWR, this section identifies projects, funding and personnel needs, volunteers, partnerships opportunities, step-down management plans, a monitoring and adaptive management plan, and plan review and revision.

PROPOSED PROJECTS

Listed below are some of the proposed project summaries and their associated costs for fish and wildlife population management, habitat management, resource protection, visitor services, and refuge administration over the next 15 years. This proposed project list reflects the priority needs identified by the public, planning team, and refuge staff based upon available information. These projects were generated for the purpose of achieving the refuge's objectives and strategies, but not all of the projects are shown. The primary linkages of these projects to those planning elements are identified in each summary.

FISH AND WILDLIFE POPULATION MANAGEMENT

Protect Biological Integrity

White River NWR, because of its size (160,000 acres), location (Mississippi River Delta, confluence of three major river systems including Arkansas, White, and Mississippi Rivers), ecological function (key wintering ground of migratory mallards, and key summering ground of neotropical birds), and the fact it is a national wildlife refuge would continue to serve as a key location for tracking changes in our environment and global climate. Biological monitoring of both terrestrial and aquatic habitats would prove invaluable toward addressing both national and regional trends. However, without dedicated staffing of a trained biological professional, irreplaceable opportunities continue to be lost. This project would allow for the hiring of a biological technician that would provide dedicated effort toward tracking both current and future trends in our habitat and environment.

RONS FY08-3071	One-Time: $0.00	Recurring Base: $97,911	Total First Year: $97,911
Station Rank: 5	Permanent Staff: 1	Temporary Staff: 0	Total Staff Cost: $97,911

(LINKAGE: Objectives: 1.1, 1.3, 1.7, 1.9, 1.15, 2.5, 2.7-8, 3.2-4, and 5.1-2)

Protect Biological Integrity

White River NWR, because of its size (160,000 acres), location (Mississippi River Delta, confluence of three major river systems including Arkansas, White, and Mississippi Rivers), ecological function (key wintering ground of migratory mallards, and key summering ground of neotropical birds), and the

fact it is a national wildlife refuge would continue to serve as a key location for tracking changes in our environment and global climate. Biological monitoring and habitat management operations migratory birds and various water management infrastrucute are critical support needed to accomplish refuge population and habitat objectives. However, without dedicated staffing of a trained biological professional, irreplaceable opportunities continue to be lost. This project would allow for the hiring of a biological technician that would provide dedicated effort toward performing habitat management operations and monitoring population responses.

RONS FY08-3599 One-Time: $0.00 Recurring Base: $80,046 Total First Year: $80,046

Station Rank: 7 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $80,046

(LINKAGE: Objectives: 1.1-6, 1.9-12, 1.16, 2.1, 2.5, 2.7-8, 3.2-4, and 5.1-2)

Reduce Cowbird Nest Parasitism

Reduce cow bird nest parasitism impacts on neotropical migratory birds along the White River Levee. White River NWR contains the largest block of bottomland hardwood forests remaining in the United States. Unfortunately, what would appear to be ideal forest breeding bird habitat is severely impacted by nest parasitism from cow birds utilizing the adjoining White River Levee. There are over 500 acres maintained by haying or grazing on the levee, which promotes use by brown-headed cowbirds. The Service provided an easement to the Levee Board for construction and maintenance of the White River Levee. This project would conduct data inventory and analysis to assess any brown-headed cowbird nest parasitism associated with current and future levee maintenance.

RONS FY08-3499 One-Time: $150,000 Recurring Base: $0.00 Total First Year: $150,000

Station Rank: 13 Permanent Staff: 0 Temporary Staff: 0 Total Staff Cost: $0.00

(LINKAGE: Objectives: 1.7, 2.2, 2.7-8, 3.2, and 3.6)

Control Invasive Feral Hogs

Feral hogs have recently begun to populate portions of White River NWR. These hogs have the potential to multiply and spread at an alarming rate if not controlled. Feral hogs tend to out-compete native wildlife for critical food resources and are known to cause predation on ground nesting birds. Additionally, feral hogs carry diseases that can be spread to both humans and domestic livestock. This project would employ temporary seasonal technicians to conduct feral hog control activities. We would also work with the AGFC to control hogs on adjoining WMAs and carry out a public outreach program on the negative impacts of feral hogs. This effort needs to occur as soon as possible before the feral hog population reaches an uncontrollable level and distribution.

RONS FY08-3653 One-Time: $11,000 Recurring Base: $3,000 Total First Year: $58,470

Station Rank: 12 Permanent Staff: 0 Temporary Staff: 1 Total Staff Cost: $44,470

(LINKAGE: Objectives: 1.9-10, 1.16, 2.1-2, 2.7, 3.2, 4.2, and 5.1-3)

SAMMS 2011200489 **Replace dirt fill/culverts with concrete bridge at Kansas Bayou**

Replace dirt fill/culverts with concrete bridge at Kansas Bayou to restore hydrology, fisheries, and aquatic resources. The project would remove the dirt fill/culverts out of the waterway, drive or install enough concrete pilings to support the desired length (160') of bridge decking, and then install concrete decking material (18' wide), with expansion joints at designated intervals and bridge railing. The bridge itself would be used for public transportation, refuge administration, and law enforcement capabilities. Permits and requests for engineering services would need to be rendered.

Project Need/Benefit:
This project is in support of the purpose, vision, goals, and management objectives of White River NWR. This bridge would improve the hydrological functions, ecology, and aquatic resources of White River NWR and would eliminate the safety hazard of the dirt fill or culverts failing. Building this asset would meet GRPA 4.1 goals by serving communities, protecting lives, resources, and property. Estimate: $685K

(LINKAGE: Objectives: 1.17, 2.4, 2.6, 4.1-6, 4.9, and 5.2-3)

SAMMS 2011200506 **Replace dirt fill/culverts with concrete bridge at Sycamore Log Crossing**

Replace dirt fill/culverts with concrete bridge at Sycamore Log Crossing to restore hydrology, fisheries habitat, and aquatic resources of White River NWR. The project would remove the dirt fill/culverts out of the waterway, drive or install enough concrete pilings to support the desired length (475') of bridge decking, and then install concrete decking material (18' wide) with expansion joints at designated intervals and bridge railing. The bridge itself would be used for public transportation, refuge administration, and law enforcement capabilities. Permits and requests for engineering services would need to be rendered.

Project Need/Benefit:
This project is in support of the purpose, vision, goals, and management objectives of White River NWR. This bridge would improve the hydrological functions, ecology, and aquatic resources of White River NWR and would eliminate the safety hazard of the dirt fill or culverts failing. Building this asset would meet GRPA 4.1 goals by serving communities, protecting lives, resources, and property. Estimate: $2.1M

(LINKAGE: Objectives: 1.17, 2.4, 2.6, 4.1-6, 4.9, and 5.2-3)

SAMMS 2011200507 **Replace dirt fill/culverts with concrete bridge at Scrub Grass Bayou**

Replace dirt fill/culverts with concrete bridge at Scrub Grass Bayou to restore hydrology, fisheries, and aquatic resources of White River NWR. The project would remove the dirt fill/culverts out of the waterway, drive or install enough concrete pilings to support the desired length (200') of bridge decking, and then install concrete decking material (18' wide) with expansion joints at designated intervals and bridge railing. The bridge itself would be used for public transportation, refuge administration, and law enforcement capabilities. Permits and requests for engineering services would need to be rendered.

Project Need/Benefit:
This project is in support of the purpose, vision, goals, and management objectives of White River NWR. This bridge would improve the hydrological functions, ecology, and aquatic resources of White River NWR and would eliminate the safety hazard of the dirt fill or culverts failing. Building this asset would meet GRPA 4.1 goals by serving communities, protecting lives, resources, and property. Estimate: $857K

(LINKAGE: Objectives: 1.17, 2.4, 2.6, 4.1, 4.5-6, 4.9, and 5.2-3)

HABITAT MANAGEMENT

Reaction of Fish to Change and Applicability to Global Climate Change

White River NWR is located near the junctions of the Arkansas, White, and Mississippi Rivers. The refuge extends along more than 90 miles of the White River and possesses more than 350 lakes that function to provide primary levels of fisheries resources. These characteristics and the protection of the habitat provided since 1935 have allowed much of the aquatic habitats to remain relatively intact. Or, has it? Collection of key reference data is extremely important in the study of global climate change. This project would allow the establishment of eight biological reference lakes within which surveys would be conducted to establish the lakes physical structure, levels, and rates of eutrophication and fish assemblages. These lakes would serve as controls for future studies of change. Locating well-placed and designed controls are generally the most difficult part in producing quality environmental based science projects.

RONS FY08-3080 One-Time: $195,000 Recurring Base: $0.00 Total First Year: $195,000

Station Rank: 11 Permanent Staff: 0 Temporary Staff: 0 Total Staff Cost: $0.00

(LINKAGE: Objectives: 1.17, 2.3-4, 2.6, 2.7-8 and 5.2)

Restore Bottomland Hardwood Forest

Restore hydrology and reforest over 7,000 acres of bottomland hardwood forest killed by prolonged exposure to standing water which was created by beaver activity. The need exists to control flooding and nuisance beaver damage on approximately 143,000 additional acres. White River NWR is the largest remaining block of bottomland hardwood forest remaining in the United States. It is also the most important mallard wintering area in the Mississippi Flyway and a Wetlands of International Importance. Beavers cause annual flooding on over 10,000 acres of live forest. The water has to be removed by breaching dams multiple times. The refuge does not have the staff to adequately reduce the beaver populations and remove beaver water that threatens tree survival. This project would provide contractual services to control beavers, remove damaging beaver water, restore impacted hydrology and reforest native bottomland hardwoods to sites previously killed by standing water.

RONS FY08-3272 One-Time: $248,000 Recurring Base: $0.00 Total First Year: $248,000

Station Rank: 10 Permanent Staff: 0 Temporary Staff: 0 Total Staff Cost: $0.00

(LINKAGE: Objectives: 1.1-3, 1.7-13, 2.2, 2.4, 3.2-3, and 5.1-2)

Sustainable Greentree Reservoir Management

White River NWR has some of the older greentree reservoirs managed for wintering waterfowl in the LMV. These seasonally managed areas total some 8,500 acres at six locations. With over 150,000 acres of bottomland hardwood habitat, White River NWR has the largest amont of this critical habitat type remaining in public ownership. The long-term sustainability of this habitat type is critically important for migratory waterfowl, neotropical birds, and floodplain fishes. This project would establish fixed points throughout the greentree reservoirs to collect essential data on water regimes, sedimentation, tree growth, and recruitment and wildlife use. A management plan would be developed utilizing project data to ensure sustainable long-term management and restoration. Failure to complete this project would result in continuing deterioration of valuable bottomland hardwood habitat. This habitat type is not only critical habitat, but also contributes to carbon sequestration.

RONS FY08-3349	One-Time: $175,000	Recurring Base: $0.00	Total First Year: $175,000
Station Rank: 14	Permanent Staff: 0	Temporary Staff: 0	Total Staff Cost: $0.00

(LINKAGE: Objectives: 1.1-3, 1.7, 2.2, 2.5-8, 4.6, and 5.1-2)

Develop Desired Forest Conditions

Restoration to achieve Desired Future Conditions (DFC's) via selective forest thinning would be conducted annually to ensure sustainable habitat for trust species and increase carbon sequestration (an important component in reducing green house gases). This project would provide an increase in the amount of DFC's achieved, from 20 percent to 25 percent in 15 years. A forestry technician would make significant progress in reaching that goal by applying forest management via thinning on 500 acres each year. Forests contribute significantly to the sequestration of carbon into solid wood, which mitigates the effects of global warming. When trees are converted to wood products such as lumber and furniture, the carbon remains stored indefinitely. The thinnings conducted on the refuge by this project results in additional carbon sequestration as the residual trees and regenerated trees grow to occupy the gap. The refuge goal is to attain and maintain enhanced habitat conditions via DFC's on 50 percent of the refuge in 15 years.

RONS FY08-3464	One-Time: $0.00	Recurring Base: $80,046	Total First Year: $80,046
Station Rank: 1	Permanent Staff: 1	Temporary Staff: 0	Total Staff Cost: $80,046

(LINKAGE: Objectives: 1.1-3, 1.7, 1.14, 2.2, 2.7-8, and 5.12)

Develop Desired Forest Conditions

Restoration to achieve DFC's via selective thinning would be conducted annually to ensure sustainable habitat for trust species and increase carbon sequestration, an important climate change objective. This project would provide a 100 percent increase in the amount of DFC's achieved, from 10 percent to 20 percent in 15 years. A professional forester would make significant progress in reaching that goal by planning and directing forest management via thinning on 500 acres each year. Forests contribute significantly to the sequestration of carbon into solid wood, which mitigates the effects of global warming. When trees are converted to wood products such as lumber and furniture, the carbon remains stored indefinitely. The thinnings conducted on the refuge by this project result in additional carbon sequestration as the residual trees and regenerated trees grow to occupy the gap. The refuge goal is to attain and maintain enhanced habitat conditions via DFC's on 50 percent of the refuge.

RONS FY08-3389 One-Time: $0.00 Recurring Base: $97,911 Total First Year: $97,911

Station Rank: 3 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $97,911

(LINKAGE: Objectives: 1.1-3, 1.7, 1.14, 2.2, 2.7-8, and 5.1-2)

Restore Desired Forest Conditions

Restoration to achieve DFC's via selective forest thinning would be conducted annually to ensure sustainable habitat for trust species and to increase carbon sequestration, an important climate change objective. This project would provide a 100 percent increase in the amount of DFC's achieved, from 15 percent to 30 percent in 15 years. A forestry technician would make significant progress in reaching that goal by conducting management via thinning on 500 acres each year. Forests contribute significantly to the sequestration of carbon into solid wood, which mitigates the effects of global warming. When trees are converted to wood products such as lumber and furniture, the carbon remains stored indefinitely. The thinnings conducted on the refuge by this project results in additional carbon sequestration as the residual trees and regenerated trees grow to occupy the gap. The refuge goal is to attain and maintain enhanced habitat conditions via DFC's on 50 percent of the refuge in 15 years.

RONS FY08-3527 One-Time: $0.00 Recurring Base: $80,046 Total First Year: $80,046

Station Rank: 6 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $80,046

(LINKAGE: Objectives: 1.1-3, 1.7, 1.9, 1.10-11, 1.13, 1.15, 2.1-2, 2.7-8, and 5.1-2)

Restore Access to Habitat for Silvicultural Practices

Restoration of vehicular access to habitat that would be used for silvicultural practices for DFC's is imperative to complete the forest management objectives of White River NWR. In order to achieve refuge habitat and wildlife objectives, forest management is imperative and requires this network of vehicle transportation. By definition, primary truck roads are used for forest management at least 3 times per 15-year cycle, secondary roads being used twice, and tertiary roads used once in that cycle. When roads are rehabilitated or maintained for a forest management action, applicable Best Management Practices are used to minimize adverse impacts to the environment while providing safe travel for the intended traffic using cost-efficient methods. When logging in a compartment is completed, it is common that at least half of the tertiary roads are closed to motorized vehicles. Some instances require a temporary bridge to be placed at a slough or ditch to allow passage to habitat for those silvicultural practices. This project would fund materials for four sets of precast concrete bridges (14' X 93' with support piles at 31' and curb) that would be stored at the maintenance compound, and would be used at nine separate locations when needed and determined. Estimate: $166K

(Linkage: Objectives: 2.2, 2.4, 2.6, 3.3, and 5.2-3)

SAMMS 2009946965 Replace Water Control Structure at Frazier Lake

As a result of a 2009 Comprehensive Condition Assessment, this 48" water control structure was identified as in need of replacement due to structure deterioration and leakage. Frazier Lake is home to hundreds of thousands of migrating waterfowl that use it to rest, feed, and roost at night. Replacement of the WCS would include removing the old plates or structure, ordering a new structure to fit into that concrete spillway, and then installation of the WCS to maximize water levels.

Project Need/Benefit:
Water control is critical to manage for production of waterfowl foods and to provide these resources to 250,000 migratory waterfowl each winter. Replacing the damaged water control structure would allow for better control of water for food production and would ensure against damage from future flood events. Replacing this asset would meet GPRA goal 4.1 by serving communities, protecting lives, resources, and property. Estimate: $26K

(Linkage: Objectives: 1.1-6, 1.16-17, 2.3-7, and 5.2)

SAMMS 2009943988 Replace Water Control Structure at Honey Locust.

As a result of a 2009 Comprehensive Condition Assessment, this structure was identified as in need of replacement due to deterioration. This structure is vital for refuge moist-soil management and to prevent unwelcome flooding on adjacent private landowners. Repairing the water control structure would allow the refuge to effectively manage moist-soil impoundments for migrating waterfowl, which is critical for achieving mission-dependent refuge goals and objectives.

Project Need/Benefit:
Water control is critical to manage for production of waterfowl foods and to provide these resources to 250,000 waterfowl each winter. Replacing the damaged water control structures would allow for better control of water for food production and would ensure against damage from future flood events. Replacing this asset would meet GPRA goal 4.1 by serving communities, protecting lives, resources, and property. Estimate: $151K

(Linkage: Objectives: 1.1-6, 1.16-17, 2.3-7, and 5.2)

SAMMS 2009943983 Replace worn WCS at Cocklebur Slough

As a result of a 2009 Comprehensive Condition Assessment, this entire structure, including the concrete and water control structure is cracked, rusted and needs to be replaced. This structure has a concrete head wall that has two 36”-diameter X 80’-long pipes with stop log structures. This structure is old and has been nonfunctional for quite some time and needs to be replaced. The entire structure would be removed, dug to grade, then a new double 36” WCS complete with concrete headwall and gear heads to open and close complete with 80’ steel pipe. Rip rap would be installed near the entry and exit of the structure to ensure erosion is slowed down if not stopped.

Project Need/Benefit:
Water control is critical to manage for production of waterfowl foods and to provide these resources to 250,000 waterfowl each winter. Repairing the water control structure would allow the refuge to effectively manage refuge hydrology for migrating waterfowl, fisheries, and shorebirds, which is critical for achieving mission-dependent refuge goals and objectives. Replacing this asset would meet GPRA goal 4.1 by serving communities, protecting lives, resources, and property. Estimate: $149K

(Linkage: Objectives: 1.1-6, 1.16-17, 2.3-7, and 5.2)

SAMMS 2010137174 Replace Worn Dry Lake Water Control Structure

As a result of a 2009 Comprehensive Condition Assessment, the two 48-inch pipes are rusted to the point of possibly collapsing, potentially causing a downstream safety hazard and loss of water management capability. The two 4' x 125' metal pipes and screw gates would be replaced with pipes

and screw gates of the same dimensions. The project would be conducted according to low hazard dam guidelines. Woody vegetation would be removed and rip rap would be placed around the new water control structures to avoid erosion.

Project Need/Benefit:
This dam was inspected by Regional Office Safety officers as one of the dams that are considered a priority due to the houseboats that are downstream from the structure and the amount of water that is contained in the watershed. Dry Lake has been used as a sanctuary for waterfowl, shorebirds, and other wildlife for more than 50 years and this structure allows refuge staff to manipulate the water levels in the lake to encourage aquatic plant species that are conducive for the refuge's mission. Replacing these worn water control structure would meet GPRA goals by replacing a mission-dependent asset in poor condition and help protecting lives, resources, and property. Estimate: $243K

(Linkage: Objectives: 1.1-6, 1.16-17, 2.3-7, and 5.2)

SAMMS 2009943982 Repair sheet piling near WCS on Wolf Bayou at Jack's Bay.

As a result of the 2009 Comprehensive Condition Assessment, the sheet pile head wall and stop log rails were identified for replacement. The corrugated sheet pile and stop log rails have rusted to the point of possibly collapsing and causing a health and safety hazard. The rusted sheet pile and stop log rails would be replaced with sheet pile the same length but wider to cover the gap (35') and new stop log rails.

Project Need/Benefit:
Replacement of the sheet pile and stop logs would eliminate a possible safety hazard and allow continued access for management activities and refuge hydrology to occur on the refuge. Replacing this asset would meet GPRA goal 4.1 by serving communities, and protecting resources. Estimate: $18K

(Linkage: Objectives: 1.1-2, 1.17, 2.3-5, and 5.2)

SAMMS 2007701472 Repair washed out levee on Reservoir A at Jack's Bay

Repair the washed out earthen levee on Reservoir A at Jacks Bay in three locations due to storm damage suffered in 2002 when a large rain event over washed the area. Three areas of the levee were quickly eroded during a large 10-inch rain event. Without repair, the levee would soon fail and all management functions would be lost within this 2,500-acre public waterfowl hunting area. New drain pipes would be installed to increase the evacuation of excess water and the three eroded sections of levee would be repaired and lined with rip-rap rock.

Project Need/Benefit:
This asset maintains water for flooding and draining approximately 2,500 acres of a public waterfowl hunting area. This 2,500-acre public waterfowl hunt areas provides more than 1,000 hours of hunting opportunity annually. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities, protecting lives, resources, and property. Estimate: $12K

(LINKAGE: Objectives: 1.1-6, 1.13, 2.3, 2.5, 2.7, 4.2, and 5.2)

SAMMS 2007701493 **Rehabilitate Willow Lake Levee for Water Storage Area at Willow Lake**

Rehabilitate leaking Willow Lake Levee for Water Storage Area at Willow Lake that is severely eroded by years of beaver digging and weather. This asset provides important habitat for migratory waterfowl and shorebirds. The water control pipe has rusted and must be replaced and the surface of the earthen dam will need to be reworked. This project would install a new flashboard riser in place of the old metal drain pipe and reworking the earthen dam would protect the dam's integrity from burrowing animals.

Project Need/Benefit:
This asset would secure the levee used for management of habitat for migratory birds. This 1,200-acre lake provides sanctuary for migratory waterfowl during the winter season. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities, protecting lives, resources, and property. Estimate: $20K

(LINKAGE: Objectives: 1.1-6, 1.13, 2.3, 2.5, 2.7, 4.2, and 5.2)

SAMMS 2009945994 **Repair Mossy Lake Levee blowout**

Repair eroded Mossy Lake Levee damage caused by time and storm events. Mossy Lake Levee suffered a breach measuring 100 feet long and 20 feet deep from recent storm events. This levee separates the White River from a complex of seven lakes. All of these seven lakes have been substantially dewatered due to the blowout and no longer sustain year-round fisheries. The project would require having 2,000 yards (approximately 3,500 tons) of rip-rap rock placed in the breach. Topsoil would be used to cap the structure.

Project Need/Benefit:
This levee separates the White River from a complex of seven lakes and is used in the drainage of hundreds of acres of bottomland hardwood forest annually. This road also provides public access for wildlife-dependent recreational opportunities on 2,000 acres of bottomland hardwood and three lakes. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities, protecting lives, resources, and property. Estimate: $539K

(LINKAGE: Objectives: 1.1-3, 1.5, 1.16-17, 2.2-6, 4.2, 4.5, and 5.2)

SAMMS 2006527157 **Repair Dam #1 on Farm Unit**

Rehabilitate leaking earthen dam #1 that is severely eroded by years of beaver activity and erosion. The old spillway is heavily eroded and the erosion is now beginning to threaten adjacent private lands. This project would install a new drop log structure in the service spillway discharge channel to prevent further undercutting. The dam surface would be leveled to grade, covered with soil stabilization fabric and 12 inches of SB2 gravel. The emergency spillway would be reshaped according to plan elevations and dimensions, lined with soil stabilization fabric, and covered with rip rap.

Project Need/Benefit:
This dam is used to create a pond with the primary function of providing habitat for both migratory birds and resident wildlife. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities, and protecting lives, resources, and property. Estimate: $140K

(LINKAGE: Objectives: 1.1-6, 1.13, 2.3, 2.5, 2.7, 4.2, and 5.2)

SAMMS 2009943954 Repair Dry Lake Dam #1 at Dry Lake

Repair leaking Dry Lake Dam #1 at Dry Lake that is eroded by years of beaver activity and erosion. This dam was inspected by Regional Office Safety officers as one of the dams that is considered a priority due to the houseboats that are downstream from the structure and the amount of water that is contained in the watershed. The project would fill and compact holes on the upstream slope, crest, and downstream slope. Perform survey that would examine hydrologic and hydraulic analysis.

Project need/Benefit:
Dry Lake has been used as a sanctuary for waterfowl, shorebirds, and other wildlife for more than 50 years and this structure allows refuge staff to manipulate the water levels in the lake to encourage aquatic plant species that are conducive for the refuge's mission. Repairing this leaking dam would meet GPRA 4.1 goal by replacing a mission-dependent asset in poor condition and helping to protect lives, resources, and property. Estimate: $69K

(LINKAGE: Objectives: 1.1-6, 1.13, 2.3, 2.5, 2.7, 4.2, and 5.2)

SAMMS 2009943956 Repair Dry lake Dam #2 at Dry lake

Repair leaking Dry Lake Dam #2 at Dry Lake that is eroded by years of beaver activity and erosion. This dam was inspected by Regional Office Safety officers as one of the dams that is considered a priority due to the houseboats that are downstream from the structure and the amount of water that is contained in the watershed. The project would fill and compact holes on the upstream slope, crest, and downstream slope. Perform survey that would examine hydrologic and hydraulic analysis.

Project need/Benefit:
Dry Lake has been used as a sanctuary for waterfowl, shorebirds, and other wildlife for more than 50 years and this structure allows refuge staff to manipulate the water levels in the lake to encourage aquatic plant species that are conducive for the refuge's mission. Repairing this leaking dam would meet GPRA 4.1 goal by replacing a mission-dependent asset in poor condition and helping to protect lives, resources, and property. Estimate: $69K

(LINKAGE: Objectives: 1.1-6, 1.13, 2.3, 2.5, 2.7, 4.2, and 5.2)

SAMMS 2011200610 Rehabilitate habitat at Dry Lake

Rehabilitate habitat at Dry Lake to maximize duck use days for up to 300,000 migratory waterfowl, shorebirds, and wading birds. Currently within the 800-acre Dry Lake impoundment, only 400 acres can be managed for waterfowl during flooded conditions. This project would develop a series of sub-impoundment levees and water control structures capable of providing independent water management cells that would increase habitat management by 200 acres. In accordance with this Draft CCP/EA, rehabilitating moist-soil units to improve duck use days on White River NWR are part of the proposed planning efforts to occur sometime in the future.

Project Need/Benefit:

Dry Lake is a well-known waterfowl resting area adjacent to Jacks Bay waterfowl hunting area. The entire Jacks Bay area annually provides 2,400 duck-use days of waterfowl hunting opportunity on White River NWR and under ideal conditions can provide up to 300,000 duck-use days per month.

This site could easily increase duck-use days, which would effectively increase waterfowl numbers on the Jacks Bay area as well as numerous tracts of private lands within 10-12 miles of the site. Estimate: $600K

(LINKAGE: Objectives: 1.1-6, 1.13, 2.3, 2.5, 2.7, 4.2, and 5.2)

RESOURCE PROTECTION

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

Provide one full-time law enforcement officer to protect wildlife, lands, facilities, employees, and the general public on Whiter River NWR. Directors Order #155 requires the Service to reduce dependency on dual function refuge officers and progress towards a full-time officer workforce. More and more violations recorded on the 160,000-acre White River NWR are being classified as serious; serious offenses have included homicide, robbery, vandalism, illegal weapons, drunkenness, and arson. Wetland damage, trespass farming and preventable habitat destruction, hunting violations, off-road vehicles, and the use of illegal drugs are all infractions that an officer will typically see. Other law enforcement related incidents have included search and rescue. As climates change and nature resources dwindle, the future needs of our citizens (e.g., energy development, food production, resource extraction) are placing additional strain on wildlife habitats throughout the Region.

RONS FY08-3073 One-Time: $0.00 Recurring Base: $150,000 Total First Year: $150,000

Station Rank: 9 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $150,000

(LINKAGE: Objectives: 1.2, 3.1, 3.8, 4.1-2, 4.4, 4.5, 4.9, 4.11, and 5.1-2)

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

Provide one full-time law enforcement officer to protect wildlife, lands, facilities, employees, and the general public on White River NWR. Directors Order #155 requires the Service to reduce dependency on dual-function refuge officers and progress towards a full-time officer workforce. This officer would assist in fulfilling these needs by being in the field full time to protect wildlife resources. Conflicts between guided and non-guided waterfowl hunters, trespass farming, hunting violations, and off-road vehicle use are increasing on refuge lands. Exploration of energy resources (e.g., wind, oil, and gas) is placing additional strain on wildlife habitats throughout the Region. Protection is the most basic form of wildlife management and this project would dedicate a full-time law enforcement officer to conserve and protect wildlife and wildlife habitats.

RONS FY10-1363 One-Time: $0.00 Recurring Base: $150,000 Total First Year: $150,000

Station Rank: 15 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $150,000

(LINKAGE: Objectives: 1.2, 3.1, 3.8, 4.1-2, 4.4-5, 4.9, 4.11, and 5.1-2)

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

Provide one full-time law enforcement officer to protect wildlife, lands, facilities, employees and the general public on White River NWR. Directors Order #155 requires the Service to reduce dependency on dual-function refuge officers and progress towards a full-time officer workforce. This officer would assist in fulfilling these needs by being in the field full time to protect wildlife resources.

Conflicts between guided and non-guided waterfowl hunters, trespass farming, hunting violations, and off-road vehicle use are increasing on refuge lands. Exploration of energy resources (e.g., wind, oil, and gas) is placing additional strain on wildlife habitats throughout the Region. Protection is the most basic form of wildlife management and this project would dedicate a full-time law enforcement officer to conserve and protect wildlife and wildlife habitats.

RONS FY10-1364 One-Time: $0.00 Recurring Base: $150,000 Total First Year: $150,000

Station Rank: 16 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $150,000

(LINKAGE: Objectives: 1.2, 3.1, 3.8, 4.1-2, 4.4-5, 4.9, 4.11, and 5.1-2)

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

Provide one full-time law enforcement officer to protect wildlife, lands, facilities, employees and the general public on White River NWR. Director's Order #155 requires the Service to reduce dependency on dual-function refuge officers and progress towards a full-time officer workforce. This officer would assist in fulfilling these needs by being in the field full time to protect wildlife resources. Conflicts between guided and non-guided waterfowl hunters, trespass farming, hunting violations, and off-road vehicle use are increasing on refuge lands. Exploration of energy resources (e.g., wind, oil, and gas) is placing additional strain on wildlife habitats throughout the Region. Protection is the most basic form of wildlife management and this project would dedicate a full-time law enforcement officer to conserve and protect wildlife and wildlife habitats.

RONS FY10-1365 One-Time: $0.00 Recurring Base: $150,000 Total First Year: $150,000

Station Rank: 17 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $150,000

(LINKAGE: Objectives: 1.2, 3.1, 3.8, 4.1-2, 4.4-5, 4.9, 4.11, and 5.1-2)

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

Provide one full-time law enforcement officer to protect wildlife, lands, facilities, employees, and the general public on White River NWR. Director's Order #155 requires the Service to reduce dependency on dual-function refuge officers and progress towards a full-time officer workforce. This officer will assist in fulfilling these needs by being in the field full time to protect wildlife resources. Conflicts between guided and non-guided waterfowl hunters, trespass farming, hunting violations, and off-road vehicle use are increasing on refuge lands. Exploration of energy resources (e.g., wind, oil, and gas) is placing additional strain on wildlife habitats throughout the Region. Protection is the most basic form of wildlife management and this project would dedicate a full-time law enforcement officer to conserve and protect wildlife and wildlife habitats.

RONS FY10-1366 One-Time: $0.00 Recurring Base: $150,000 Total First Year: $150,000

Station Rank: 18 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $150,000

(LINKAGE: Objectives: 1.2, 3.1, 3.8, 4.1-2, 4.4-5, 4.9, 4.11, and 5.1-2)

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

This project would add a supervisory refuge officer to the refuge, and would assist in the completion of the International Association of Chiefs of Police (IACP) Deployment Model for the Refuge System. Supervisory officers provide oversight and mentoring of the refuge officers working at a specific refuge, or on a larger scale, on a refuge complex. They provide assistance to the Division of Refuge Law Enforcement and their assigned Region through the development and delivery of law enforcement training at courses such as Refuge Officer Basic School, Law Enforcement for Field Supervisors, Annual In-Service training, and may serve as a Field Training Officer for the Refuge System. Supervisory officers also perform law enforcement patrols, interaction with the visiting public, emergency operations, and perform all other functions related to a supervisory office including scheduling, coordinating details, case management and interagency coordination.

RONS FY10-2564 One-Time: $0.00 Recurring Base: $150,000 Total First Year: $150,000

Station Rank: 19 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $150,000

(LINKAGE: Objectives: 1.2, 3.1, 3.8, 4.1-2, 4.4-5, 4.9-11, and 5.1-2)

SAMMS 2009943981 Replace missing boundary signs on Big Island Unit

As a result of the 2009 Comprehensive Condition Assessment, 10 percent of boundary signs, posts, and hardware are missing. Approximately 285 aluminum refuge boundary signs complete with hardware and posts would need to be purchased and installed where needed to ensure the boundary is accurately depicted. Refuge staff would install the boundary signs where needed on the Big Island Unit.

Project Need/Benefit:
Posting boundary signs on the refuge is very important to make sure that the general public knows where the boundary is, so as not to cross onto private land or vice versa. The refuge signs that would replace the missing ones would protect the resource and the general public. Replacing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $29K

(Linkage: Objectives: 4.1-2, 4.9, and 5.2)

SAMMS 2009943980 Replace missing boundary signs on Crooked lake Unit

As noted in the 2009 Comprehensive Condition Assessment, 15 percent of boundary signs, posts, and hardware are missing. Approximately 84 aluminum refuge boundary signs complete with hardware and posts would need to be purchased and installed to ensure that the boundary is accurately depicted. Refuge staff would install the boundary signs where needed on the Crooked Lake Unit.

Project Need/Benefit:
Posting boundary signs on the refuge is very important to make sure that the general public knows where the boundary is, so as not to cross onto private land or vice versa. The refuge signs would protect the resource and the general public. Replacing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $9K

(LINKAGE: Objectives: 4.1, 4.2, 4.9, and 5.2)

SAMMS 2009945438 Replace missing boundary signs on Levee Unit

Replace damaged or missing boundary signs on the Levee unit. Through the years, signs have been removed by vandalism, by storms, and by normal wear and tear. The project would install approximately 310 signs and posts where there are none or are currently in need of replacement.

Project need/benefit:
These signs identify the boundary of the refuge and areas closed to the public. Properly placed and maintained signs that clearly identify boundaries are critical to allowing effective enforcement of refuge regulations, and ultimately, ensuring the security of the refuge. Replacing this mission-critical asset would meet GPRA goals by serving communities and protecting resources and property. Estimate: $50K

(LINKAGE: Objectives: 4.1-2, 4.9, and 5.2)

VISITOR SERVICES

Visitor Orientation

Provide visitor orientation and administrative support at the White River NWR Visitor Center, which currently receives more than 5,000 visits annually. This new position would help ensure that the public is oriented to the visitor center and provided current information regarding overall refuge facilities and public use opportunities. This position would also provide administrative support for special events, managed hunts, and other wildlife-dependent public use activities enjoyed by over 350,000 refuge visitors, while allowing the refuge to expand additional environmental education and interpretation programs targeted at connecting children and nature. Our state-of-the-art visitor center is currently under-utilized by the visiting public due to lack of staffing resources. Adding this position would allow expanded public use opportunities throughout the week and on weekends, possibly increasing visitor center visits to over 20,000 annually.

RONS FY08-3249 One-Time: $0.00 Recurring Base: $64,622 Total First Year: $64,622

Station Rank: 8 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $64,622

(LINKAGE: Objectives: 4.1-2, 4.5-9, and 5.1-3)

Initiate Environmental Education program

Plan and conduct environmental education and interpretation programs that will connect over 5,000 children with nature annually. The refuge has a visitor center with state-of-the-art displays and an environmental education classroom, but only one park ranger to oversee all public use activities on this 160,000-acre refuge, which currently receives over 350,000 annual visits. This new position would allow the refuge to offer additional programs and events targeting children, and would make better use of visitor center facilities. Additionally, this position would help with our volunteer program and environmental education partnership with AGFC at the Potlatch Environmental Education Center at Cooks Lake. Adding this position would expand our ability to not only connect children with nature, but also provide improved public use opportunities for all refuge visitors.

RONS FY08-3260 One-Time: $0.00 Recurring Base: $80,046 Total First Year: $80,046

Station Rank: 4 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $80,046

(LINKAGE: Objectives: 4.1, 4.7-8, and 5.1-3)

SAMMS 04136007 Rehabilitate Weber boat ramp and gravel parking lot

Rehabilitate deteriorated Weber graveled parking lot which accommodates a boat ramp. The parking lot is damaged due to thousands of vehicles hauling boats during rainy conditions and dry conditions that have caused rutting in the parking lot. This asset is 16,226 square feet and accommodates consumptive users (i.e., hunting and fishing), as well as non-consumptive users (i.e., birders, wildlife observation and photography) during the entire year if not flooded. Rehabilitation would include excavation of present material, compaction of material with vibrator compactor, placement of geotextile fabric to minimize loss of gravel, and installation of 8" of limestone SB-2 gravel to entire parking lot.

Project Need/Benefit:
This parking lot is one of the main parking lots that has a boat ramp providing access not only to staff for controlling nuisance species, surveying waterfowl, conducting law enforcement, but also allows the public access to several thousand acres of prime habitat. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $67K

(LINKAGE: Objectives: 1.13, 1.17, 2.3, 2.6, 3.4, 4.1-2, 4.5, 4.10, and 5.2)

SAMMS 04136008 Rehabilitate Prosperous bayou #1 and #2 boat ramp

Rehabilitate deteriorated Prosperous Bayou graveled parking lot, which accommodate a boat ramp. The parking lot receives a lot of seasonal traffic that utilizes it daily, rain or shine. The asset is the only parking lot that is utilized during the waterfowl hunting season from mid-November until January 31. Several hundred thousand wintering migratory waterfowl utilize this area yearly, and this area serves as the only area available for waterfowl hunting on the South unit. Rehabilitation would include leveling, reshaping, and resurfacing the parking lot with limestone SB-2 gravel.

Project Need/Benefit:
This parking lot is one of the only parking lots on the South Unit that is utilized during the waterfowl hunting period and is flooded with vehicles with trailers. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $7K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2006535847 Repair Waters Bayou Boat launch

Rehabilitate deteriorated Waters Bayou boat launch. The boat launch is damaged due to hundreds of vehicles hauling boats during rainy conditions and dry conditions that caused rutting in the parking lot. This asset accommodates consumptive users (i.e., hunting and fishing), as well as non-consumptive users (i.e., birders, wildlife observation, and wildlife photography) during the entire year if not flooded. Rehabilitation would include leveling, reshaping, and resurfacing the parking lot with limestone SB-2 gravel.

Project Need/Benefit:
This boat launch provides access not only to staff for controlling nuisance species, surveying waterfowl, and conducting law enforcement, but also allows the public access to several thousand acres of prime habitat. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $6K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2006535856 Repair Goose Lake Parking Lot

Rehabilitate deteriorated Goose Lake parking lot that accommodates a boat launch. The parking lot is damaged due to seasonal floods and hundreds of vehicles hauling boats during rainy conditions and dry conditions that caused rutting in the parking lot. This asset accommodates consumptive users (i.e., hunting and fishing), as well as non-consumptive users (i.e., birders, wildlife observation and wildlife photography) during the entire year if not flooded. Rehabilitation would include leveling, reshaping, and resurfacing the parking lot with limestone SB-2 gravel.

Project Need/Benefit:
This parking lot is one of the five parking lots on the North Unit that is utilized during the spring fishing season and throughout the summer. Each summer, consumptive users utilize this parking lot, when spring floods reside, to access one of the many lakes on the refuge. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: 14K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2006535890 Repair Kansas Lake Boat ramp

Repair rutted and deteriorating Kansas Lake boat ramp caused by heavy public use and storm events. The ramps rutted, uneven surface is unsafe and not useable most of the year. The deteriorated graveled boat ramp would be replaced with an all-weather concrete slab ramp with improved graveled access and parking. A single lane concrete ramp would provide safe all-weather access, while accommodating increased visitor use.

Project Need/Benefit:
This boat ramp provides public fishing and hunting access on White River NWR for 2,000 acres on the North unit. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $25K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2006536866 Repair Long Lake Boat ramp

Repair rutted and deteriorating Long Lake ramp caused by heavy public use and storm events. The ramps rutted, uneven surface is unsafe and not useable most of the year. The project would rehabilitate a deteriorated gravel boat ramp with an all-weather concrete slab ramp with improved graveled access and parking. A single lane concrete ramp would provide safe all-weather access, while accommodating increased visitor use.

Project Need/Benefit:
This boat ramp provides public fishing and hunting access on White River NWR for 12,000 acres on the South unit. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $25K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2011200480 Rehabilitate Swan Lake boat ramp

Repair rutted and deteriorating Swan Lake ramp caused by heavy public use and storm events. The ramps rutted, uneven surface is unsafe and not useable most of the year. The project would rehabilitate a deteriorated graveled boat ramp with an all-weather concrete slab ramp with improved graveled access and parking. A single lane concrete ramp would provide safe all-weather access, while accommodating increased visitor use.

Project Need/Benefit:
This boat ramp provides public fishing and hunting access on White River NWR for 14,000 acres on the North unit. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $25K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2011200797 Rehabilitate Escronges Lake boat ramp

Repair rutted and deteriorating Escronges Lake ramp caused by heavy public use and storm events. The ramps rutted, uneven surface is unsafe and not useable most of the year. The project would rehabilitate a deteriorated graveled boat ramp with an all-weather concrete slab ramp with improved graveled access and parking. A single lane concrete ramp would provide safe all-weather access, while accommodating increased visitor use.

Project Need/Benefit:
This boat ramp provides public fishing and hunting access on White River NWR for 11,000 acres on the South unit. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $25K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2011200799 Rehabilitate Buck Lake boat ramp

Repair rutted and deteriorating Buck Lake ramp caused by heavy public use and storm events. The ramps rutted, uneven surface is unsafe and not useable most of the year. The project would rehabilitate a deteriorated graveled boat ramp with an all-weather concrete slab ramp with improved graveled access and parking. A single lane concrete ramp would provide safe all-weather access, while accommodating increased visitor use.

Project Need/Benefit:
This boat ramp provides public fishing and hunting access on White River NWR for 5,000 acres on the North unit. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $25K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2011200806 Rehabilitate Wolf Lake boat ramp

Repair rutted and deteriorating Wolf Lake ramp caused by heavy public use and storm events. The ramps rutted, uneven surface is unsafe and not useable most of the year. The project would rehabilitate a deteriorated graveled boat ramp with an all-weather concrete slab ramp with improved graveled access and parking. A single lane concrete ramp would provide safe all-weather access, while accommodating increased visitor use.

Project Need/Benefit:
This boat ramp provides public fishing and hunting access on White River NWR for 14,000 acres on the North unit. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $25K

(LINKAGE: Objectives: 1.1, 1.8, 1.17, 2.3, 3.3, 4.1-2, 4.4-7, and 5.2)

SAMMS 2011200482 Installation of Webcam at Demonstration Area

Install components, hardware, and equipment associated with the webcam from Demonstration Area to Visitor Center. The webcam would be installed on the Observation Tower in the Demonstration Area for the purpose of recording migratory waterfowl. Hundreds of thousands of migratory waterfowl visit the Demonstation Area annually; however, visitors are not permitted in this waterfowl sanctuary during peak use period in order to prevent disturbance. A webcam would allow refuge visitors to view wintering waterfowl at the Demonstration Area without causing disturbance. This project would install an enclosed weather proof camera, solar panel, batteries, regulator to charge batteries, and approximately 2 miles of fiber optic cable running to the visitor center. An LCD screen would be installed in the Visitor Center to display images and connectivity to the network and server.

Project Need/Benefit:
This project is in support of the purpose, vision, and goals of this Draft CCP/EA. This webcam would display biological patterns of migratory waterfowl use during the migration period in a closed area not accessible by the public for viewing purposes. Providing this webcam would meet GRPA 4.1 goal by serving communities and protecting lives, resources, and property. Estimate: $50K

(LINKAGE: Objectives: 1.1-3, 2.1, 3.2, 4.1, 4.6-8, and 5.2)

SAMMS 2011200484 Upgrade Wildlife Drive with parking lots and interpretive panels

Upgrade wildlife drive with parking lots and interpretive panels to begin implementation of forest management interpretation using wayside exhibits, demonstration plots, mile markers, and parking lot pullouts. Currently, there are no opportunities along the wildlife drive for the public to safely park and visit the trails and or engage in wildlife-dependent recreation. Along the Wildlife Drive, mile markers would be installed at strategic locations near interpretive points of interest. At each of the three trailheads, a wayside exhibit would be installed and a pullout/parking lot would be created with limestone SB-2 gravel complete with parking stops.

Project Need/Benefit:
This project is in support of the purpose, vision, and goals of the Draft CCP/EA. Providing this type of facility improvement would eliminate the potential for public safety hazards pertaining to the non-availability of adequate parking spaces. Building this asset would meet GRPA 4.1 goals by serving communities and protecting lives, resources, and property. Estimate: $10K

(LINKAGE: Objectives: 1.2, 1.9, 1.13, 4.1, 4.6, 4.8-9, and 5.2)

SAMMS 2011200485 Construction of Photo Blind on Bottomland Hardwood Trail

Construct a 12' X 10' photo blind complete with a pitched roof, shingles, and windows with overhangs. The Bottomland Hardwood Trail has an extensive boardwalk that crosses a beaver pond that could be used for wildlife observation and wildlife photography. Material would be pressure-treated pine, stainless steel fasteners, and wood shingles.

Project Need/Benefit:
Construction of this asset would comply with the Improvement Act and would allow 90,000+ visitors the chance to view annual migration of neotropical migratory birds and waterfowl undetected. Estimate: 10K

(LINKAGE: Objectives: 1.1, 1.3, 1.5, 1.7, 1.16, 2.4, 4.1, 4.6-8, and 5.2)

REFUGE ADMINISTRATION

Maintain Assets and Public Use Facilities

White River NWR is a 160,000-acre refuge with more than 700 real and personal property assets including 84 water control structures, 25 levees, 989 miles of roads, 350 miles of public use trails, 29 buildings including a 10,000-square-foot visitor center and 9 Civilian Conservation Corp Era historic buildings, numerous pieces of mobile equipment, and only three wage-grade employees. Due to this shortfall in skilled maintenance staff, much required maintenance of facilities is not appropriately addressed. Damage through neglect is increasing and because of this neglect, costs of final repairs are skyrocketing. Routine daily and yearly maintenance is the best and most cost-effective manner to protect this high-value public property. Hiring a permanent full-time maintenance worker would save resources and dollars.

RONS FY08-3075 One-Time: $0.00 Recurring Base: $77,650 Total First Year: $77,650

Station Rank: 2 Permanent Staff: 1 Temporary Staff: 0 Total Staff Cost: $77,650

(LINKAGE: Objectives: 1.1, 1.3, 1.9-10, 1.13, 2.1-3, 2.5, 3.2-3, and 5.1-2)

SAMMS 2009943870 Repair Visitor Center

As indicated in the 2009 Comprehensive Condition Assessment, the visitor center has many deficiencies that need to be addressed. The fascia boards on the eaves are rotten, the glass wall at both the front entrance and rear entrance leaks under the door. Rotten floor boards are present at both locations. The roof supports are sagging and the insulation on the roof is falling. The siding trim board is rotten. The alarm and fire system is not working correctly and need to be recalibrated. The

ramp at the back door on the northeast side is too steep for wheel chairs. The wall behind the mop sink is rotten. A contract would need to be written to include all the items listed to cut energy costs, minimize termite damage, increase staff safety and security, and ensure the longevity of the building.

Project Need/Benefit:
The building is the headquarters for White River NWR and supports a 15-person staff and 4 temporary or seasonal staff. The inadequate roof, falling insulation, and faulty fire and alarm system pose a critical health and safety element to visiting public, and permanent and temporary staff. Repairing this asset would meet GRPA goals by serving communities and protecting lives, resources, and property. Estimate: $176K

(LINKAGE: Objectives: 4.1, 4.7-8, and 5.1-2)

SAMMS 2009943874 Repair oil shed building at the Farm Unit

As indicated in the 2009 Comprehensive Condition Assessment, the oil shed has a few deficiencies that need to be addressed. The paint on the exterior is coming off. The lighting and electrical wiring are not up to code for a chemical building. The oil building is 440 square feet; the exterior paint will need to be sandblasted and the building repainted with a quality exterior paint. Electrical contractors would need to come in and remove the old wire, plugs, and lights, and replace all with up-to-code materials.

Project Need/Benefit:
This is the only oil storage building that is used on the Farm Unit for several pieces of heavy equipment and a fleet of vehicles. Bringing the electrical wiring up to code would improve the safety and integrity of the building if an accident happened. Repairing this asset would meet GRPA goals by serving communities and protecting lives, resources, and property. Estimate: $30K

(LINKAGE: Objectives: 4.1, 4.7-8 and 5.1-2)

SAMMS 2010137456 Replace equipment storage shed located at Farm unit

Replace rusted equipment storage shed located at the Farm Unit due to exposure to the elements. The existing equipment storage shed is used to protect heavy equipment, boats, and other small equipment from the damaging effects of the weather. The roof of the barn is rusted and the structure has areas of dry rot. A replacement pole barn would provide a safer storage area for equipment and other refuge resources.

Project Need/Benefit:
Replacing the deficient pole barn would protect expensive heavy and small equipment from weather, extend the life of those assets, and reduce future maintenance costs. Replacing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $176K

(LINKAGE: Objectives: 1.1, 2.1-2, and 5.2)

SAMMS 2009943879 Repair garage building located at Jack's Bay

Repair rusted garage building located at Jack's Bay subheadquarters due to exposure to the elements. The existing garage building is used to store heavy equipment, ATV's, and other small equipment from the damaging effects of the weather. The electrical system would need to be evaluated to be brought up

to code. All sub steel is rusted and needs to be sandblasted and repainted. All wall sheet panels and roof panels need to be replaced. Toilet area needs to be replaced and lights need to be replaced. Replace roll up door and existing walk in door with electrical roll up door.

Project Need/Benefit:
Replacing the deficient garage building would protect expensive heavy and small equipment from weather, extend the life of those assets and reduce future maintenance costs, and allow an area for equipment to be serviced out of the weather if needed. Location of garage building is 40 miles away from nearest maintenance facility. Replacing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $77K

(LINKAGE: Objectives: 1.1, 2.1-2, and 5.2)

SAMMS 2009945328 Repair Lost Lake Road

As a result of 2008 spring floods, up to 16 inches of sand were deposited on the .93-mile graveled road causing damage to the road surface. This public use road must be repaired to allow for safe travel. Repairs would involve removal of the sand, grading of the road to the original elevation, crowning the surface to provide adequate crown for proper drainage, and applying SB-2 road gravel.

Project Need/Benefit:
Lost Lake Road provides access to approximately 8,000 acres of refuge land. Refuge employees and visitors use this road on a daily basis throughout the year. Repairing this asset would remove the current public safety hazard of an uneven road surface and ensure against further degradation of this road from future storms. Repairing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $67K

(LINKAGE: Objectives: 1.1-3, 1.7, 1.9-10, 1.13, 1.17, 2.1-2, 2.5, 2.7, 3.2, and 5.2-3)

SAMMS 2007701829 Rehabilitate East Moon Lake Graveled Road

Rehabilitate 1.61 miles of worn FHWA Route 125 - East Moon Lake Graveled Road. The graveled layer is inadequate in areas, and the road surface shows signs of wash boarding. The road base would be restructured, and the crown would be recontoured to promote adequate road surface drainage, pot holes and ruts would be filled, and road ditches would be cleaned out.

Project Need/Benefit:
Rehabilitation of this would provide visitors travel access on the refuge even in adverse conditions once all repairs are complete. Repairing this asset would remove the current public safety hazard of an unevened road surface and ensure against further degradation of this road from future storms. Repairing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $750K

(LINKAGE: Objectives: 1.1-3, 1.7, 1.9-10, 1.13, 1.17, 2.1-2, 2.5, 2.7, 3.2, and 5.2-3)

SAMMS 2007701811 Rehabilitate Prairie Bayou/Wolf Lake gravel Road

Rehabilitate worn Prairie Bayou/Wolf Lake Gravel Road (FHWA Route 117). This road is used by the public visiting White River NWR. The road needs to have an additional graveled layer to carry traffic. Repairs would involve removal of the sand, grading of the road to the original elevation, grading the

surface to provide adequate crown for proper drainage, and applying SB-2 road gravel. The road ditches are inadequate on more than 50 percent of the roadway and would be cleaned for proper drainage.

Project Need/Benefit:
Visitors would be able to travel this road even in adverse conditions once all repairs are complete. Repairing this asset would remove the current public safety hazard of an unevened road surface and ensure against further degradation of this road from future storms. Repairing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $750K

(LINKAGE: Objectives: 1.1-3, 1.7, 1.9-10, 1.13, 1.17, 2.1-2, 2.5, 2.7, 3.2, and 5.2-3)

SAMMS 2008880848 Repair of flood damaged Wildlife Drive

As a result of 2008 spring floods, up to 3 inches of silt and mud were dumped upon the road's surface. Repairs would involve removal of the sand, grading of the road to the original elevation, crowning the surface to provide adequate crown, as well as cleaning ditches for proper drainage. After that, 6" of limestone SB-2 road gravel would be installed. This work would restore 5.4 miles of road used by the public.

Project need/Benefit:
The wildlife drive is the main road behind the visitor center that provides access to approximately 1,200 acres of refuge land. Refuge employees and visitors use this road on a daily basis throughout the year except when closed or flooded. Repairing this asset would remove the current public safety hazard of an unevened road surface and ensure against further degradation of this road from future storms. Repairing this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $445K

(LINKAGE: Objectives: 1.1-3, 1.7, 1.9-10, 1.13, 1.17, 2.1-2, 2.5, 2.7, 3.2, and 5.2)

SAMMS 2006549469 Rehabilitate South CC Road to the Visitor Center

Rehabilitate unsafe South CC road to the visitor center due to a nonexistent turn lane. This project would rehabilitate the road by constructing two turn lanes with comparable material, specifications, and engineering of Highway 1. The turn lane would be a 14-foot wide, asphalt turn lane with the same specifications as current material.

Project Need/Benefit:
This is the main road that is used by 15 refuge staff, volunteers, and several hundred thousand visitors annually that utilize the visitor center. Rehabilitating this asset would meet GPRA goal 4.1 by serving communities and protecting lives, resources, and property. Estimate: $200K

(LINKAGE: Objectives: 1.1-3, 1.7, 1.9, 1.10, 1.13, 1.17, 2.1-2, 2.5, 2.7, 3.2, and 5.2)

SAMMS 2009943887 Repair CCC built barn located at the Farm Unit

As indicated in the 2009 Comprehensive Condition Assessment, the CCC-built barn has a few deficiencies that need to be addressed. The wood is dry rotted and needs to be replaced. The siding is loose and needs to be repaired. The roof leaks and needs to be replaced. Columns are rotten and need to be replaced. The project would include, if allowable by historical responsibilities, to demolish the old asset and replace with a 35' X 100' metal pole barn complete with electrical outlets, lights, shelving for lumber, and storage for ATV's, heavy equipment, or small equipment.

Project Need/Benefit:
Repairing this historical CCC storage barn will help preserve one of the most complete set of CCC structures remaining anywhere in the Refuge System, while providing much needed safe, secure, and dry storage for various supplies, materials, and equipment. Repairing this asset would meet GRPA 4.1 goals by serving communities and protecting lives, resources, and property. Estimate: $155K

(LINKAGE: Objectives: 1.1-3, 2.1-2, 2.5, 2.7, 3.2-3, and 5.2)

SAMMS 2007701678 Replace torn chain link fence at Levee unit office building and equipment yard

Replace the torn chain link fence at the Levee Unit building and equipment yard. The fence is torn, rusted, leaning, and no longer able to fully meet its function in protection of government property. The old fence and gates would be replaced with new materials. This asset provides security to the facility and other assets parked nearby. Researchers and other cooperators are also served by this asset by providing a secure location for personnel and equipment.

Project Need/Benefit:
This asset provides security to the facility and other assets parked nearby. Researchers and other cooperators are also served by this asset by providing a secure location for personnel and equipment. Repairing this asset would meet GRPA 4.1 goal by serving communities and protecting lives, resources, and property. Estimate: $63K

(LINKAGE: Objectives: 1.1-3, 2.1-2, 2.5, 2.7, 3.2-3, and 5.2)

SAMMS 2007730764 Replace torn chain link fence at St. Charles Compound

Replace the torn chain link fence at the St. Charles compound. The fence is torn, rusted, leaning, and no longer able to fully meet its function in protection of government property. The old fence and gates would be replaced with new materials. This would also include an additional 500 feet (23 percent) to include the missing section along the southwestern section. This asset provides security to the facility and other assets parked nearby. Staff, researchers, and other cooperators are also served by this asset by providing a secure location for personnel and equipment.

Project Need/Benefit:
This asset provides security to the facility and other assets parked nearby. Staff, researchers, and other cooperators are also served by this asset by providing a secure location for personnel and equipment. Repairing this asset would meet GRPA 4.1 goal by serving communities and protecting lives, resources, and property. Estimate: $145K

(LINKAGE: Objectives: 1.1-3, 2.1-2, 2.5, 2.7, 3.2-3, and 5.2)

SAMMS 2009943867 Repair Maintenance Shop located at the Farm Unit

As indicated in the 2009 Comprehensive Condition Assessment, the maintenance shop has a few deficiencies that need to be addressed. The paint on the exterior is coming off and needs to be sandblasted and repainted. Both the fire alarm and security alarm are non-functional and need to be replaced. The office area has broken floor tile, broken ceiling tile, and faulty wiring in the kitchen and bathroom. All the lighting and electrical wiring in the kitchen and bathroom areas need to be replaced with more energy efficient lighting. New floor tile and ceiling tile would need to be installed.

Project Need/Benefit:
Repairs made to the Maintenance Shop would eliminate a possible safety hazard and provide more energy efficient facilities to better manage 160,000 acres of habitat. Replacing this asset would meet GPRA goal 4.1 by serving communities and protecting resources. Estimate: $89K

(LINKAGE: Objectives: 2.7, and 5.1-2)

SAMMS 2010122990 Maintenance Shop Tier 2 Energy Updates

Replace existing shop HVAC, windows, insulation, water heater, and lighting to meet energy efficiency standards, and to include energy efficient heating, ventilation, cooling, and lighting improvement to the Maintenance Shop. Rehabilitate heating ventilation and cooling system. Project involves component renewal of the heating, ventilation, and air conditioning equipment, windows, insulation, water heater, and lighting fixtures.

Project Needs/Benefit:
This project is in support of Executive Order 13514, the Energy Independence and Security Act and the Energy Policy Act. The Department of the Interior has committed to achieving a 20 percent reduction in scope 1 and 2 green house gas emissions by 2020. Estimate: $950K

(LINKAGE: Objectives: 2.7, and 5.1-2)

SAMMS 2010124568 VC/Office Tier 2 Energy Updates

Construct energy efficient heating, ventilation, cooling, and lighting improvements to the visitor center. Rehabilitate heating ventilation and cooling system. This project would involve component renewal of the heating, ventilating, and air conditioning equipment, windows, insulation, water heater, and lighting fixtures.

Project Needs/Benefit:
This project is in support of Executive Order 13514, the Energy Independence and Security Act and the Energy Policy Act. The Department of the Interior has committed to achieving a 20 percent reduction in scopes 1 and 2 greenhouse gas emissions by 2020. Estimate: $550K

(LINKAGE: Objectives: 2.7, 5.1-2)

SAMMS 2007685280 Replace Audio-Visual equipment in Visitor Center

Replace outdated, deteriorating audio visual equipment in visitor center. Audio visual equipment is not functioning properly and is not meeting operational standards. DVD players are becoming problematic and causing more devoted staff time to keep them running. This causes disruption with visitor services, displays, and exhibits. Replacement of all audio visual equipment would include computer generated programming and components that would meet today's modern industry standards.

Project Need/Benefit:
This asset would increase customer satisfaction, reduce staff time, maintenance costs, and allow for more effective programs to occur. The new computer based audio visual equipment would greatly enhance the visual and audio effects of all displays. Estimate: $35K

(LINKAGE: Objectives: 4.1, 4.7-8, and 5.2)

SAMMS 2011200547 Construct Heavy Equipment wash pad

Construct heavy equipment wash pad that would be used to maintain heavy equipment, ATV's, boats, and vehicles. Removal of mud, grass seed, and dirt would minimize the transfer of invasive species, (i.e., Johnson grass), decrease track breakdown on heavy equipment, and allow bush hogs to be serviced properly. The concrete pad would be 25' X 60' with a collection pit at the end to separate dirty water from clean water and the reuse of filtered water. A separate enclosed wash facility would be close to the pad to house the equipment needed to properly utilize, separate, and recycle runoff water.

Project Need/Benefit:
This project is in support of the purpose, vision, and goals of this Draft CCP/EA. This wash pad would decrease invasive species transfer, increase longevity of heavy equipment, and would allow proper service of other equipment. Providing this asset would ultimately prolong replacement and repair in between vehicles. Building this asset would meet GRPA 4.1 goal by serving communities and protecting lives, resources, and property. Estimate: $160K

(LINKAGE: Objectives: 2.1-2, 2.6, 3.4, and 5.2)

SAMMS 2008863358 Construct Storage Shed for Large Equipment

Construct a steel storage building to store heavy equipment and welding shop at the maintenance compound of White River NWR. Currently, we have room for 15 pieces of heavy equipment under two sheds, but need room for 26 pieces of heavy equipment. Equipment that is stored out in the weather deteriorates quicker than equipment that is protected. This project would construct a new 80X120-foot steel construction storage building with 16-foot side walls, roll-up doors on each side of each bay (total of five bays), two single entrance doors at each end, and a welding bay, complete with all the necessary electrical outlets at one end.

Project Need/Benefit:
White River NWR is a 160,000-acre refuge with more than 700 real and personal property assets, including 84 water control structures, 25 levees, 98 miles of roads, 447 miles of public use trails, and equipment necessary to maintain them. Heavy equipment that is protected from the elements would extend the life of the refuge's investment and reduce costs associated with repairs. Constructing this asset would meet GRPA 4.1 goal by serving communities and protecting lives, resources, and property. Estimate: $200K

(LINKAGE: Objectives: 2.1-2, 2.6, 3.4, and 5.2)

Table 16. Summary of projects

	PROJECT TITLE	COST
FISH AND WILDLIFE POPULATION MANAGEMENT		
FY08-3071	Protect Biological Integrity	$97,911
FY38-3599	Protect Biological Integrity	$80,046
FY08-3499	Reduce Cowbird Nest Parasitism	$150,000
FY08-3653	Control Invasive Feral Hogs	$58,470
2011200488	Replace dirt fill/culverts with concrete bridge at Kansas Bayou	$428,000
2011200506	Replace dirt fill/culverts with concrete bridge at Sycamore Log Crossing	$2,100,000
2011200507	Replace dirt fill/culverts with concrete bridge at Scrub Grass Bayou	$857,000
HABITAT MANAGEMENT		
FY08-3080	Reaction of Fish to Change and Applicability to Global Climate Change	$195,000
FY08-3272	Restore Bottomland Hardwood Forest	$248,000
FY08-3349	Sustainable Green tree Reservoir Management	$175,000
FY08-3464	Develop Desired Forest Conditions	$80,046
FY08-3389	Develop Desired Forest Conditions	$97,911
FY08-3527	Develop Desired Forest Conditions	$80,046
2009946965	Replace Water Control Structure at Frazier Lake	$26,000

	PROJECT TITLE	COST
2009943988	Repair worn gate and operator on Water Control Structure at Honey Locust.	$151,000
2009943983	Replace worn WCS at Cocklebur Slough	$149,000
2010137174	Replace Worn Dry Lake Water Control Structure	$243,000
2009943982	Repair sheet piling near WCS on Wolf Bayou at Jack's Bay.	$18,000
2007701472	Repair washed out levee on Reservoir A at Jack's Bay	$12,000
2007701493	Rehabilitate Willow Lake Levee for Water Storage Area at Willow Lake	$20,000
2009945994	Repair Mossy Lake Levee blowout	$539,000
2006527157	Repair Dam #1 on Farm Unit	$140,000
2009943954	Repair Dry Lake Dam #1 at Dry Lake	$69,000
2009943956	Repair Dry Lake Dam #2 at Dry lake	$69,000
RESOURCE PROTECTION		
FY08-3073	Provide Visitor, Resource, and Facility Protection (Law Enforcement)	$150,000
FY10-1363	Provide Visitor, Resource, and Facility Protection (Law Enforcement)	$150,000
FY10-1364	Provide Visitor, Resource, and Facility Protection (Law Enforcement)	$150,000
FY10-1365	Provide Visitor, Resource, and Facility Protection (Law Enforcement)	$150,000
FY10-1366	Provide Visitor, Resource, and Facility Protection (Law Enforcement)	$150,000
FY10-2564	Provide Visitor, Resource, and Facility Protection (Law Enforcement)	$150,000
2009943981	Replace missing boundary signs on Big Island Unit	$29,000

	PROJECT TITLE	COST
2009943980	Replace missing boundary signs on Crooked Lake Unit	$9,000
2009945438	Replace missing boundary signs on Levee Unit	$50,000
VISITOR SERVICES		
FY08-3249	Visitor Orientation	$64,622
FY08-3260	Initiate Environmental Education program	$80,046
04136007	Rehabilitate Weber boat ramp and gravel parking lot	$67,000
04136008	Rehabilitate Prosperous bayou #1 and #2 boat ramp	$7,000
2006535847	Repair Waters Bayou Boat launch	$6,000
2006535856	Repair Goose Lake Parking Lot	$14,000
2006535890	Repair Kansas Lake Boat ramp	$25,000
2006536866	Repair Long Lake Boat ramp	$25,000
2011200806	Rehabilitate Wolf Lake Boat ramp	$25,000
2011200799	Rehabilitate Buck Lake Boat ramp	$25,000
2011200797	Rehabilitate Escronges Lake Boat ramp	$25,000
2011200480	Rehabilitate Swan Lake Boat ramp	$25,000
2011200482	Installation of Webcam at Demonstration Area	$50,000
2011200484	Upgrade Wildlife Drive with parking lots and interpretive panels	$10,000
2011200485	Construction of Photo Blind on Bottomland Hardwood Trail	$15,000

	PROJECT TITLE	COST
REFUGE ADMINISTRATION		
FY08-3075	Maintain Assets and Public Use Facilities	$77,650
2009943870	Repair Visitor Center	$176,000
2009943874	Repair oil shed building at the Farm Unit	$30,000
2010137456	Replace equipment storage shed located at Farm unit	$176,000
2009943879	Repair garage building located at Jack's Bay	$77,000
2009945328	Repair Lost Lake Road	$67,000
2007701829	Rehabilitate East Moon Lake Gravel Road	$750,000
2007701811	Rehabilitate Prairie Bayou/Wolf Lake gravel Road	$750,000
2008880848	Repair of flood damaged Wildlife Drive	$445,000
2006549469	Rehabilitate South CC Road to the Visitor Center	$200,000
2009943887	Replace CCC built barn located at the Farm Unit	$155,000
2007701678	Replace torn chain link fence at Levee unit office building and equipment yard.	$63,000
2007730764	Replace torn chain link fence at St. Charles Compound	$145,000
2009943867	Repair Maintenance Shop located at the Farm Unit	$89,000
2010122990	Maintenance Shop Tier 2 Energy Updates	$950,000
2010124568	VC/Office Tier 2 Energy Updates	$550,000
2007685280	Replace Audio-Visual equipment in Visitor Center	$35,000

	PROJECT TITLE	COST
2011200547	Construct Heavy Equipment wash pad	$160,000
SAMMS	Restore Access to Habitat for Silvicultural Practices	$166,000
2008863358	Construct Storage Shed for Large Equipment	$200,000
2011200610	Rehabilitate Habitat at Dry Lake	$600,000
TOTAL		**$13,396,748**

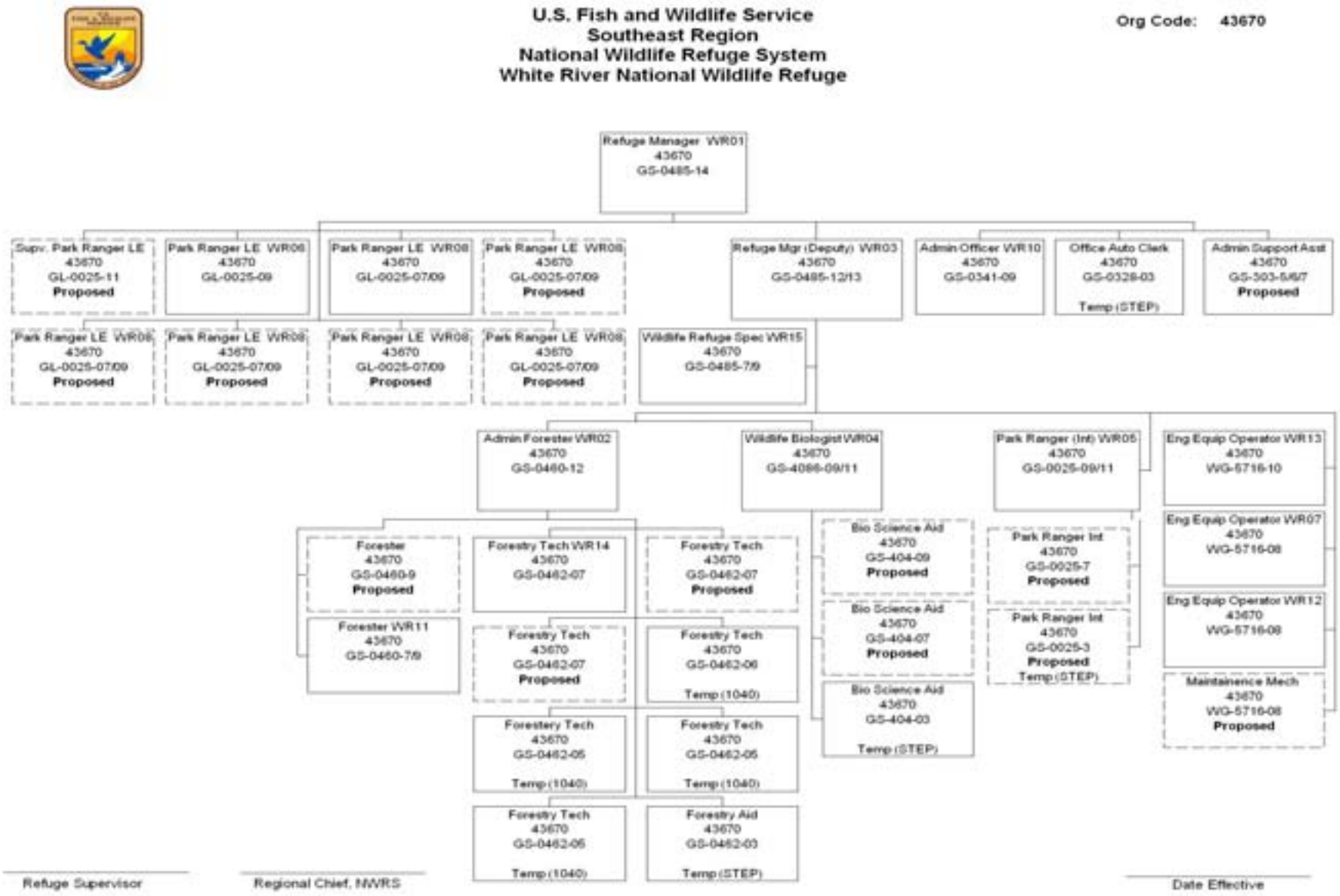
Table 17. Funding and personnel

Existing Positions	Annual Costs Existing Positions
Refuge Manager, GS-14	$149,570
Deputy Refuge Manager, GS-12/13	$126,570
Administrative Officer, GS-09	$73,475
Office Automation Clerk, (STEP) GS-03 TEMP	**$20,220**
Administrative Support Assistant, GS-05/06/07 (4-year term)	$31,707
Park Ranger (Law Enforcement), GS-09	$85,915
Park Ranger (Law Enforcement), GS-07/09	$85,915
Wildlife Refuge Specialist, GS-05/07/09	$81,940
Administrative Forester, GS-12	$106,550
Park Ranger (Interpretive), GS-09/11	$88,840

Existing Positions	Annual Costs Existing Positions
Wildlife Biologist, GS-09/11	$88,840
Engineering Equipment Operator, WG-10	$71,390
Engineering Equipment Operator, WG-08	$58,079
Engineering Equipment Operator, WG-08	$57,451
Forestry Tech, GS-07	$47,414
Forester, GS-07/09	$57,767
Biological Science Aid, (STEP) GS-03 TEMP	**$5,113**
Park Ranger, (STEP) GS-02 TEMP	**$4,211**
Biological Science Aid, (STEP) GS-03 TEMP	**$5,113**
Forestry Aid, (STEP) GS-03 TEMP	**$5,113**
Forestry Tech, (1040) GS-06 TEMP	**$20,361**
Forestry Tech, (1040) GS-05 TEMP	**$18,266**
Forestry Tech, (1040) GS-05 TEMP	**$18,266**
Forestry Tech, (1040) GS-05 TEMP	**$18,266**
Sub-total – Salary for TEMP Positions	**$114,929**
Sub-total – Salary for existing Positions	$1,129,510
Sub-total – Salary for TEMP and existing positions	**$1,244,439**

Proposed Positions	Annual Costs Proposed Positions
Biological Science Aid, GS-09	$97,911
Biological Science Aid, GS-07	$80,046
Forestry Technician, GS-07	$80,046
Forester, GS-09	$97,911
Forestry Technician, GS-07	$80,046
Law Enforcement Officer, GS-07/09	$150,000
Law Enforcement Officer, GS-07/09	$150,000
Law Enforcement Officer, GS-07/09	$150,000
Law Enforcement Officer, GS-07/09	$150,000
Law Enforcement Officer, GS-07/09	$150,000
Supervisory Law Enforcement Officer, GS-11	$150,000
Administrative Support Assistant, GS-05	$64,622
Park Ranger (Interpretive), GS-07	$80,046
Maintenance Worker, WG-08	$77,650
Sub-total – Salary for proposed positions	$1,558,278
Total – Salary for existing and proposed positions	**$2,802,717**

Figure 15. White River NWR staffing chart



PARTNERSHIP/VOLUNTEERS OPPORTUNITIES

A key element of this Draft CCP/EA is to establish partnerships with local volunteers, landowners, private organizations, and state and federal natural resource agencies. White River NWR has historically partnered with many other agencies and organizations to improve management of the refuge. It is anticipated that these partnerships will continue and opportunities to develop additional partnerships will be pursued. Partnerships are critical for the refuge to fulfill its purposes; achieve its goals, objectives, and strategies; leverage funds; minimize costs; and bridge relationships with others.

The refuge has cooperated with the following federal agencies: Federal Bureau of Investigation, Federal Highway Administration, National Park Service, Army Corps of Engineers Little Rock District, Army Corps of Engineers Memphis District, Environmental Protection Agency, Fish and Wildlife Service's Division of Law Enforcement, Fish and Wildlife Service's Division of Migratory Birds, Fish and Wildlife Service's Ecological Services, Fish and Wildlife Service's Fisheries and Aquatic Resources Conservation, Geological Survey, Geological Survey's National Wetland Research Center, Geological Survey's Patuxent Wildlife Research Center, USDA Farm Service Agency, USDA Forest Service, USDA Natural Resources Conservation Service, and Coast Guard.

The refuge has cooperated with the following Native American tribes: Choctaw Nation of Oklahoma, Osage Nation, Quapaw Tribe, and the United Keetoowah Band of Cherokee.

The refuge has cooperated with the following state agencies: Arkansas Archaeological Survey, Arkansas Cooperative Fish and Wildlife Research Unit, Arkansas Department of Environmental Quality, Arkansas Forestry Commission, Arkansas Game and Fish Commission, Arkansas Natural Heritage Commission, Arkansas Natural Resources Commission, Arkansas State Historic Preservation Office, Arkansas State Police, Arkansas Transportation and Highway Department, and Arkansas Department of Health.

The refuge has cooperated with the following Local agencies: DeWitt Chamber of Commerce; Delta Rivers Regional Tourism Council; Judges of Monroe, Arkansas, Phillips, and Desha Counties, Arkansas; Sheriff Departments of Monroe, Arkansas, Phillips, and Desha Counties, Arkansas; and Volunteer Fire Department of St. Charles, Clarendon, and Ethel, Arkansas.

The refuge has cooperated with the following universities: Phillips Community College, Arkansas State University, Arkansas Technical University, Cornell Laboratory of Ornithology, Harding University, Mississippi State University, Southern Illinois University, University of Arkansas (Fayetteville, Monticello, and Pine Bluff), University of Memphis, University of Tennessee, University of Georgia, and University of Missouri Gaylord Memorial Laboratory.

The refuge has cooperated with the following non-governmental organizations/agencies: Audubon Arkansas, The Conservation Fund, Ducks Unlimited, Friends of Felsenthal, Friends of White River, Greenbrier Wetland Consultants, National Wild Turkey Federation, National Wildlife Federation, The Nature Conservancy, and White River Drainage District.

Step-Down Management Plans

A comprehensive conservation plan is a strategic plan that guides the direction of the refuge. A step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services. These plans (Table 18) are also developed in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

Table 18. National wildlife refuge step-down management plans related to the goals and objectives of the comprehensive conservation plan

Step-down Plan	Completion Date
Access Plan	2014
Cultural Resources	2020
Fire Management/Fire Effects Monitoring	2016
Safety	2016
Fishing	2016
Habitat Management	2019
Hunting	2015
Hurricane/Disaster Action	2012
Invasive, Exotic, and Nuisance Plant/Animal	2018
Inventory/Monitoring	2017
Law Enforcement	2012
Visitor Services	2013

MONITORING AND ADAPTIVE MANAGEMENT

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

To apply adaptive management, specific surveying, inventorying, and monitoring protocols would be adopted for the refuge. The habitat management strategies would be systematically evaluated to determine management effects on wildlife populations. This information would be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations would include AGFC, ecosystem team, and other appropriate partner participation. If monitoring and evaluation indicate undesirable effects for target and non-target species and/or communities, then alterations to the management projects would be made. Subsequently, the comprehensive conservation plan would be revised. Specific monitoring and evaluation activities would be described in the step-down management plans.

PLAN REVIEW AND REVISION

The comprehensive conservation plan, when final, would be reviewed annually as the refuge's annual work plans and budgets are developed. It would also be reviewed to determine the need for revision. A revision would occur if and when conditions change or significant information becomes available, such as a change in ecological conditions or a major refuge expansion. The final plan would be augmented by detailed step-down management plans to address the completion of specific strategies in support of the refuge's goals and objectives. Revisions to the comprehensive conservation plan and the step-down management plans would be subject to public review and NEPA compliance.

SECTION B. ENVIRONMENTAL ASSESSMENT

I. Background

INTRODUCTION

The Service prepared this EA for White River NWR in compliance with NEPA and the Improvement Act. The Improvement Act requires the development of comprehensive conservation plans for all refuges. Following a public review and comment period on this Draft CCP/EA, a final decision will be made by the Service that will guide White River NWR's management actions and decisions over the next 15 years, provide understanding about the refuge and management activities, and incorporate information and suggestions from the public and refuge partners.

The Draft CCP/EA proposes a management direction, which is described in detail through a set of goals, objectives, and strategies. The Draft CCP/EA addresses current management issues, provides long-term management direction and guidance for the refuge, and satisfies the legislative mandates of the Improvement Act. While this Draft CCP/EA provides general management direction, subsequent step-down plans will provide more detailed management direction and action.

This Draft CCP/EA is needed to address current management issues, to provide long-term management direction for the refuge, and to satisfy the legislative mandates of the Improvement Act, which requires the preparation of a comprehensive conservation plan for all national wildlife refuges.

PURPOSE AND NEED FOR ACTION

The purpose of the EA is to meet the purpose(s) of the refuge and the goals identified in the Draft CCP (for which we evaluate each alternative). The purpose is to ensure that White River NWR protects and conserves populations of native migratory birds and other wildlife resources, as well as the bottomland hardwood forest habitats along the White River that sustain these wildlife populations. The need of the EA is to adopt a 15-year management plan that will provide guidance for future management and that meets the mandates Improvement Act.

DECISION FRAMEWORK

Based on the assessment described in this document, the Service will select an alternative to implement the final CCP for White River NWR. This EA will determine and evaluate a range of reasonable management alternatives. The intent is to support informed decision-making regarding future management of the refuge. Each alternative presented in this EA was generated with the potential to be fully developed into a final CCP. The predicted biological, physical, social, and economical impacts of implementing each alternative are analyzed in this EA. This analysis will assists the Service in determining if the alternatives represent no significant impacts, thus requiring the preparation of a Finding of No Significant Impact, or if the alternatives represent significant impacts, thus requiring more detailed analysis through an Environmental Impact Statement and a Record of Decision. Following public review and comment, the Service will select an alternative to be fully developed for this refuge.

PLANNING STUDY AREA

White River NWR extends for nearly 100 river miles along both banks of the lower White River, a tributary of the Mississippi River in southeastern Arkansas, east-southeast of the city of Little Rock.

This EA will identify management on refuge lands, as well as those lands proposed for acquisition by the Service.

AUTHORITY, LEGAL COMPLIANCE, AND COMPATIBILITY

The Service developed this Draft CCP/EA in compliance with the Improvement Act and Part 602 of the Service Manual (National Wildlife Refuge System Planning). The actions described within this Draft CCP/EA also meet the requirements of NEPA. The staff achieved compliance with NEPA through the involvement of the public and the incorporation of this EA in this document, with a description of the alternatives considered and an analysis of the environmental consequences of the alternatives (Chapters III and IV in this section). When fully implemented, the CCP will strive to achieve the vision and purposes of White River NWR.

The final CCP's overriding consideration will be to carry out the purposes for which the refuge was established. The laws that established the refuge and provided the funds for acquisition state the purposes. Fish and wildlife management is the first priority in refuge management, and the Service allows and encourages public use (wildlife-dependent recreation) as long as it is compatible with, or does not detract from, the refuge's mission and purposes.

COMPATIBILITY

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be compatible. A compatible use "...will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." In addition, "wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety."

An interim compatibility determination is a document that assesses the compatibility of an activity during the period of time the Service first acquires a parcel of land to the time a formal, long-term management plan for that parcel is prepared and adopted. The Service has completed an interim compatibility determination for the six priority general public uses of the Refuge System, as listed in the Improvement Act. These uses are hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

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

Prior to initiating the Draft CCP/EA in 2009, the refuge and the Service conducted a Biological Review and a Visitor Services Review. In August 2008, a diverse team of some 22 federal and state personnel undertook a comprehensive review of habitat and wildlife management programs at the

refuge. The team then considered how the refuge might fit into achieving a number of relevant regional and system-wide landscape conservation needs. The Biological Review team included staff from the refuge, as well as Service fish and wildlife biologists from the Regional Office, including the Division of Ecological Services and Division of Migratory Birds. In addition, wildlife biologists from the AGFC, USDA Forest Service, Arkansas Natural Heritage Commission, and Ducks Unlimited participated. The team's recommendations were set forth in its final report entitled, *White River National Wildlife Refuge Biological Review*.

The Visitor Services Review was conducted in 2008 by Service public use and outreach specialists. The review team toured the refuge, identified and discussed the current status of public use programs, and debated the pros and cons of various recommendations for enhancing and improving these programs.

The CCP core planning team, which consists of the refuge manager, deputy refuge manager, refuge forester, refuge biologist, law enforcement officer, visitor services manager, and a contractor with experience in comprehensive conservation planning met for the first time in March 2009, for an initial tour of the refuge and an overview of its habitat and wildlife resources and public use programs, facilities, and opportunities. The core planning team also conducted additional internal scoping and prepared a preliminary schedule and plans for public involvement.

External (public) and additional internal scoping were conducted in June 2009. Three public meetings were held in three towns (Helena, Clarendon, and DeWitt) near different parts of the refuge.

A complete summary of the issues and concerns is provided in Appendix D, Public Involvement - Summary of Public Scoping Comments.

II. Affected Environment

For a description of the affected environment, see Section A, Chapter II, Refuge Overview.

II. Description of Alternatives

FORMULATION OF ALTERNATIVES

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve the refuge's purpose and vision, and the goals identified in the Draft CCP/EA; the priorities and goals of the Lower Mississippi River Ecosystem Team; the goals of the Refuge System; and the mission of the Service. Alternatives are formulated to address the significant issues, concerns, and problems identified by the Service and the public during public scoping.

The three alternatives identified and evaluated represent different approaches to provide permanent protection, restoration, and management of the refuge's fish, wildlife, plants, habitats, and other resources, as well as compatible wildlife-dependent recreation. Refuge staff assessed the biological conditions and analyzed the external relationships affecting the refuge. This information contributed to the development of refuge goals and, in turn, helped to formulate the alternatives. As a result, each alternative presents different sets of objectives for reaching refuge goals. Each alternative was evaluated based on how much progress it would make and how it would address the identified issues related to fish and wildlife populations, habitat management, resource protection and conservation, visitor services, and refuge administration. A summary of the three alternatives is provided in Table 19.

DESCRIPTION OF ALTERNATIVES

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

ALTERNATIVE A (CURRENT MANAGEMENT - NO ACTION)

Under Alternative A, current management direction or the No Action Alternative, White River NWR would continue to be managed as it has been in recent years.

Alternative A would pursue Goal 1, to manage and protect migratory birds and native wildlife populations on White River NWR to contribute to the purpose for which it was established and to fulfill the mission of the Refuge System.

In pursuit of this goal, under this alternative, the refuge would continue to support existing migratory waterfowl numbers and habitat acreage in an attempt to meet or exceed the foraging habitat objectives of the LMVJV and the NAWMP. It would also continue to provide functional waterfowl refuge/sanctuary areas throughout the refuge, comprising at least 60 percent of the refuge. The refuge would continue to provide quality wood duck nesting and brood-rearing habitat in bottomland hardwoods, cypress swamps, and scrub/shrub habitats. As time allows, staff would conduct banding to support objectives of the Mississippi Flyway Council.

Alternative A would provide incidental benefits for shorebirds, but with no active management on their behalf. Likewise, it would undertake no active habitat management for marsh birds but would continue to provide habitat for them in shallow-water areas and moist-soil units. The refuge would provide no active habitat management for wading birds, but would continue to provide habitat for breeding and wintering colonial waterbirds in shallow-water areas and forested wetlands.

This alternative would continue to provide both managed and unmanaged forest habitat, to provide a diversity of forest conditions that support forest breeding birds designated as high priority in the MAV (Bird Conservation Region 26), through forest restoration on newly acquired parcels and silvicultural management of some existing forested tracts. The refuge would continue to support the protection and enhancement of threatened and endangered species, as well as species of conservation concern, through research, survey, recovery, conservation, and management programs.

There would be no specific management for white-tailed deer but active management of forested habitat would continue, as would early succession open lands, and cropland that incidentally benefits deer. Our aim would be to maintain a healthy deer herd consistent with long-term habitat capability. We would collect and analyze deer harvest data, conduct periodic herd health checks, and provide quality recreational opportunities for deer hunters.

Under Alternative A, there would be no specific management for turkeys. However, active habitat management would continue that incidentally results in enhanced habitat for turkeys and provides quality recreational opportunities. This alternative would maintain, restore, and enhance a variety of habitats suitable for use by black bears. We would continue no active management for furbearers, other than controlling nuisance animals when necessary.

Alternative A would continue active habitat management to provide diverse habitats (early succession openland, agriculture, and bottomland forest) that supports healthy populations of resident small game, thus providing quality recreational activities for small game hunters. We would continue active habitat management that provides a diversity of habitats and supports a healthy, diverse, and viable resident bat population. There would continue to be no active management for nongame mammals or their habitats, although nongame mammals and their habitats occur throughout the refuge. Present management carried on into the future would maintain and enhance habitat for a diverse assemblage of reptile and amphibian species.

This alternative would maintain aquatic habitat for a diverse assemblage of fish species, particularly those recognized as species of special concern by state and/or federal agencies. Incidentally, it would also provide for quality fishing opportunities on the refuge.

Under Alternative A, the refuge would pursue Goal 2, which is to manage and conserve the functions and values of the bottomland hardwood forest ecosystem and associated habitats of the Lower White River to achieve refuge purposes, wildlife population objectives, and benefit migratory birds and other wildlife.

In pursuit of this goal, White River NWR would continue to provide a complex of habitat conditions through integrated open land rotation management, in time and space, to meet the needs of migratory birds, including migratory waterfowl, shorebirds, wading birds, and secretive marsh birds. Grazing of levees by cattle would be continued, as would be haying after July 1 of the Drainage District's right-of-way. Through active forest management, we would aim to achieve Desired Forest Conditions on 17 percent of the refuge, to protect, manage, and restore the values and functions of its forestland and to sustain the biological needs of native wildlife and migratory birds.

Under Alternative A, the refuge's hydrology would continue being altered by both off-refuge (upstream within the White River watershed) and on-refuge manipulations that result in an unnatural hydrograph. Staff would continue to operate functioning water control structures and keep non-functioning water control structures inactive. We would continue limited efforts, through the use of BMPs recommended by the Arkansas Forestry Commission, in refuge management and operations, to reduce levels of stream impairment from turbidity, siltation, and pollution.

Staff would continue to conduct incidental inventorying, monitoring, and researching on the refuge, but without the guidance and priorities of an Inventorying and Monitoring Plan. No IMP would be prepared and implemented under Alternative A. Similarly, there would be no active, systematic efforts to monitor or mitigate global climate change.

Alternative A would pursue Goal 3, which is to work with partners to minimize impacts from threats to the refuge's natural and cultural resources. In pursuit of this goal, we would continue to protect cultural and historical resources from disturbances. The refuge would follow standard service protocol and procedures according to Section 106 of the National Historic Preservation Act.

This alternative would continue opportunistic control of:

- nuisance and exotic terrestrial animal species such as feral hogs, nutria, and beaver
- exotic and invasive terrestrial and aquatic plant species
- nuisance and exotic aquatic animal species such as Asian carps, northern snakeheads, zebra mussels, and Asian clams.

The refuge would continue to provide a permit to the COE, allowing the deposition of non-beneficial dredge material at two sites in the Lower White River totaling 180 acres. We would work cooperatively with the COE to develop a long-term dredge spoil disposal alternative that is compatible with refuge purposes. Grazing would continue to be allowed along the Drainage District's right-of-way over Service properties, as authorized by an agreement between the District and the Service. Haying would be allowed after July 1 each year on the Drainage District's right-of-way over Service properties. The refuge would also continue to acquire key parcels within the approved acquisition boundary. We would continue to promote communication, cooperation, and partnerships between other agencies, land managers, and private citizens to minimize impacts from external threats to the functions and values of the refuge's wetland ecosystems.

Alternative A would pursue Goal 4, to provide compatible, wildlife-dependent recreation opportunities that promote an understanding and appreciation of fish, wildlife, and habitat conservation and the Refuge System.

In pursuit of this goal, White River NWR would continue to promote and operate visitor services without a visitor services plan; the refuge would conduct maintenance of roads, trails, boat ramps, and other public use infrastructure. Alternative A would continue to provide existing hunting opportunities that allow for quality public recreation and are compatible with the purposes for which the refuge was established. It would provide up to 17 commercial duck guiding permits plus an additional 10 permits during periods when flooding reaches 24.5 feet at St. Charles and 25.5 feet at Clarendon, simultaneously.

This alternative would continue to provide existing fishing opportunities that allow for quality public recreation and are compatible with the purposes for which the refuge was established. It would also continue to provide existing wildlife observation and photography opportunities that allow for quality public recreation and are compatible with refuge purposes.

Existing environmental education and outreach opportunities that allow for quality public recreation activities that are compatible with the purposes of the refuge would continue. Existing interpretive facilities, materials, and programs, including visitor center exhibits, kiosks, signage, brochures, and summer campfire programs, would continue as well.

Alternative A would continue to provide and maintain approximately 90 miles of primarily graveled public access roads and 400 miles of dirt roads/trails utilized for forest management and ATV access. The refuge would continue to allow primitive camping associated with wildlife-dependent activities on about 44,000 acres of the refuge and at 24 maintained campgrounds on the remainder of the refuge. We would also continue to allow small boats to be left along the small isolated lakes year-round. Existing permitted houseboats would continue being gradually eliminated, according to the houseboat management plan. We would also document non-permitted houseboats.

This alternative maintains the existing permanent staff of 14 FTE's. It would also maintain existing facilities, infrastructure, and equipment necessary to perform habitat management, restoration, and improvement on the refuge, in addition to maintaining essential infrastructure, such as roads, levees, and water control structures. Furthermore, Alternative A would maintain the volunteer program at the present level and continue to support the Friends group and other cooperative partnerships.

ALTERNATIVE B (MINIMAL RESOURCE AND PUBLIC USE MANAGEMENT)

The thrust of Alternative B is reduced management of resources and public use on White River NWR. This alternative would still pursue the five refuge goals, but it would approach them from the perspective of custodial stewardship, or minimal active management. The Service would be a good custodian of the landscape and the White River ecosystem without attempting to intervene overly in natural ecosystem processes, thus allowing nature to take its own course.

Alternative B would pursue Goal 1, to manage and protect migratory birds and native wildlife populations on White River NWR to contribute to the purpose for which it was established and to fulfill the mission of the Refuge System.

With regard to migratory bird populations, Alternative B differs markedly from Alternative A. It would eliminate all active management and habitat manipulation, allowing open lands and forested habitats to function and progress through habitat succession. Concerning migratory bird sanctuary, however, Alternative B is the same as Alternative A. Functional waterfowl refuge/sanctuary areas would continue to be provided throughout the refuge, comprising at least 60 percent of the refuge.

Under Alternative B, we would eliminate wood duck banding activities and cease active habitat management for wood ducks. With respect to shorebirds, we would also eliminate active management of moist-soil units and agricultural fields and allow natural succession to occur. Active management of shallow-water areas, impoundments, and forested wetlands on behalf of marsh birds, colonial nesting waterbirds, and wading birds would cease, so as to allow natural succession to occur on those habitats. Alternative B would eliminate active management of forest stands for the benefit of forest breeding birds and allow natural succession on all abandoned croplands, moist-soil units, and scrub/shrub habitats for the incidental benefit of forest breeding bird species.

While endangered and other listed and protected species would continue on the refuge, staff would eliminate active management and operate the refuge without knowing the extent or number of endangered species that occur on the refuge.

Game animals such as deer, wild turkey, and bear, would continue on the refuge, but Alternative B would halt active habitat management to provide enhanced habitat. All active forest and open land management and collection of biological data about white-tailed deer would cease, but we would continue to use deer hunting to regulate population levels in support of a healthy white-tailed deer herd consistent with long-term habitat capability. This alternative would still aim to provide quality recreational opportunities for deer hunters. With regard to wild turkey, the refuge would stop all active habitat management and allow forest succession to occur on all lands, which would initially increase nesting habitat. Eventually, however, nesting habitat would be lost due to forest succession. We would stop all active habitat management and allow forest succession to occur uninterrupted on all lands, which would incidentally support black bears.

Furbearer populations would be allowed to fluctuate naturally without controlling nuisance animals. Staff would stop all active habitat management and allow forest succession to occur on all lands for the incidental benefit of small game and non-game mammals. Natural succession would form wooded and wetland habitats that would support sustainable populations of most bat species. Stopping all active habitat management and allowing forest succession to occur on all lands would be the preferred approach to supporting a diverse assemblage of reptiles and amphibians. Additionally, riverine and floodplain aquatic habitat would function without intervention under this alternative.

Alternative B would pursue Goal 2, managing and conserving the functions and values of the bottomland hardwood forest ecosystem and associated habitats of the Lower White River, to achieve refuge purposes, wildlife population objectives, and benefit migratory birds and other wildlife. We would phase out active refuge management and habitat manipulation of open lands, gradually allowing them to undergo natural succession, except for levees and rights-of-way, which must be kept open per interagency agreements. We would also eliminate active forest management – allowing natural succession and processes to achieve Desired Forest Conditions on 5 percent of the refuge to protect and restore the values and functions of the refuge's forestland. This would help sustain the biological needs of native wildlife and migratory birds.

Alternative B would allow aquatic habitats to function without management practices. Refuge hydrology under Alternative B would be the same as Alternative A. The hydrology of the White River, and its tributaries, sloughs, and lakes would continue to be altered both by off-refuge and on-refuge manipulations that result in an unnatural hydrograph. Nuisance beaver control and associated habitat impacts would be eliminated, resulting in a continual lose of forested habitat. All active water management on the refuge would be eliminated and we would allow habitat succession to occur on areas with water control capabilities.

Alternative B would eliminate all active open land and forested habitat management on the refuge. This may reduce erosion from adjacent lands through an increase in the acreage of undisturbed forested riparian habitat. All inventory, monitoring, and researching on the refuge would discontinue. Under Alternative B, the refuge's approach to climate change would be the same as Alternative A – there would be no active, systematic efforts to monitor or mitigate global climate change.

Under Goal 3, we would work with partners to minimize impacts of threats to the refuge's natural and cultural resources. Alternative B would pursue this goal through a variety of means and measures. Cultural resources would be protected through minimal implementation of standard Service protocol and procedures according to Section 106 of the National Historic Preservation Act.

Alternative B would identify and track occurrences of invasive terrestrial and aquatic animals and plants but make no efforts to control them.

Treatment of dredge spoil sites would be the same as Alternative A: the refuge would continue to provide a permit to the COE allowing the deposition of non-beneficial dredge material at two sites totaling 180 acres. We would work cooperatively with the COE to develop a long-term dredge spoil disposal alternative that would be compatible with refuge purposes.

Grazing and haying would be dealt with the same as Alternative A. Grazing of the Drainage District's right-of-way over Service properties would be allowed as authorized by an agreement between the District and the Service. Haying would continue to be allowed after July 1 each year on the Drainage District's right-of-way over Service properties.

With regard to refuge land acquisition, the refuge would continue to acquire key parcels within the approved acquisition boundary. We would also continue to promote communication, cooperation, and partnerships between other agencies, land managers, and private citizens to minimize impacts from external threats to the functions and values of the refuge's wetland ecosystems.

Alternative B would also pursue Goal 4, which would be to provide compatible, wildlife-dependent recreation opportunities that promote an understanding and appreciation of fish, wildlife, and habitat conservation, as well as the Refuge System.

With regard to visitor services and public use management, Alternative B would be the same as Alternative A, except that it would discontinue maintenance of roads, trails, boat ramps, and other public use infrastructure that accommodate priority public uses. Public uses and visitation would still be allowed, but the refuge would no longer provide support and maintain facilities. Hunting would be permitted and encouraged, but the refuge would cease maintenance of the facilities and infrastructure that support hunting. Commercial duck guiding on the refuge would be eliminated.

The other priority public uses – fishing, wildlife observation, wildlife photography, and environmental education, and interpretation – would all be allowed under Alternative B, except that maintenance of facilities and infrastructure that support these activities would be discontinued. Existing access roads and trails would not be maintained. Small boats would no longer be allowed to remain overnight along the refuge's isolated lakes. We would also cease maintenance of 24 primitive campgrounds and eliminate camping.

Alternative B would continue to gradually eliminate existing permitted houseboats according to the Houseboat Management Plan. It would also document non-permitted houseboats, the same as Alternative A.

Goal 5 is to obtain and apply sufficient resources and support toward achieving the refuge's purposes and the goals and objectives of this document.

Alternative B would reduce refuge staff to eight by eliminating the following positions: assistant refuge manager, two foresters, forestry technician, and equipment operator. The remaining eight employees should be sufficient to manage the refuge on a custodial, "hands off" basis.

The refuge would maintain a minimal inventory of facilities, infrastructure, and equipment needed for basic resource management. The only tasks required by law, regulations, or policy, which includes human safety, endangered species management, and law enforcement, would be undertaken. We

would reduce involvement with volunteers to a seasonal basis as needed. Reduced staff resources may diminish support for the Friends group and other cooperative partnerships.

ALTERNATIVE C (ENHANCED RESOURCE AND PUBLIC USE MANAGEMENT) - PROPOSED ALTERNATIVE

Alternative C is the Service's proposed alternative for managing White River NWR over the next 15 years. The objectives and strategies in Section A, Chapter IV, are derived from Alternative C.

Like the other two alternatives addressed in this Draft CCP/EA, Alternative C would pursue Goal 1, which would be to manage and protect migratory birds and native wildlife populations on White River NWR, to contribute to the purposes for which it was established and to fulfill the mission of the Refuge System. Alternative C would pursue this goal by aiming to achieve a number of objectives.

Alternative C would continue to support migratory waterfowl populations, with a focus on providing wetland habitat to wintering ducks and breeding wood ducks. It would also maintain current the waterfowl sanctuary and explore opportunities to improve the spatial distribution of the refuge's waterfowl sanctuaries to help meet its waterfowl objectives. The refuge would aim to increase wood duck nesting and brood-rearing habitat through land acquisition and conduct banding activities, in an attempt to band 63 wood ducks annually. Doing this would support the objectives of the Mississippi Flyway Council. To improve banding efficiency, we would provide and maintain a limited number of strategically placed wood duck boxes.

Through managing the timing of lake drawdowns and flood ups, under Alternative C the refuge would provide fall migration habitat for shorebirds from July through October, to contribute to the objectives set forth in the U.S. Shorebird Conservation Plan, and the Lower Mississippi Valley/West Gulf Coastal Plain Shorebird Management Plan. We would also provide high-quality habitat for breeding and migrating marsh birds, in conjunction with meeting waterfowl habitat requirements where possible, and monitor results of management actions. Alternative C would provide critical habitats for long-legged wading birds and protect all rookery sites from disturbance from March to August (i.e., their breeding season) to contribute to objectives set forth in the North American Waterbird Conservation Plan.

Forest breeding birds are also a priority of Alternative C. With the aid of additional biological and forestry specialists to assist with planning, implementing, and monitoring, the refuge would improve, intensify, and expand forest management for the enhanced benefit of high-priority forest breeding birds such as neotropical migratory birds like warblers.

With regard to conserving threatened and endangered species and species of concern, Alternative C would be the same as Alternative A – the refuge would continue to support their protection and enhancement through research, survey, recovery, conservation, and management programs. Additionally, this alternative would attempt to restore habitats for listed species.

White-tailed deer would be managed the same as Alternative A, except that we would use harvest and health check data to adjust hunting seasons if and when necessary. Likewise with regard to wild turkey management, Alternative C would be identical to Alternative A, except that we would monitor turkey population status with the aid of additional staff. Also with the aid of additional staff, we propose to intensify management programs to provide enhanced habitat conditions that would support a healthy and sustainable black bear population and monitor bear occurrence. Once again we would apply adaptive management: management action results would be used to adjust future

management decisions. Furbearer management would be the same as Alternative A, except that additional opportunities would be identified to expand programs for controlling nuisance animals.

Small game management would also be identical to Alternative A, that is, we would continue active habitat management to provide diverse habitats (early succession openland, agriculture, and bottomland forest) that support healthy populations of resident small game, and provide quality recreational activities. Bat management would also be the same as Alternative A, except that with the aid of additional staff, we could perform periodic bat surveys to document occurrence and habitat use.

Under Alternative C, resident nongame mammals and a diverse assemblage of reptiles and amphibians would benefit from enhanced habitat management; those animals and natural communities Elements of Special Concern Arkansas Natural Heritage Commission would receive particular emphasis in management. Likewise, we would maintain and enhance (conserve, restore, and manage) aquatic habitat for a rich diversity of fishes, particularly those recognized as species of special concern by state and/or federal agencies.

Under Goal 2, we would manage and conserve the functions and values of the bottomland hardwood forest ecosystem and associated habitats of the Lower White River to achieve refuge purposes, wildlife population objectives, and benefit migratory birds and other wildlife. Alternative C would pursue this goal through a variety of objectives.

With regard to open lands under passive management (levees, fallow fields, and rights-of-way), Alternative C would maintain these to provide a complex of habitat types primarily suited to benefit migratory birds and resident wildlife. We would also explore opportunities to increase the efficiency of current open lands and maintain or increase the acreage of habitat to be included in integrated open land management. We would monitor vegetation and wildlife responses to treatment and we would implement adaptive management.

The refuge would work with the White River Drainage District to eliminate grazing activities on the levee based on the compatibility considerations (providing habitat that negatively impacts neotropical bird species), and instead mow or hay outside of the March to August breeding dates. This would assure that woody encroachment on the levees would be minimized. Optimal management would establish conditions in which grass and herbaceous growth is not inhibited or removed between March and August annually. To avoid disruption of the nesting season of neotropical migratory songbirds in the adjacent refuge forest and to prevent creating suitable BHCO habitat during the nesting season, mowing/haying would not be allowed until August 1, to prevent creating suitable BHCO habitat during the nesting season.

With respect to actively managed open lands (cropland and moist-soil), Alternative C would expand and intensify management to provide a complex of habitat types primarily suited to benefit migratory birds. The refuge would explore opportunities to increase efficiency of current open lands and maintain or increase the acreage of habitat to be included in integrated open land management. In addition, we would monitor vegetation and wildlife responses to treatment and implement adaptive management.

Through active forest management, White River NWR would aim to achieve Desired Forest Conditions on 40 percent of the refuge to protect, manage, and restore the values and functions of its forestland in order to sustain the biological needs of native wildlife and migratory birds.

Alternative C would improve and restore the aquatic habitats of lakes, sloughs, and bayous on the White River NWR, to fulfill the mission and purposes of the refuge. We would restore and/or mimic hydrologic patterns (i.e., the timing, frequency, duration and extent of flooding) and the habitats associated with particular hydrologic characteristics on-refuge and cooperate in interagency efforts to restore and/or mimic a more natural hydrograph on the White River. This alternative would also endeavor to improve the functionality of water control structures and create more natural water regimes, while providing important resources for wetland-dependent wildlife.

Alternative C would establish and implement management actions to protect and improve water quality on the refuge while not interfering with activities associated with habitat management. This alternative would also prepare, maintain, and start to implement an Inventorying and Monitoring Plan and use the results to implement adaptive management. Unlike Alternatives A and B, Alternative C would address climate change by designing and beginning to implement long-term monitoring, which has potential to track and assess changes due to global climate change. As possible, refuge staff would coordinate these efforts with larger regional monitoring efforts.

Alternative C would pursue Goal 3 – working with partners to minimize impacts from threats to the refuge's natural and cultural resources. Under Alternative C, the refuge would develop and begin to implement a Cultural Resources Management Plan. Until such time as the plan is complete, the refuge would follow standard Service protocol and procedures according to Section 106 of the National Historic preservation Act.

With regard to invasive terrestrial animals, we would intensify and expand prevention and control programs, including development of a database to track occurrences and control measures. We would develop and implement a Nuisance Animal Management Plan, which would detail objectives and methods for nuisance animal control. We would also develop a Rapid Response and Prevention Plan for invasive aquatic animals, and within 5 years of CCP approval, develop a Nuisance Animal Management Plan that would detail wider objectives and methods for control of all nuisance animals. Similarly, for invasive plant species, we would develop and implement an Invasive Plants Plan for coordinated control efforts when infestations are encountered, and we would develop a database to systematically track invasive plant occurrences and treatments.

Concerning dredge disposal sites, we would complete the Partnering Agreement with the COE that seeks a long-term dredge spoil disposal alternative. We would also complete a compatibility determination for the proposed Partnering Agreement Alternative. Should the proposed alternative be found not compatible, the dredge spoil deposition on refuge sites would be eliminated as expeditiously as practicable.

Working with partners, we would acquire from willing sellers priority lands within or adjacent to the approved acquisition boundary that would enhance the conservation values of the refuge; over the long term, we would consider acquisition boundary expansion to ensure the protection of bottomland hardwood habitats and enhance landscape conservation.

Under Goal 4, we would provide compatible, wildlife-dependent recreation opportunities that promote an understanding and appreciation of fish, wildlife, and habitat conservation and the Refuge System.

In pursuit of Goal 4, Alternative C would promote, manage, and improve appropriate and compatible public uses with the recruitment of additional visitor services staff, preparation of a visitor services plan, and better access and improved facilities. We would develop a new Hunt Plan to improve hunting opportunities, while ensuring safe, compatible, and quality experiences. Efforts would be made to

develop more consistent hunting seasons and regulations on the North and South Units. Public use impacts would be monitored and adjustments would be made as needed to protect resources.

Under Alternative C, within 1 year of CCP approval, the refuge would modify the guide program to provide fair and equitable hunting opportunities that foster a safe ethical hunting experience, reduce commercial guides' ability to monopolize the most easily accessible quality hunting sites and minimize conflicts between non-guided hunters and hunting guides. We would reduce the number of commercial duck guiding permits from 17 to 5, and eliminate the availability of 10 additional guiding permits during specified flood conditions.

Under Alternative C, within 5 years of CCP approval, the refuge would develop a new Fishing Plan to improve fishing opportunities, while ensuring safe, compatible, and quality experiences. We would also try to improve and expand wildlife observation and photography opportunities, while ensuring safe, compatible, and quality experiences.

Alternative C would also move to improve and expand environmental education, outreach, and interpretive opportunities, while ensuring safe, compatible, and quality experiences; recruit additional visitor services staff to develop a series of standard environmental education programs for visiting school groups, and training for teacher-led discovery field trips. For interpretation purposes, the refuge would develop and install a display that explains the forest management program and desired forest conditions, and would develop forest demonstration plots and interpretive panels at wildlife drive pullouts.

The refuge would maintain existing public access in a safe and environmentally appropriate manner to support wildlife-dependent priority public uses. Within 2 years of CCP approval, Alternative C would reduce the number of miles of tertiary ATV trails by 25 percent, and within 5 years of CCP approval, we would develop an Access Plan which would reduce the overeall number of miles of tertiary ATV trails by approximately 50 percent. In addition, the refuge would utilize seasonal closures as necessary to minimize resource impacts and ensure the quantity and quality of access necessary to provide compatible wildlife-dependent priority public uses.

Alternative C would reduce the refuge's camping program and encourage the use of nearby private campgrounds. The number of campgrounds would be reduced and some campgrounds would only be open to accommodate peak-use periods associated with quota deer hunts. Camping would be restricted to designated areas and the minimal area necessary to meet priority public use needs. White River NWR's management would promote the use of surrounding private campgrounds by refuge users and encourage the development of additional private campground sites.

The refuge would continue to gradually eliminate existing permitted houseboats according to Houseboat Management Plan, and prohibit the attachment of non-permitted houseboats to refuge property. We would work with other state and federal agencies to ensure all remaining houseboats are in compliance with marine sanitation regulations.

Goal 5 is to obtain and apply sufficient resources and support toward achieving the refuge's purposes and the goals and objectives of this document. Alternative C would pursue this goal as well.

As resources become available, we would strategically add 14 staff positions that would improve the capacity and capability of White River NWR to achieve its legislated purposes and accomplish management goals and objectives in this CCP.

Like Alternative A, Alternative C would maintain existing facilities, infrastructure, and equipment necessary to perform habitat management, restoration, and improvement on the refuge, in addition to maintaining essential infrastructure, such as roads, levees, and water control structures. In addition to this, Alternative C, with the aid of additional staff and equipment, would improve facilities and infrastructure that facilitate management programs for trust species and visitor services, and maintain or improve access for management purposes and visitor use.

This alternative would maintain existing facilities, water management infrastructure, and equipment necessary to perform habitat management, restoration, and improvement on the refuge, in addition to maintaining essential infrastructure, such as roads, levees, and water control structures. With the aid of additional staff and equipment, improve facilities and infrastructure that facilitate management programs for trust species, access for management purposes and visitor use, and facilitate visitor services.

With the aid of additional staff under Alternative C, we wouid expand the volunteer program and cooperation with the Friends group and other cooperative partnerships.

FEATURES COMMON TO ALL ALTERNATIVES

Although the alternatives differ in many ways, there are similarities among them as well. These common features are listed below to reduce the length and redundancy of the individual alternative descriptions.

- The approximate area and general shape of the refuge would not change from one alternative to the next.
- Each of the alternatives would manage and protect migratory birds and native wildlife populations on White River NWR.
- Each alternative would continue to provide functional waterfowl sanctuary areas throughout the refuge, comprising at least 60 percent of its area.
- Each of the alternatives would continue to provide habitat for, and populations of, wood ducks, shorebirds, colonial nesting waterbirds, and marsh birds.
- Forest breeding birds would continue to benefit from large areas of the refuge in bottomland hardwood forests.
- The Endangered Species Act would ensure protection of all federally listed threatened and endangered species under each of the alternatives.
- Each alternative would support harvestable populations of white-tailed deer, wild turkey, furbearers, and small game mammals.
- Populations of bats and other nongame mammals, reptiles, amphibians, and fisheries would all continue regardless of the alternative selected.
- Each alternative would aim to manage and conserve the functions and values of the bottomland hardwood forest ecosystem and associated habitats of the Lower White River.

- Bottomland hardwood forests would remain the dominant habitat type under each alternative.
- Hydrology along the White River would continue to be influenced primarily by forces upstream on and off the refuge, and beyond refuge management's jurisdiction or control.
- Each alternative would endeavor to reduce erosion and sedimentation.
- Global climate change has the potential to cause significant effects on refuge ecology under each alternative.
- The refuge would work with partners to minimize impacts from threats to the refuge's natural and cultural resources.
- Section 106 of the NHPA would ensure protection of the refuge's cultural and historic resources.
- Nonnative and invasive plants and animals, both terrestrial and aquatic, would impact native plant communities and animal populations under each alternative.
- Acquisition of key parcels within the existing acquisition boundary would continue under each alternative.
- The refuge would remain open to visitation and to a number of compatible, wildlife-dependent public uses, including the priority public uses: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.
- Under each alternative, the refuge would continue to gradually eliminate existing permitted houseboats according to the Houseboat Management Plan and document non-permitted houseboats.
- A staff of at least eight full-time employees would be maintained.
- The refuge would continue to use equipment, facilities, and infrastructure.
- Under each alternative, the refuge would continue to rely on partnerships, volunteers, and the Friends group.

A summary of the three alternatives is provided in Table 19.

COMPARISON OF THE ALTERNATIVES BY ISSUE

Table 19. Comparison of alternatives by management issues for White River NWR

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Goal 1: Manage and protect migratory birds and native wildlife populations on White River NWR to contribute to the purpose for which it was established and to fulfill the mission of the efuge System.			
Migratory waterfowl population	Continue to support existing migratory waterfowl numbers and habitat acreage in an attempt to meet or exceed the foraging habitat objectives of the LMVJV and the NAWMP.	Eliminate active management and habitat manipulation, allowing open lands and forested habitats to function and progress through habitat succession.	Continue to support migratory waterfowl populations with a focus on providing wetland habitat to wintering ducks and breeding wood ducks.
Migratory waterfowl – sanctuary	Continue to provide functional waterfowl refuges/sanctuary areas throughout the refuge, comprising at least 60% of the refuge.	Same as Alternative A.	Maintain current sanctuary and explore opportunities to improve spatial distribution of waterfowl refuges/sanctuaries to help meet waterfowl objectives.
Wood ducks	Continue to provide quality wood duck nesting and brood-rearing habitat in bottomland hardwoods, cypress swamps and scrub shrub habitats. As time allows, conduct banding to support objectives of the Mississippi Flyway Council.	Eliminate banding activities and cease active habitat management.	Increase wood duck nesting and brood-rearing habitat through land acquisition and conduct banding activities, in an attempt to band 63 wood ducks annually, to support objectives of the Mississippi Flyway Council. To improve banding efficiency, provide and maintain a limited number of strategically placed wood duck boxes in areas which banding is to occur.
Shorebirds	Provide incidental benefits with no active management for shorebirds.	Eliminate active management of moist-soil units and agricultural fields and allow natural succession to occur.	Through managing the timing of lake drawdowns and flood ups, provide fall migration habitat from July through October to contribute to the objectives set forth in the U.S. Shorebird Conservation Plan, Lower Mississippi Valley/West Gulf Coastal Plain Shorebird Management Plan.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Marsh birds	Provide no active habitat management for marsh birds but continue to provide habitat for them in shallow water areas and moist soil units.	Eliminate active management of shallow water areas and impoundments and allow natural succession to occur.	Provide high-quality habitat for breeding and migrating marsh birds, in conjunction with meeting waterfowl habitat requirements where possible, and monitor results of management actions.
Colonial waterbirds/wading birds	Provide no active habitat management for wading birds, but continue to provide habitat for breeding and wintering colonial waterbirds in shallow water areas and forested wetlands.	Eliminate active management of shallow water areas and forested wetlands and allow natural succession to occur.	Provide critical habitats for long-legged wading birds and protect all rookery sites from disturbance from March to August (breeding season) to contribute to objectives set forth in the North American Waterbird Conservation Plan.
Forest breeding birds	Continue to provide both managed and unmanaged forest habitat, to provide a diversity of forest conditions that support forest breeding birds designated as high priority in the MAV (Bird Conservation Region 26), through forest restoration on newly acquired parcels and silvicultural management of some existing forested tracts.	Eliminate active management of forest stands for the benefit of forest breeding birds and allow natural succession to proceed on all abandoned croplands, moist-soil units, and scrub-shrub habitats for the incidental benefit of forest breeding bird species.	With the aid of additional biological and forestry specialists to assist with planning, implementing, and monitoring, improve, intensify, and expand forest management for enhanced benefit of high priority forest breeding birds.
Threatened and endangered species and species of conservation concern	Continue to support the protection and enhancement of threatened and endangered species through research, survey, recovery, conservation, and management programs.	Eliminate active management and operate refuge without knowing extent or number of endangered species that occur on the refuge.	Same as Alternative A, and attempt to restore habitats for listed species.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
White-tailed deer	No specific management for white-tailed deer but continue active management of forested habitat, early succession open lands, and cropland that incidentally benefit deer, while maintaining a healthy deer herd consistent with long-term habitat capability. Collect and analyze deer harvest data, conduct periodic herd health checks and provide quality recreational opportunities.	Stop all active forest and open land management and collection of biological data but continue to aim for a healthy deer herd consistent with long-term habitat capability, and provide quality recreational opportunities.	Same as Alternative A, except use harvest and health check data to adjust hunting practices if and when necessary.
Eastern Wild Turkeys	No specific management for turkeys, but continue active habitat management that incidentally results in enhanced habitat for turkeys and provides quality recreational opportunity.	Stop all active habitat management and allow forest succession to occur on all lands, which would initially increase nesting habitat. Eventually, nesting habitat would be lost through forest succession.	Same as Alternative A, except monitor turkey population status with the aid of additional staff.
Black bears	Maintain, restore, and enhance a variety of habitats suitable for use by black bears.	Stop all active habitat management and allow forest succession to occur on all lands, which would incidentally support black bears.	With the aid of additional staff, intensify management programs to provide enhanced habitat conditions that would support a healthy and sustainable black bear population and monitor bear occurrence. Use management action results to adjust future management decisions.
Furbearers	Continue no active management for furbearers, other than controlling nuisance animals when necessary.	Allow furbearer populations to fluctuate naturally without controlling nuisance animals.	Same as Alternative A, except identify additional opportunities to expand programs for controlling nuisance animals.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Small game (mammals)	Continue active habitat management to provide diverse habitats (early succession openland, agriculture and bottomland forest) that support healthy populations of resident small game, and provide quality recreational activities.	Stop all active habitat management and allow forest succession to occur on all lands for the incidental benefit of small game mammals.	Same as Alternative A.
Bats	Continue active habitat management that provides a diversity of habitats and supports a healthy, diverse, and viable resident bat population.	Stop all active habitat management and allow natural succession to form wooded and wetland habitats that would support sustainable populations of most bat species.	Same as Alternative A, except with the aid of additional staff, perform surveys to document occurrence and habitat use.
Non-game mammals	Continue no active management for non-game mammals or their habitats although non-game mammals and their habitats occur throughout the refuge.	Stop all active habitat management and allow forest succession to occur for the incidental benefit of non-game mammals.	Enhance habitat to support resident non-game mammals, particularly those recognized as Species of Greatest Conservation Need by the Arkansas Wildlife Action Plan.
Reptiles and amphibians	Maintain and enhance habitat for a diverse assemblage of reptile and amphibian species.	Stop all active habitat management and allow forest succession to occur on all lands that would support a diverse assemblage of reptiles and amphibians.	Maintain and enhance habitat for a diverse assemblage of resident reptile and amphibian species, particularly those recognized as Species of Greatest Conservation Need in the Arkansas Wildlife Action Plan.
Fisheries	Maintain aquatic habitat for a diverse assemblage of fish species, particularly those recognized as species of special concern by State and/or Federal agencies and provide quality fishing opportunities.	Allow riverine and floodplain aquatic habitat to function without intervention.	Maintain and enhance (conserve, restore, and manage) aquatic habitat for a diverse assemblage of fish species, particularly those recognized as species of special concern by State and/or Federal agencies.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Goal 2: Manage and conserve the functions and values of the bottomland hardwood forest ecosystem and associated habitats of the Lower White River, to achieve refuge purposes, wildlife population objectives, and benefit migratory birds and other wildlife.			
Open lands under passive management (levees, fallow fields, and rights-of-way)	Continue to provide a complex of habitat conditions through integrated open land rotation management, in time and space, to meet the needs of migratory birds; including migratory waterfowl, shorebirds, wading birds and secretive marsh birds. Grazing of levees continued.	Maintain levees and rights-of-way as open lands, per interagency agreements, but allow fallow fields to undergo natural succession.	Maintain open lands to provide a complex of habitat types primarily suited to benefit migratory birds and resident wildlife. Explore opportunities to increase efficiency of current open lands and maintain or increase acreage of habitat to be included in integrated open land management. Monitor vegetation and wildlife responses to treatment and implement adaptive management.
Open lands under active management (cropland and moist-soil)	Continue to provide a complex of habitat conditions through integrated open land rotation management, in time and space, to meet the needs of migratory birds; including migratory waterfowl, shorebirds, wading birds, and secretive marsh birds.	Phase out active refuge management and habitat manipulation of open lands, gradually allowing them to undergo natural succession.	Expand and intensify active management of open lands to provide a complex of habitat types primarily suited to benefit migratory birds. Explore opportunities to increase efficiency of current open lands and maintain or increase acreage of habitat to be included in integrated open land management. Monitor vegetation and wildlife responses to treatment and implement adaptive management.
Forested habitats	Through active forest management achieve Desired Forest Conditions on 17 percent of the refuge to protect, manage, and restore the values and functions of the refuge's forestland to sustain the biological needs of native wildlife and migratory birds.	Eliminate active forest management allowing natural succession and processes to achieve Desired Forest Conditions on 5 percent of the refuge to protect and restore the values and functions of the refuge's forestland to sustain the biological needs of native wildlife and migratory birds.	Through active forest management achieve Desired Forest Conditions on 40 percent of the refuge to protect, manage, and restore the values and functions of the refuge's forestland to sustain the biological needs of native wildlife and migratory birds.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Aquatic habitat management	Continue to use BMPs recommended by the Arkansas Forestry Commission in refuge management and operations.	Allow aquatic habitats to function without management practices.	Improve and restore the aquatic habitats of lakes, sloughs and bayous on the White River NWR to fulfill the mission and purposes of the refuge.
Refuge hydrology	Hydrology is altered by both off-refuge and on-refuge manipulations that result in an unnatural hydrograph.	Same as Alternative A.	Restore and/or mimic hydrologic patterns (i.e., timing, frequency, duration, and extent of flooding) and habitats associated with particular hydrologic characteristics on-refuge and cooperate in interagency efforts to restore and/or mimic a more natural hydrograph on the White River.
Water control	Continue to operate functioning water control structures and keep non-functioning water control structures inactive.	Eliminate all active water management on the refuge and allow habitat succession to occur on areas with water control capabilities.	Improve functionality of water control structures and create more natural water regimes, while providing important resources for wetland-dependent wildlife.
Water quality (aquatic resources)	Continue limited efforts, through the use of BMPs recommended by the Arkansas Forestry Commission in refuge management and operations, to reduce levels of stream impairment from turbidity, siltation, and pollution.	Eliminate all active open land and forested habitat management on the refuge, which may reduce erosion from adjacent lands through an increase in acreage of undisturbed forested riparian habitat.	Establish and implement management actions to protect and improve water quality on the refuge while not interfering with activities associated with habitat management.
Inventorying, monitoring, and researching	Continue to conduct incidental inventorying, monitoring, and researching on the refuge without the guidance and priorities of an Inventorying and Monitoring Plan.	Discontinue all inventorying, monitoring, and researching on the refuge.	Prepare, maintain, and start to implement an Inventorying and Monitoring Plan and use results to implement adaptive management.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Global climate change	No active, systematic efforts to monitor or mitigate global climate change.	Same as Alternative A.	Design and begin to implement long-term monitoring, which has potential to track and assess changes due to global climate change. As possible, coordinate these efforts with larger regional monitoring efforts.
Goal 3: Work with partners to minimize impacts from threats to the refuge's natural and cultural resources.			
Cultural resources	Continue to protect cultural and historical resources from disturbances. The refuge would follow standard Service protocols and procedures according to Section 106 of the National Historic Preservation Act.	Minimal implementation of standard Service protocols and procedures according to Section 106 of the National Historic Preservation Act.	Develop and begin to implement a Cultural Resources Management Plan. Until such time, the refuge would follow standard Service protocols and procedures according to Section 106 of the National Historic Preservation Act.
Invasive terrestrial animals	Continue opportunistic control of nuisance and exotic terrestrial animal species such as feral hogs, nutria, and beaver.	Identify and track occurrence of invasive terrestrial animals but make no efforts to control them.	Intensify and expand prevention and control programs, including development of a database to track occurrences and control measures. Develop and implement a Nuisance Animal Management Plan, which details objectives and methods for nuisance animal control.
Invasive aquatic animals	Continue opportunistic control of nuisance and exotic aquatic animal species such as Asian carps, northern snakeheads, zebra mussels, and Asian clams.	Identify and track occurrence of invasive aquatic animals but make no efforts to control them.	Develop a Rapid Response and Prevention Plan for invasive aquatic animals, and within 5 years of CCP approval, develop a Nuisance Animal Management Plan which details wider objectives and methods for control of all nuisance animals.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Invasive plants	Continue opportunistic control of exotic and invasive terrestrial and aquatic plant species.	Identify and track occurrence of exotic and invasive terrestrial and aquatic plant species but make no efforts to control them.	Develop and implement an Invasive Plants Plan for coordinated control efforts when infestations are encountered and develop a database to systematically track invasive plant occurrences and treatments.
Dredge spoil sites	Continue to provide a permit to the COE allowing the deposition of non-beneficial dredge material at two sites totaling 180 acres. Work cooperatively with the COE to develop a long term dredge spoil disposal alternative that is compatible with refuge purposes.	Same as Alternative A.	Complete the Partnering Agreement with the COE that seeks a long-term dredge spoil disposal alternative. Complete a compatibility determination for the proposed Partnering Agreement Alternative. Should the proposed alternative be found not compatible, the dredge spoil deposition on refuge sites would be eliminated as expeditiously as practicable.
Refuge land acquisition	Continue to acquire key parcels within the approved acquisition boundary.	Same as Alternative A.	Working with partners, acquire priority lands from willing sellers within or adjacent to the approved acquisition boundary that would enhance the conservation values of the refuge; over the long term consider acquisition boundary expansion to ensure the protection of bottomland hardwood habitats and enhance landscape conservation.
External threats	Promote communication, cooperation, and partnerships between other agencies, land managers, and private citizens to minimize impacts from external threats to the functions and values of the refuge's wetland ecosystems	Same as Alternative A.	Same as Alternative A.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Goal 4: Provide compatible, wildlife-dependent recreation opportunities that promote an understanding and appreciation of fish, wildlife, and habitat conservation and the Refuge System.			
Visitor services and public use management	Continue to promote and operate visitor services without a visitor services plan; conduct maintenance of roads, trails, boat ramps, and other public use infrastructure.	Same as Alternative A, except discontinue maintenance of roads, trails, boat ramps, and other public use infrastructure that accommodate priority public uses.	Promote, manage, and improve appropriate and compatible public uses with the recruitment of additional visitor service staff, preparation of a visitor services plan, and better access and improved facilities.
Hunting	Continue to provide existing hunting opportunities that allow for quality public recreation and are compatible with the purposes for which the refuge was established.	Same as Alternative A, except discontinue maintenance of facilities and infrastructure that supports hunting.	Develop a new Hunt Plan to improve hunting opportunities, while ensuring safe, compatible, and quality experiences. Efforts would be made to develop more consistent hunting seasons and regulations on the North and South Units. Public use impacts would be monitored and adjustments would be made as needed to protect resources.
Commercial duck guiding	Provide up to 17 commercial duck guiding permits plus an additional 10 permits during periods when flooding reaches 24.5 feet at St. Charles and 25.5 feet at Clarendon simultaneously.	Eliminate commercial duck guiding on the refuge.	Within 1 year of CCP approval, modify guide program to provide fair equitable hunting opportunities that foster a safe ethical hunting experience, reduce commercial guides' ability to monopolize the most easily accessible quality hunting sites, and minimize conflicts between non-guided hunters and hunting guides. Reduce the number of commercial duck guiding permits from 17 to 5 and eliminate availability of 10 additional guiding permits during specified flood conditions.
Fishing	Continue to provide existing fishing opportunities that allow for quality public recreation and are compatible with the purposes for which the refuge was established.	Same as Alternative A, except discontinue maintenance of facilities and infrastructure that support fishing.	Within 5 years of CCP approval, develop a new Fishing Plan to improve fishing opportunities, while ensuring safe, compatible, and quality experiences.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Wildlife observation and photography	Continue to provide existing wildlife observation and photography opportunities that allow for quality public recreation and are compatible with refuge purposes.	Same as Alternative A except discontinue maintenance of facilities and infrastructure that support wildlife observation and photography.	Improve and expand wildlife observation and photography opportunities, while ensuring safe, compatible, and quality experiences.
Environmental education and outreach	Continue existing environmental education and outreach opportunities that allow for quality public recreation and are compatible with the purposes for which the refuge was established.	Same as Alternative A, except discontinue maintenance of facilities and infrastructure that support environmental education.	Improve and expand environmental education and outreach opportunities, while ensuring safe, compatible, and quality experiences; recruit additional visitor services staff to develop a series of standard environmental education programs for visiting school groups, and training for teacher-led discovery field trips.
Interpretation	Existing interpretive facilities, materials, and programs, including visitor center exhibits, kiosks, signage, brochures, and summer campfire programs, would continue.	Same as Alternative A, except discontinue maintenance of facilities and infrastructure that support interpretation.	Improve and expand interpretation opportunities, while ensuring safe, compatible, and quality experiences; develop and install a display that explains forest management programs and desired forest conditions, and develop forest demonstration plots and interpretive panels at wildlife drive pullouts.
Public access	Continue to provide and maintain approximately 90 miles of primarily graveled public access roads and 400 miles of dirt roads/trails utilized for forest management and ATV access.	Existing access roads and trails would not be maintained.	Maintain existing public access in a safe and environmentally appropriate manner to support wildlife-dependent priority public uses. Within 2 years of CCP approval, reduce the number of miles of ATV trails by 25 percent and within 5 years of CCP approval, develop an Access Plan which would overall reduce the number of miles of ATV trails by approximately 50 percent; utilize seasonal closures as necessary to minimize resource impacts and ensure the quantity and quality of access necessary to provide compatible wildlife-dependent priority public uses.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Camping	Continue to allow primitive camping associated with wildlife-dependent activities on about 44,000 acres of the refuge and at 24 maintained campgrounds on the remainder of the refuge.	Cease maintenance of 24 primitive campgrounds and eliminate camping.	Reduce the number of campgrounds and allow camping only during peak use periods (quota hunts) at a number of designated campgrounds. Camping would be restricted to designated areas and the minimal area necessary to meet priority public use needs. Promote use of surrounding private campgrounds by refuge users and encourage development of additional private campground sites.
Houseboat mooring	Continue to gradually eliminate existing permitted houseboats according to houseboat management plan and document non-permitted houseboats.	Same as Alternative A.	Continue to gradually eliminate existing permitted houseboats according to the Houseboat Management Plan and prohibit the attachment of non-permitted houseboats to refuge property. Work with other state and federal agencies to ensure all remaining houseboats are in compliance with marine sanitation regulations.
Goal 5: Obtain and apply sufficient resources and support toward achieving the refuge's purposes and the goals and objectives of this document.			
Staffing	Maintain existing permanent staff of 14 FTE's.	Reduce staff to 8 by eliminating the following positions: 1 assistant refuge manager, 1 law enforcement officer, 2 foresters, 1 forestry technician, and1 equipment operator.	As resources become available, strategically add 14 staff positions that would improve the capacity and capability of White River NWR, to achieve its legislated purposes and accomplish management goals and objectives in this Draft CCP/EA.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Facilities, infrastructure, and equipment	Maintain existing facilities, infrastructure, and equipment necessary to perform habitat management, restoration, and improvement on the refuge, in addition to maintaining essential infrastructure, such as roads, levees, and water control structures.	Maintain minimal inventory of facilities, infrastructure, and equipment needed for basic resource management and only tasks required by law, regulations, or policy, which includes human safety, endangered species management, law enforcement etc..	Maintain existing facilities, water management infrastructure, and equipment necessary to perform habitat management, restoration, and improvement on the refuge, in addition to maintaining essential infrastructure, such as roads, levees, and water control structures. With the aid of additional staff and equipment, improve facilities and infrastructure that facilitate management programs for trust species, access for management purposes and visitor use, and facilitate visitor services.
Volunteers, partners, and friends	Maintain the volunteer program at present level and continue to support the Friends group and other cooperative partnerships.	Reduce involvement with volunteers to seasonal basis as needed. Reducing staff resources may diminish support for Friends group and other cooperative partnerships.	With the aid of additional staff, expand the volunteer program and cooperation with the Friends group and other cooperative partnerships.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

The alternatives' development process under NEPA and the Improvement Act is designed to allow consideration of the widest possible range of issues and potential management approaches. During the alternatives' development process, several different solutions were considered. The following alternative, in particular, was considered and developed during the goals/objectives/alternatives workshop, but was eventually eliminated and not selected for detailed study in this Draft CCP/EA for the reason(s) described.

The eliminated alternative was called "Maximum Resource Management" and it called for intensifying management of wildlife populations, habitat, and public use. Rough objectives were drafted for this alternative in the goals/objectives/alternatives workshop. The objectives chosen by the team for this alternative tended to represent ideals obtainable in a world of unlimited budgetary and staffing resources. Ultimately, the planning team decided that this alternative was utopian rather than realistic or reasonable, and eliminated it from further consideration, thus removing it from the alternatives comparison matrix (Table 19) in this Draft CCP/EA.

IV. Environmental Consequences

OVERVIEW

This section analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each of the three alternatives described in Section B, Chapter III. For each alternative, the expected outcomes are portrayed through the 15-year life of the final CCP.

EFFECTS COMMON TO ALL ALTERNATIVES

A few potential effects would be the same under each alternative and are summarized under seven categories: environmental justice, climate change, other management, land acquisition, cultural resources, refuge revenue sharing, and other effects.

ENVIRONMENTAL JUSTICE

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

None of the management alternatives described in this Draft CCP/EA would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. Implementation of any action alternative that includes public use and environmental education is anticipated to provide a benefit to the residents residing in the surrounding communities.

CLIMATE CHANGE

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

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

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

Conserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in this Draft CCP/EA would conserve or restore land and water, and would thus enhance carbon sequestration. This, in turn, contributes positively to efforts to mitigate human-induced global climate changes.

Global climate change may begin to alter refuge ecology, hydrology, flora, and fauna over the 15-year life of the final CCP, but precise changes are difficult if not impossible to predict, due to myriad of complicated variables and factors. Potential changes may include the following:

- Increase in the annual mean temperature
- Increase frequency of hot extremes and heat waves
- Fewer and less severe cold extremes
- Longer and earlier arriving warm seasons
- Cool season warms and shortens
- Changes in summer temperatures larger than those in winter
- Uncertain future precipitation patterns, with the possibility of both increasing and decreasing precipitation
- Increased atmospheric humidity
- Greater rate of evapotranspiration
- More intense and less predictable hydrologic cycle
- More extreme events such as heavy down pours and droughts
- Lengthening rain-free periods (i.e., sustained droughts), but rainfall individual events becoming more intense
- More runoff and flash flooding
- Reduction in water availability and quality, and shallow water aquifer recharge
- Seasonality of rainfall to shift; relatively greater precipitation in winter and less in summer
- Warmer winters impacting soil organic matter, and carbon and nitrogen sequestration
- Changes in the timing of life-history events, that is the phenology, for particular species will occur
- Potential decoupling of coevolved interactions, such as plant-pollinator relationships
- Shifting the timing of animal migrations
- Pest outbreaks and increases in invasive species
- Increased spread of wildlife diseases and parasites
- Increased spread of invasive and nonnative species, including plants, animals, and pathogens
- Increased temperatures and sustained drought periods causing increased wildfire potential.

OTHER MANAGEMENT

All management activities that could affect the refuge's natural resources, including subsurface mineral reservations, utility lines and easements, soils, water and air, and historical and archaeological resources, would be managed to comply with all laws and regulations. In particular, any existing and future oil and gas exploration, extraction, and transport operations on the refuge would be managed identically under each of the alternatives. Thus, the impacts would be the same.

LAND ACQUISITION

Funding for land acquisition from willing sellers within the approved acquisition boundary of White River NWR would come from the Land and Water Conservation Fund, the Migratory Bird Conservation Fund, Corps of Engineers mitigation programs, or donations from conservation and private organizations. Conservation easements and leases can be used to obtain the minimum interests necessary to satisfy refuge objectives if the refuge staff can adequately manage uses of the areas for the benefit of wildlife. The Service can negotiate management agreements with local, state, and federal agencies, and accept conservation easements. Some tracts within the refuge acquisition boundary may be owned by other public or private conservation organizations. The Service would work with interested organizations to identify additional areas needing protection and provide technical assistance if needed. The acquisition of private lands is entirely contingent on the landowners and their willingness to participate.

CULTURAL RESOURCES

All alternatives afford additional land protection and low levels of development, thereby producing little negative effect on the refuge's cultural and historic resources. Potentially negative effects could include logging, construction of new trails or facilities, and development of water impoundments. In most cases, these management actions would require review by the Service's Regional Archaeologist in consultation with the State of Arkansas' Historic Preservation Office, as mandated by Section 106 of the National Historic Preservation Act. Therefore, the determination of whether a particular action within an alternative has the potential to affect cultural resources is an on-going process that would occur during the planning stages of every project.

Service acquisition of land with known or potential archaeological or historical sites provides two major types of protection for these resources: protection from damage by federal activity and protection from vandalism or theft. The National Historic Preservation Act requires that any actions by a federal agency which may affect archaeological or historical resources be reviewed by the State Historic Preservation Office, and that the identified effects must be avoided or mitigated. The Service's policy is to preserve these cultural, historic, and archaeological resources in the public trust, and avoid any adverse effects wherever possible.

Land acquisition, within the current acquisition boundary, by the Service would provide some degree of protection to significant cultural and historic resources. If acquisition of private lands does not occur and these lands remain under private ownership, the landowner would be responsible for protecting and preserving cultural resources. Development of off-refuge lands has the potential to destroy archaeological artifacts and other historical resources, thereby decreasing opportunities for cultural resource interpretation and research.

REFUGE REVENUE-SHARING

Annual refuge revenue-sharing payments to Desha, Monroe, Arkansas, and Phillips Counties, Arkansas, would continue at similar rates under each alternative. If lands are acquired and added to the refuge, the payments would increase accordingly.

OTHER EFFECTS

Each of the alternatives would have similar effects or minimal to negligible effects on soils, water quality and quantity, noise, transportation, human health and safety, children, hazardous materials, waste management, aesthetics and visual resources, and utilities and public services. The

alternatives would not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. The alternatives do not involve highly uncertain, unique, or unknown environmental risks to the human environment; nor would they establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. The alternatives would not lead to a violation of federal, state, or local laws imposed for the protection of the environment. Overall, there would not be a significant effect on the human environment from any of the alternatives; the effects that do occur would not be highly controversial.

SUMMARY OF EFFECTS BY ALTERNATIVE

The following section describes the environmental consequences of adopting each refuge management alternative. Table 20 summarizes and addresses the likely outcomes for the specific issues, and is organized by broad issue categories.

ALTERNATIVE A (CURRENT MANAGEMENT - NO ACTION)

Under Alternative A, current management direction or the No Action Alternative, White River NWR would continue to be managed as it has been in recent years.

Impacts on migratory and resident birds and trust species from this alternative would be minimal. Migratory waterfowl numbers are unlikely to either increase or decrease significantly. The wood duck population and production on the refuge are unlikely to change. Numbers of migrating, southbound shorebirds passing through, foraging, and resting on the refuge are likely to remain the same. Marshbird populations in shallow water areas and moist soil units on the refuge are unlikely to change. Similarly, numbers of breeding and wintering colonial waterbirds would likely remain unchanged as well.

Forest breeding bird populations are likely to increase somewhat on average, due to improvements in forest structure and composition from the refuge's forest management program. Threatened and endangered species on the refuge would continue to be protected.

The refuge's deer herd is likely to fluctuate in size from year to year but not follow any long-term upward or downward trend under current management. Likewise, the population of wild turkeys would likely remain about the same as at present. However, the black bear population may increase slowly over time as a result of improved habitat conditions.

Under Alternative A, populations of furbearers and small game mammals are unlikely to change overall; they are expected to remain essentially the same. The resident bat population is expected to remain viable, although unpredictable variables like diseases (e.g., white-nose syndrome, which continues to spread) can have pronounced or even devastating effects. The abundance and diversity of non-game mammals on the refuge is unlikely to change. Similarly, the diverse assemblage of resident reptile and amphibian species will probably continue under current management. Aquatic habitats and fisheries would continue largely unchanged as well.

With regard to the refuge's habitats, no substantial changes are expected as a result of implementing Alternative A. The quantity and quality of open land habitats would not change. The area of forested habitats on the refuge would remain the same and the quality of forest habitat would improve, as Desired Forest Conditions are gradually obtained on 17 percent of refuge due to ongoing, long-term implantation of the Forest Habitat Management Plan. There would be little or no change in the quantity or quality of aquatic habitats. Hydrology, principally hydrology of the White River, would

continue to be dominated by off-refuge factors and upstream forces within the White River watershed that affect many aspects of refuge management. Water quality and stream impairment from turbidity, siltation, and pollution would continue due both the forest harvesting operations on the refuge and land use off the refuge, though likely at a somewhat reduced level due to BMPs.

Under Alternative A, various refuge programs would continue to offer some, but not complete protection for natural and cultural resources. Cultural and historic resources would continue to be protected under Section 106 of the National Historic Preservation Act.

Certain invasive terrestrial and aquatic animal species gradually encroach into native communities of flora and fauna on the refuges; control efforts would be only partially successful in preventing the spread of these invasives into both terrestrial and aquatic habitats. Likewise, various invasive plant species gradually encroach into native communities of flora and fauna on the refuges; control efforts are only partially successful in precluding spread of invasives. Invasive species of both plants and animals have potential to seriously and adversely impact native flora and fauna through competition, predation, and displacement.

Ongoing periodic dredge disposal from the COE's efforts to maintain a navigation channel on the White River would result in continued localized turbidity and perhaps contaminant problems. Continued grazing of White River levees would continue to favor cowbird populations at the expense of forest-nesting birds whose nests they parasitize. The same would occur with haying.

Alternative A would not have adverse impacts on existing public use opportunities on the refuge, which would all be maintained. Hunting opportunities throughout the refuge would generally remain the same over time. Opportunities for commercial duck guiding would remain essentially unchanged. Non-guided hunters would continue to be somewhat disadvantaged. Fishing opportunities throughout the refuge would generally remain the same over time. Existing opportunities for wildlife observation, wildlife photography, and environmental education and interpretation on the refuge would not change appreciably.

Access to the refuge's backcountry on its road and trail network would remain the same. Camping opportunities and facilities would also remain the same, but houseboat mooring would gradually become more restricted as the refuge begins to reign in the unfettered access throughout the refuge houseboats have enjoyed for decades, which a number have taken advantage of, leaving their boats on the refuge for weeks, months, or years at a time, or even abandoning them. Small boats would still be left along the refuge's isolated lakes year-round.

Under Alternative A, facilities, infrastructure, and equipment would be maintained as at present.

ALTERNATIVE B – MINIMAL RESOURCE AND PUBLIC USE MANAGEMENT

The thrust of Alternative B is reduced management of resources and public use on White River NWR. While this is not the Service's proposed alternative, under a more restrictive budgetary scenario it would be a more realistic alternative, as active management measures were curtailed and natural forces, including natural plant community succession, were allowed to take their course on the refuge. In general, the impacts from Alternative B are either more adverse than or equal to those of the No Action Alternative (A). In only a few instances does this alternative result in effects likely to be more beneficial than those of Alternative A.

Migratory waterfowl numbers would be likely to decline sharply with the elimination of croplands and moist-soil units, because both of these managed habitats attract large numbers of waterfowl to forage during the late fall and winter months. However, the resident wood duck population and its production on the refuge would be unlikely to change over the CCP's lifetime, because the maturing forest would furnish both adequate habitat and nesting cavities.

Under Alternative B, shorebird and marsh bird numbers would decrease somewhat due to a reduction of suitable habitat like moist-soil units. However, the populations of breeding and wintering colonial waterbirds would likely remain unchanged, because their habitat area would not change appreciably.

Reduced acreage of bottomland hardwood forest habitat in Desired Forest Conditions in Alternative B would probably result in a somewhat smaller number and diversity of forest breeding bird species. That is, overall numbers of forest breeding songbirds as well as species diversity would decrease, because of predicted changes in forest structure without management and selective harvest – fewer small clearings and gradual disappearance of understory and ground vegetation as the forest canopy closed over time.

Threatened and endangered species on the refuge would be less likely to thrive and continue recovery under Alternative B due to a lack of information on their occurrence and distribution, and the general policy of avoiding active habitat manipulation, even to expressly benefit threatened and endangered species.

The loss of cropland would adversely impact the refuge's deer herd by reducing its food supply, but the increase in browse from more early successional vegetation (scrub/shrub) would be beneficial and offset the loss of unharvested crops. The net outcome on deer numbers is uncertain over a 15-year period. Over the longer term, however, there is little doubt that the deer herd would decline as the closed canopy bottomland hardwood forest matures and the amount of accessible browse decreases.

In contrast, wild turkey population would probably increase over the 15-year life of the CCP because of more forested habitats and greater mast production. Likewise, the black bear population is expected to increase, and probably faster than it would under Alternative A.

Certain furbearer species would likely increase and others would likely decrease with the expected habitat changes. Similarly, the relative abundance of small game mammal species, non-game mammals, bats, reptiles and amphibians is expected to shift towards those species that prefer forested habitats. No major changes are expected.

Under Alternative B, aquatic habitats and fisheries would continue largely unchanged, as they would in Alternative A. No substantial changes in species occurrence, distribution, and abundance are predicted.

With regard to the refuge's habitats, under Alternative B, the major change is a loss of habitat diversity as, over time, more and more of the refuge reverted to closed canopy bottomland hardwood forest (the natural plant community in this region as a result of succession). Management of moist-soil units and croplands would cease and they would be abandoned. Through the process of natural community succession, in this ecosystem they would revert to bottomland hardwood forests over a period of several decades. Due to this aforestation, the area of forested habitats on the refuge would increase. Succession would lead over time to more mature forest, but the quality of forest habitat for most wildlife would decrease, with Desired Forest Conditions being obtained on just 5 percent of the refuge under Alternative B.

With regard to aquatic habitats, Alternative B would be the same as Alternative A. – there would be little or no change in the quantity or quality of aquatic habitats. Similarly, hydrology would continue to be dominated by off-refuge factors and forces that affect many aspects of refuge management, just as in Alternative A. However, the increase in acreage of undisturbed forested riparian habitat would likely result in reduced water quality and stream impairment from turbidity, siltation, and pollution.

Global climate change may begin to alter refuge ecology, hydrology, flora, and fauna over the 15-year life of the CCP, but precise changes are difficult if not impossible to predict, due to myriad of complicated variables and factors. Predicted changes under Alternative B may include the same ones listed under Alternative A above.

Under Alternative B, various refuge programs would continue to offer some, but not complete protection for natural and cultural resources. Cultural and historic resources would continue to be protected under Section 106 of the National Historic Preservation Act.

Certain invasive terrestrial and aquatic animal and plant species would gradually encroach further into native communities of flora and fauna on the refuges. The lack of control efforts in this alternative would worsen the problem. Ongoing periodic dredge disposal from the COE's efforts to maintain a navigation channel on the White River would result in continued localized turbidity and perhaps contaminant problems. Continued grazing of White River levees would continue to favor cowbird populations at the expense of forest-nesting birds whose nests they parasitize. The same issues would occur with haying.

While Alternative B would still allow for each of the priority public uses on the refuge, as well as other non-wildlife-dependent public uses, its overall impact on public use and recreation would still be negative. This is because much of the facilities and infrastructure that support consumptive and non-consumptive outdoor recreation on the refuge would be abandoned and eventually cease to be functional under this alternative. Thus, the level of visitation that occurs now would be unable to continue in the future. This is an adverse impact.

Hunting opportunities would be similar to those of Alternative A, for awhile, but would gradually begin to diminish with the disappearance of habitat diversity on the refuge, as well as the loss of access as roads and trails are no longer maintained and begin to deteriorate. Interior areas of the refuge may become virtually inaccessible to all but the hardiest hunters. Alternative B would completely eliminate commercial duck guiding on the refuge, which would disadvantage guides and their clients but increase opportunities somewhat for non-guided duck hunters.

While the entire refuge would remain open to fishing, facilities such as ramps and campgrounds that facilitate fishing would no longer be maintained, leading to less and lower quality fishing as these facilities degrade over time. Wildlife observation and wildlife photography opportunities would also diminish, because of habitat succession to increasingly mature forest as well as reduced access due to the gradual disappearance of roads and trails. More of the refuge would become inaccessible to wildlife observation and wildlife photography.

Overall, under Alternative B, public access would be sharply curtailed, and essentially eliminated across much of the refuge, as backcountry roads and trails are closed and/or maintenance ceases; public hunting and fishing opportunities on the refuge would decrease as a direct result.

Environmental education and the public benefits it provides would decrease, as would interpretation. These impacts would occur because of reduced staff size and facilities. Camping on the refuge would be eliminated, which many refuge users would view as a setback. Elimination of camping

would have implications for levels of hunting and fishing and thus impacts on wildlife and fish populations. One positive impact of eliminating camping would be less localized impact in former campsites (e.g., much less litter and sanitary waste disposal problems), as well as less drain on refuge staff resources. Small boats along the refuge's small isolated lakes would be removed.

Effects related to houseboat mooring under Alternative B would be the same as Alternative A. It would gradually be more restricted, which would be beneficial for the refuge environment, but somewhat detrimental to houseboat owners and users.

As indicated throughout this discussion, facilities, infrastructure, and equipment would be drastically reduced overall under Alternative B.

ALTERNATIVE C – ENHANCED RESOURCE AND PUBLIC USE MANAGEMENT (PROPOSED ALTERNATIVE)

As noted above, Alternative C is the Service's proposed alternative for managing White River NWR over the coming 15 years. Overall, if it could be thoroughly implemented, this alternative would have more beneficial effects, and fewer negative or adverse impacts, than the previous two alternatives (A and B).

Under Alternative C, numbers of migratory waterfowl, and resident wood ducks, would be likely to increase somewhat over current levels. Southbound shorebird numbers are also likely to increase somewhat due to increased available habitat.

Numbers of marsh birds, colonial nesting waterbirds and wading birds may possibly increase over Alternative A. Forest breeding bird populations are likely to increase on the refuge, more than under Alternatives A and B, because of increasing amounts of forest habitat and because of forestry treatments aimed at improving habitat quality for priority bird species. Furtheremore, the reduction of nest parasitism from brown-headed cowbirds (because of the reduced or eliminated grazing and haying/mowing restricted to after August 1) should improve reproductive success, and populations, of nesting neotropical songbirds and other forest-nesting birds on the refuge. A greater percentage of the refuge forests would have attained Desired Forest Conditions, which are based on the habitat needs of wildlife, especially forest nesting birds. Threatened and endangered species on the refuge would continue to be protected, as in Alternative A.

The refuge's deer herd is likely to fluctuate in size from year-to-year, but not follow any long-term upward or downward trend under the proposed management of Alternative C. The population of wild turkeys would likely remain about the same as at present. However, the black bear population may increase slowly over time as a result of improved habitat conditions, perhaps to a level somewhat greater than under Alternative A.

Under Alternative C, populations of furbearers and small game mammals are unlikely to change appreciably from current levels. The resident bat population is expected to remain viable, although as in the other two alternatives, unpredictable variables like diseases can have pronounced or even devastating effects. Resident nongame mammals, especially special status species, may benefit from proposed habitat management, and its greater focus on state-listed species. The diverse assemblage of resident reptile and amphibian species is likely to continue under Alternative C. Fisheries may benefit from hydrology restoration and management.

With regard to the refuge's habitats, in general, Alternative C calls for managing them more intensively and guided more explicitly by adaptive management. In general, the effects of these management proposals would be beneficial for the refuge's habitats. The quantity and quality of open land habitats may increase somewhat. The area of forested habitats on the refuge would remain the same and the quality of forest habitat should improve, if, as proposed, Desired Forest Conditions can be obtained on 40 percent of the refuge. Some improvement in the quality of aquatic habitats on the refuge is likely due to less erosion and sedimentation. There should be slow but gradual progress toward a more natural hydrograph on the White River, which would be beneficial for many aspects of refuge management. As in Alternative A, water quality and stream impairment from turbidity, siltation, and pollution would continue, though likely at a somewhat reduced level due to more stringent implementation of BMPs when conducting logging, silvicultural, road-building, and road-maintenance operations on the refuge.

Under Alternative C, the predicted, possible impacts of climate change would be the same as under Alternatives A and C. However, the proposed long-term monitoring to track and assess these changes and coordinate regional responses may assist adaptive management and reduce potential adverse impacts to native flora and fauna on the refuge.

Resource protection would improve under Alternative C. Preparation and implementation of a CRMP would improve both knowledge and preservation of the refuge's cultural resources. Database development would help the refuge to systematically track occurrences and treatments of invasive terrestrial and aquatic animal and plant species. The proposed Nuisance Animal Management Plan and the Invasive Plant Plan would help slow, halt, or even reverse the spread and impacts of invasive plants and animals on native biota.

Impacts from dredge spoil disposal would be the same as Alternative A – continued localized turbidity and perhaps contaminant problems from dredge disposal – except that a new agreement with the COE could shift the location off-refuge or reduce the scale of localized impacts. Eliminating grazing on the levee and revising the haying agreement to delay mowing and/or haying until after August 1 would both benefit forest-nesting birds by reducing nest parasitism by cowbirds.

Under Alternative C, hunting opportunities on the refuge may improve somewhat from increased visitor services but also from improved habitat and more abundant game. By lowering the number of commercial duck guide permits, conflicts between sport hunters and commercial duck guides would likely be reduced overall. Fishing opportunities and experience would be likely to improve. Both facilities and opportunities for wildlife observation and photography would also improve. Environmental education and interpretation, and the public benefits these provide, would both increase substantially under this alternative.

In Alternative C, access would be somewhat more restricted than under Alternative A in an effort to reduce administrative and maintenance costs as well as resource impacts. However, sufficient public access would remain, such that, while this reduced access would be an adverse impact to the public, it would not constitute a significant adverse impact. Camping would be restricted to designated areas, thus concentrating and limiting its impacts. The impacts of abandoned small boats being left along the refuge's small isolated lakes would be reduced.

With regard to facilities, infrastructure, and equipment, these would increase somewhat were Alternative C to be adopted and fully implemented.

Table 20. Summary of environmental effects by alternative, White River NWR

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Migratory waterfowl	Migratory waterfowl numbers unlikely to increase or decrease significantly.	Migratory waterfowl numbers likely to decline sharply with elimination of croplands and moist soil units.	Migratory waterfowl numbers likely to increase somewhat over current levels.
Wood ducks	Wood duck population and production unlikely to change.	Same as Alternative A.	Wood duck numbers and production likely to increase somewhat over current levels.
Shorebirds	Southbound shorebird numbers likely to remain the same.	Shorebird numbers would decrease due to reduction of suitable habitat like moist soil units.	Southbound shorebird numbers likely to increase somewhat.
Marsh birds	Marshbird populations in shallow water areas and moist soil units unlikely to change.	Marsh bird numbers would likely decrease slightly due to reduction of suitable habitat like moist soil units.	Numbers may possibly increase over Alternative A.
Colonial waterbirds/wading birds	Numbers of breeding and wintering colonial waterbirds would likely remain unchanged.	Same as Alternative A.	Numbers may possibly increase over Alternative A.
Forest breeding birds	Forest breeding bird populations likely to increase somewhat on average.	Reduced acreage of bottomland hardwood forest habitat in Desired Forest Conditions would probably result in somewhat reduced number and diversity of forest breeding bird species	Forest breeding bird populations likely to increase on the refuge, more than under Alternatives A and B, because of increasing amounts of forest habitat and because of forestry treatments aimed at improving habitat quality for priority bird species. Reduction of nest parasitism from BHCOs (because of reduced grazing) should improve reproductive success, and populations, of nesting neotropical songbirds on the refuge.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Threatened and endangered species	Threatened and endangered species on the refuge would continue to be protected.	T & E species less likely to thrive due to lack of information on their occurrence & distribution, and policy of avoiding active habitat manipulation under this alternative, even to benefit T & E species.	Same as Alternative A.
White-tailed deer	Deer herd likely to fluctuate in size from year to year but not follow any long-term trend.	Loss of cropland would adversely impact deer herd, but increase in browse from more early successional vegetation (scrub-shrub) would be beneficial. Net outcome uncertain over 15-year period. Over longer term, deer herd would decline as forest matures.	Same as Alternative A.
Eastern Wild Turkeys	Population of wild turkeys would likely remain about the same.	Wild turkey population would probably increase over the 15-year life of the CCP because of more forested habitats.	Same as Alternative A.
Black bears	Black bear population may increase slowly over time.	Black bear population expected to increase, and likely faster than under Alternative A.	Same as Alternative A, though population increase may be greater for while.
Furbearers	Populations of different furbearer species unlikely to change overall.	Certain furbearer species would likely increase and others would likely decrease with expected habitat changes.	Same as Alternative A.
Small game (mammals)	Populations of small game mammal species expected to remain essentially unchanged.	Relative abundance of small game mammal species expected to shift towards those species that prefer forested habitats.	Same as Alternative A.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Bats	Resident bat population expected to remain viable, although unpredictable variables like diseases (e.g., white-nose syndrome) can have pronounced effects.	Relative abundance of bats expected to shift towards those species that prefer forested habitats.	Same as Alternative A.
Non-game mammals	Abundance and diversity of non-game mammals unlikely to change.	Relative abundance of resident non-game mammals expected to shift towards those species that prefer forested habitats.	Resident non-game mammals, especially special status species, may benefit from proposed habitat management.
Reptiles and amphibians	Diverse assemblage of resident reptile and amphibian species likely to continue.	Overall species diversity likely to decrease, but populations of species favoring forest likely to increase.	Same as Alternative A.
Fisheries	Aquatic habitats and fisheries would continue largely unchanged.	Same as Alternative A.	Fisheries may benefit from hydrology restoration and management.
Open lands (levees, cropland, moist soil, lakes, ponds)	Quantity and quality of open land habitats would not change.	Moist soil units and croplands would revert to forest via succession.	Quantity and quality of open land habitats may increase somewhat.
Forested habitats	Area of forested habitats on the refuge remains the same and quality of forest habitat improves, as Desired Forest Conditions are obtained on 17% of refuge.	Area of forested habitats increases, succession leads to more mature forest, but quality of forest habitat decreases, with Desired Forest Conditions obtained on 5% of refuge.	Area of forested habitats on the refuge remains the same and quality of forest habitat improves, as Desired Forest Conditions are obtained on 40% of refuge.
Aquatic habitats	Little or no change in the quantity or quality of aquatic habitats.	Same as Alternative A.	Some improvement in the quality of aquatic habitats on the refuge.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Refuge hydrology	Hydrology continues to be dominated by off-refuge factors and forces that affect many aspects of refuge management	Same as Alternative A.	Slow but gradual progress more natural hydrograph on the White River would be beneficial for many aspects of refuge management.
Water quality (aquatic resources)	Water quality and stream impairment from turbidity, siltation, and pollution continues, though likely at a somewhat reduced level due to BMPs.	Increase in acreage of undisturbed forested riparian habitat likely results in reduced water quality and stream impairment from turbidity, siltation, and pollution.	Same as Alternative A.
Global climate change	Likely to alter refuge ecology, hydrology, flora, and fauna over the 15-year life of the plan, but difficult to predict with any precision.	Same as Alternative A.	Same as Alternative A. Also, long-term monitoring to track and assess changes and coordinate regional responses may assist adaptive management.
Cultural resources	Continue to be protected under Section 106 of the National Historic Preservation Act.	Same as Alternative A.	Preparation and implementation of a CRMP would improve both knowledge and preservation of the refuge's cultural resources.
Invasive terrestrial animals	Certain invasive terrestrial animal species gradually encroach into native communities of flora and fauna on the refuges; control efforts are only partially successful in preventing spread of invasives.	Certain invasive terrestrial animal species gradually encroach into native communities of flora and fauna on the refuges; lack of control efforts in this alternative would worsen the problem.	Database development helps refuge to systematically track occurrences and treatments of invasive terrestrial animal species; Nuisance Animal Management Plan helps slow, halt or reverse spread and its impacts on native biota.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Invasive aquatic animals	Certain invasive aquatic animal species gradually encroach into native communities of flora and fauna on the refuges; control efforts are only partially successful in preventing spread of invasives.	Certain invasive terrestrial animal species gradually encroach into native communities of flora and fauna on the refuges; lack of control efforts in this alternative would worsen the problem.	Database development helps refuge to systematically track occurrences and treatments of invasive terrestrial animal species; Nuisance Animal Management Plan helps slow, halt or reverse spread and its impacts on native biota.
Invasive plants	Certain invasive plant species gradually encroach into native communities of flora and fauna on the refuges; control efforts are only partially successful in precluding spread of invasives.	Certain invasive plant species gradually encroach into native communities of flora and fauna on the refuges; lack of control efforts in this alternative would worsen the problem.	Database development helps refuge to systematically track occurrences and treatments of invasive plant species; Invasive Plant Plan helps slow, halt or reverse spread and its impacts on native biota.
Dredge spoil disposal	Continued localized turbidity and perhaps contaminant problems from dredge disposal	Same as Alternative A.	Same as Alternative A, except that new agreement could shift location off-refuge or reduce scale of localized impacts.
Grazing	Continued grazing of White River levees continues to benefit cowbird populations at the expense of forest-nesting birds whose nests they parasitize.	Same as Alternative A.	Eliminating grazing on the levee will benefit forest-nesting birds by reducing nest parasitism by cowbirds.
Haying	Continued grazing of White River levees continues to benefit cowbird populations at the expense of forest-nesting birds whose nests they parasitize.	Same as Alternative A.	Revising haying agreement to delay mowing and/or haying until after August 1 will benefit forest-nesting birds by reducing nest parasitism by cowbirds.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Hunting	Hunting opportunities throughout refuge would generally remain the same over time.	Hunting opportunities would be similar to Alternative A for awhile but would gradually begin to diminish with disappearance of habitat diversity on the refuge as well as loss of access as roads and trails deteriorate. Interior areas of refuge may become virtually inaccessible to all but the hardiest hunters.	Hunting opportunities throughout refuge may improve somewhat from increased visitor services but also from improved habitat & more abundant game.
Commercial duck guiding	Opportunities would remain essentially unchanged. Non-guided hunters would continue to be somewhat disadvantaged.	Complete elimination of commercial duck guiding on the refuge would disadvantage guides and their clients but increase opportunities somewhat for non-guided duck hunters.	Conflicts between sport hunters and commercial guides would likely be reduced overall.
Fishing	Fishing opportunities throughout refuge would generally remain the same over time.	While the entire refuge would remain open to fishing, facilities such as ramps and campgrounds that facilitate fishing would no longer be maintained, leading to less and lower quality fishing.	Fishing opportunities and experience likely to improve.
Wildlife observation and photography	Existing opportunities for wildlife observation and photography on the refuge would not change appreciably.	Wildlife observation and photography opportunities would diminish, because of habitat succession to increasingly mature forest and reduced access due to gradual disappearance of roads and trails.	Both facilities and opportunities for wildlife observation and photography would improve.
Environmental education and outreach	Existing EE opportunities on the refuge would continue unchanged.	EE and the public benefits it provides would decrease.	EE and the public benefits it provides would increase substantially.

Issues	A. No Action Alternative (Current Management Direction)	B. Minimal Resource and Public Use Management	C. Enhanced Resource and Public Use Management (Proposed Alternative)
Interpretation	Existing interpretive opportunities on the refuge would continue unchanged.	Interpretation and the public benefits it provides (educational and pleasure) would decrease.	Interpretation and the public benefits it provides would increase substantially.
Public access	Access would remain the same.	Access would be eliminated as roads and trails are closed and/or maintenance ceases; public hunting and fishing opportunities would decrease.	Access would be somewhat curtailed in an effort to reduce costs and resource impacts, but sufficient access would remain.
Camping	Camping opportunities and facilities would remain the same.	Camping on the refuge would be eliminated, which many refuge users would view as a setback. Elimination of camping would have implications for levels of hunting and fishing and thus impacts on wildlife and fish populations.	Camping would be restricted to designated areas, concentrating and limiting its impacts.
Houseboat mooring	Gradually more restricted.	Same as Alternative A.	Same as Alternative A.
Leaving small boats on refuge	Opportunities would remain essentially unchanged.	Use would be eliminated.	Use would be reduced and better controlled.
Facilities, infrastructure, and equipment	Would be maintained as at present.	Would be drastically reduced.	Somewhat of an increase over Alternative A.

UNAVOIDABLE IMPACTS AND MITIGATION MEASURES

Under Alternative A – the No-Action Alternative – there are a number of unavoidable impacts, including law enforcement, that is not adequate for protecting any significant visitor use; inadequate water quality from contaminants and sediments; unnatural hydrology on the White River that complicates refuge management; continued degradation of the biological functions of native plant communities and wildlife habitat due to the invasion of exotic plants and nuisance animals; and a continued decrease in biodiversity. Over time, if these issues are not addressed, they would continue to impact refuge resources.

Under Alternative B – Minimal Resource and Public Use Management – the unavoidable impacts cited for Alternative A would be exacerbated. In addition, migratory bird populations would decline as a result of abandoning active forest management and eliminating cropland and moist-soil units. Public uses would suffer because maintenance of facilities would cease and access would be sharply curtailed due to the closure of roads and trails.

Alternative C, the proposed alternative, also has some unavoidable impacts. River hydrology is largely determined by multiple factors (e.g., dams, water withdrawals, and contaminants) upstream and well outside of the refuge's jurisdiction. Overall however, adverse impacts to the refuge from the actions contemplated under this alternative generally are expected to be minor and/or short-term in duration. Moreover, the refuge would attempt to minimize these impacts whenever possible. The following sections describe the measures the refuge would employ to mitigate and minimize the potential impacts that would result from implementation of the proposed alternative.

WATER QUALITY FROM SOIL DISTURBANCE AND USE OF HERBICIDES

Soil disturbance and siltation due to water management activities; road and levee maintenance; and logging and other forest management and silvicultural operations is expected to be minor and of short duration. To further reduce potential impacts, the refuge would use best management practices (BMPs) to minimize the erosion of soils into water bodies.

Foot traffic on new and extended interpretive foot trails is expected to have a negligible impact on soil erosion. To minimize the impacts from public use, the refuge would include informational signs that request trail users to remain on the trails, in order to avoid causing potential erosion problems.

Long-term herbicide use for cooperative farming and exotic plant control could result in a slight decrease in water quality in some areas. Pesticides would only be used when other alternatives are not available and will be evaluated and approved for use through the Service's Pesticide Use Proposal system. Through the proper application of herbicides, however, this is expected to have a minor impact on the environment, with the benefit of reducing or eliminating nuisance and exotic plant infestations.

WILDLIFE DISTURBANCE

Disturbance to wildlife is an unavoidable consequence of any public use program, regardless of the activity involved. While some activities such as wildlife observation may be less disturbing than others, all of the public use activities proposed under the proposed alternative would be planned to avoid unacceptable levels of impact.

The known and anticipated levels of disturbance from the proposed alternative are not considered to be significant. Nevertheless, the refuge will manage public use activities to reduce impacts. Providing access for fishing opportunities allows the use of a renewable natural resource without

adversely impacting other resources. Hunting would also be managed with restrictions that ensure minimal impact on other resources. General wildlife observation may result in minimal disturbance to wildlife. If the refuge determines that impacts from the expected additional visitor uses are above the levels that are anticipated, those uses will be discontinued, restricted, or rerouted to other less sensitive areas.

VEGETATION DISTURBANCE

Negative impacts could result from the creation, extension, and maintenance of trails that require the clearing of non-sensitive vegetation along their length. This is expected to be a minor short-term impact.

Increased visitor use may increase the potential for the introduction of new exotic species into areas when visitors do not comply with boating regulations at the boat ramps and other access points, or with requests to stay on trails. The refuge would minimize this impact by enforcing the regulations for access to the refuge's water bodies, and by installing informational signs that request users to stay on the trails.

Forest harvesting and silvicultural operations are essential in managing forest habitat for the benefit of wildlife. However, vegetation can be inadvertently damaged in pursuing these activities. The refuge's forestry staff will ensure that all contracted forest management and harvesting activities properly and thoroughly implement standard forestry BMPs.

USER GROUP CONFLICTS

As public use increases, unanticipated conflicts between different user groups could occur. If this should happen, the refuge would adjust its programs, as needed, to eliminate or minimize any public use issues. The refuge would use methods that have proven to be effective in reducing or eliminating public use conflicts. These methods include establishing separate use areas, different use periods, and limits on the numbers of users in order to provide safe, quality, appropriate, and compatible wildlife-dependent recreational opportunities.

EFFECTS ON ADJACENT LANDOWNERS

Implementation of the proposed alternative is not expected to negatively affect the owners of private lands adjacent to the refuge. Positive impacts that would be expected include higher property values, less intrusion of invasive exotic plants, and increased opportunities for viewing more diverse wildlife.

However, some negative impacts that may occur include a higher frequency of trespass onto adjacent private lands, and noise associated with increased traffic. To minimize these potential impacts, the refuge would provide informational signs that clearly mark refuge boundaries; maintain the refuge's existing parking facilities; use law enforcement; and provide increased educational efforts at the visitor center.

LAND OWNERSHIP AND SITE DEVELOPMENT

Land acquisition efforts by the Service could lead to changes in land use and recreational use patterns. However, most of the non-Service-owned lands within the refuge's approved acquisition boundary are currently undeveloped. If these lands are acquired as additions to the refuge, they would be maintained in a natural state, managed for native wildlife populations, and opened to wildlife-compatible public uses, where feasible.

Potential development of the refuge's buildings, trails, and other improvements could lead to minor short-term negative impacts on plants, soils, and some wildlife species. When building any new kiosks, photography blinds or fishing piers, efforts would be made to use recycled products and environmentally sensitive treated lumber. All construction activities would comply with the requirements of Section 404 of the Clean Water Act; the National Historic Preservation Act; Executive Order 11988, Floodplain Management; and other applicable regulatory requirements.

CUMULATIVE IMPACTS

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

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

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

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

Nevertheless, because of concerns expressed about the cumulative effects of hunting on other refuges in the Southeast, this section analyzes and discusses in some detail the cumulative impacts of the hunting program of each alternative on a variety of resources at White River NWR.

ANTICIPATED IMPACTS ON WILDLIFE SPECIES

Migratory Birds

The Service annually prescribes frameworks, or outer limits, for dates and times when hunting may occur and the number of birds that may be taken and possessed. These frameworks are necessary to allow state selections of season and limits for recreation and sustenance; aid federal, state, and tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which states may select season dates, bag limits, shooting hours, and other options for the each migratory bird hunting season.

The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, federal annual regulations both allow and limit the hunting of migratory birds.

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any ... bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to “the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds,” and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the Service as the lead federal agency for managing and conserving migratory birds in the United States. Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four flyways for the primary purpose of managing migratory game birds. Each flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each state and province in that flyway. White River NWR is within the Mississippi Flyway.

The process for adopting migratory game bird hunting regulations, located in 50 CFR 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule making process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulations-development schedules, based on "early" and "late" hunting season regulations. Early hunting seasons pertain to all migratory game bird species in Alaska, Hawaii, Puerto Rico, and the U.S. Virgin Islands; migratory game birds other than waterfowl (e.g., dove, woodcock); and special early waterfowl seasons, such as teal or resident Canada geese. Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl seasons not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to flyway councils and other interested parties (USFWS 2006).

Under each of the three alternatives, including the proposed action, sanctuary areas – closed to waterfowl hunting – would constitute at least 60 percent of the refuge. High waterfowl harvest rates and hunting activity in Arkansas make sanctuary a critically important function of Arkansas refuges. Activities such as maintaining body temperature, searching for food and roost sites, avoiding disturbance, molting, courtship, and pair bonding are energy consuming activities for waterfowl in winter. The assumed interaction between disturbance, energetic costs and low survival can at least partially be mitigated by sanctuary where waterfowl can rest and perform these activities with a minimum of interruption. Sanctuary or refuge is critical for waterfowl to conserve energy to survive the winter period and conduct activities preparatory to perform other life functions, particularly reproduction.

Due to its strategic location in the heavily hunted MAV, coupled with the ability of the refuge to manage for a concentrated source of high-quality waterfowl food resources, White River NWR provides critically important waterfowl sanctuaries. These established sanctuaries must remain in place in order to provide areas free from disturbance to wintering waterfowl.

The bottomland hardwoods in the Lower White River ecosystem are historically important to waterfowl, especially wintering mallards and wood ducks and breeding wood ducks and hooded mergansers. Under the proposed alternative, the refuge proposes to implement the following strategies:

- Maintain intensive food production areas (moist-soil impoundments and agricultural fields) as inviolate sanctuaries and restrict access to these areas to necessary management activities during waterfowl hunting seasons.
- Keep established (traditional) sanctuaries in place.
- Explore and evaluate the establishment of non-waterfowl hunting areas throughout the refuge, distributed in relatively large blocks (at least 2,000 acres configured with minimal border/interior ratios) along the length of the White River.
- Maintain at least 60 percent of the refuge in non-waterfowl hunting area.
- Restrict access in these refuge sanctuary areas by regular enforcement throughout waterfowl hunting seasons.
- Provide daily temporal refuge in all areas of the refuge by restricting waterfowl hunting to morning only hunting in authorized hunting areas.
- Establish a no-entry policy for these areas after 1 p.m. or some reasonable time.
- Reevaluate access points and routes for hunting and fishing areas to reduce disturbance to interior bottomland hardwood areas, sanctuaries, and key resources.

The generally healthy condition of waterfowl populations along the Mississippi Flyway in recent years supports the conclusion that waterfowl hunting at White River NWR is not contributing to any cumulative adverse impact on waterfowl populations in either Arkansas or the Mississippi Flyway.

Because the Service is required to take abundance of migratory birds and other factors in to consideration, the Service undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, state, and provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of state and federal governments. After Service establishment of final frameworks for hunting seasons, the states may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the federal frameworks but never more liberal. Season dates and bag limits for national wildlife refuges open to hunting are never longer or larger than the state regulations. In fact, based upon the findings of an environmental assessment developed when a national wildlife refuge opens a new hunting activity, season dates and bag limits may be more restrictive than the state allows.

NEPA considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, ‘‘Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88– 14),’’ filed with the Environmental Protection Agency on June 9, 1988. We published a notice of availability in the *Federal Register* on June 16, 1988 (53 FR 22582), and our Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate, tiered environmental assessment, “Duck Hunting Regulations for [YEAR],” and associated findings of no significant impact (FONSI). Further, in a notice published in the September 8, 2005, *Federal Register* (70 FR 53376), the Service announced its intent to develop a new Supplemental

EIS for the migratory bird hunting program. More information may be obtained from: Chief, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NWR, Washington, DC 20240.

Resident Big Game

Deer

The white-tailed deer is the most popular game species on the refuge. Deer hunting has a long history here. It began in 1956, with the first archery deer hunt and in 1961 for the first gun deer hunt. The refuge was one of the first tracts of public land in the southeastern United States to implement either sex deer hunting, which was very controversial at that time. In 1974, the refuge implemented the first muzzleloader deer hunt, and in an effort to increase interest in this aspect of the sport, sponsored black powder shooting demonstrations and contests at the Chute Bridge.

From 1961 through 1992, refuge deer hunts were managed under a single management unit. However, with the acquisition of the Potlatch lands in 1992, the refuge was subjectively divided at Hwy 1 to define the separate North and South Units. Management of the two units varied. The South Unit was managed in accordance with existing regulations while the North Unit was to have more liberal seasons until such time as greater information was available on current practices and biological requirements of the area. Since acquisition, the additional bucks-only deer hunts on the North Unit have gradually been reduced, and in 2007, only four additional days were allowed. Archery season continues to be open one month longer on the North Unit than on the South.

In many areas of the South Unit, the forest canopy has become closed, limiting the amount of available browse and reducing carrying capacity of the habitat for deer. By continuing to implement the refuge's Forest Habitat Management Plan, particularly as it relates to providing habitat needs of priority forest-dwelling nongame birds, conditions will be enhanced for maintaining a large, healthy deer population as well. Such active management will provide a diversity and abundance of understory, midstory, and overstory stand components (i.e., complex forest stand structure) to meet the needs of a variety of non-game forest birds and resident wildlife, including black bear and deer.

In general, refuge management reviews the deer harvest to guide future management decisions. The deer hunting program is conducted within state season frameworks but the hunt may be shorter than corresponding State seasons. Even under the hunting pressure to which they are subjected on and off refuge, deer continue to be abundant on the refuge, utilizing the diversity of habitats. The annual harvest has fluctuated from year to year, but generally not trended downward in more than half a century of hunting. Thus, continuation of deer hunting on refuge lands should not have negative cumulative impacts on the area's and state's deer herd and may be beneficial for habitats.

Wild Turkey

The refuge holds a spring (gobbler) hunt annually. The entire refuge is open concurrent with the statewide season. At this time the greatest concentration of turkeys are found at Jacks Bay, Alligator Lake, and the Levee. Prior to the 2008 flood, it appeared that the turkey harvest had leveled off but the flock is totally influenced by river levels.

Service biologists believe the turkey population can support the current level of hunting pressure, as judged by continuing high turkey populations. The refuge would continue to manage its turkey hunts in such a manner as to avoid cumulative adverse effects on turkey numbers.

Resident Small Game

The refuge allows hunting of resident small game, including furbearers, squirrels, rabbits, and bullfrogs. Furbearers include the opossum, raccoon, striped skunk, river otter, beaver, mink, muskrat, nutria, red fox, gray fox, coyote, and bobcats. Hunting effort for furbearers has remained relatively steady over the years. By far the most popular small game hunting on the refuge is for squirrel.

The refuge has both swamp and cottontail rabbits but their numbers are low. Hunting seasons for these species run concurrent with squirrel hunting. At this time there are no data on actual numbers harvested.

Refuge management believes small game populations can support the current modest, controlled hunting pressure they receive. The refuge would continue to manage small game hunts in such a manner as to avoid cumulative adverse effects on populations of small game species.

Nongame Wildlife

Nongame or non-hunted wildlife would include non-hunted migratory birds such as songbirds, wading birds, raptors, and woodpeckers; small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, skinks, turtles, lizards, salamanders, frogs and toads; and invertebrates such as butterflies, moths, other insects and spiders. Except for migratory birds and some species of migratory bats, butterflies and moths, these species have very limited home ranges and hunting could not affect their populations regionally; thus, only local effects will be discussed.

Hypothetically, disturbance to non-hunted migratory birds could have regional, local, and flyway effects. (Regional and flyway effects would not be applicable to species that do not migrate such as most woodpeckers, and some songbirds including cardinals, titmice, wrens, chickadees, etc.) However, the cumulative effects of disturbance to non-hunted migratory birds under the proposed action are expected to be negligible for the following reasons. Except for the spring turkey season, hunting seasons would not coincide with the nesting season. Long-term future impacts that could occur if reproduction was reduced by hunting are not relevant for this reason. Disturbance to the daily wintering activities of birds, such as feeding and resting, might occur. Disturbance to birds by hunters would probably be commensurate with that caused by non-consumptive users. The cumulative effects of disturbance to non-hunted migratory birds under the proposed action are expected to be small for the above reasons.

With regard to other wildlife, disturbance would be unlikely for the following reasons. Small mammals, including bats, are inactive during winter when hunting season occurs (with the exception of the spring turkey season). These species are also nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Hibernation or torpor by cold-blood reptiles and amphibians also limits their activity during the hunting season when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season. Encounters with reptiles and amphibians in the early fall are few and should not have cumulative negative effects on reptile and amphibian populations. Invertebrates are also not active during cold weather and would have few interactions with hunters during the hunting season. Refuge regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles are restricted to roads and the harassment or taking of any wildlife other than the game species legal for the season is not permitted.

Some species of bats, butterflies and moths are migratory. Cumulative effects to these species at the "flyway" level should be negligible. These species are in torpor or have completely passed through central Arkansas by peak hunting season in November-January. Some hunting occurs during August through October when these species are migrating; however, hunter interaction with bats would be commensurate with that of non-consumptive users, which is minimal.

Threatened and Endangered Species

There are four federally endangered species expected to occur within the refuge: interior least tern, ivory-billed woodpecker, and pink mucket and fat pocketbook mussels.

An Intra-Service Section 7 evaluation under the Endangered Species Act is included as Appendix G in this Draft CCP-EA. It concludes that the proposed action would have no effect on these listed species. While some of these species may occur on the refuge, hunters are unlikely to mistake them for geese, ducks, turkeys, deer, squirrels, or rabbits. The cumulative adverse impact on listed species would be negligible, comparable to that caused by anglers, boaters and non-consumptive users.

ANTICIPATED IMPACTS ON REFUGE PROGRAMS, FACILITIES, CULTURAL RESOURCES, ENVIRONMENTAL JUSTICE, ENVIRONMENTAL RESOURCES, AND SURROUNDING COMMUNITIES

Wildlife-Dependent Recreation

If public use levels expand over time, unanticipated conflicts between user groups may occur on the refuge. The refuge's visitor use programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities. Over the years, experience at many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of hunting on other wildlife-dependent recreation on White River NWR would be negligible to minor.

Refuge Facilities

The Service defines facilities as: "Real property that serves a particular function(s) such as buildings, roads, utilities, water control structures, raceways, etc." Those facilities most utilized by hunters are roads, parking lots, trails and boat launching ramps. Maintenance or improvement of existing facilities (i.e., parking areas, roads, trails, and boat ramps) would cause minimal short-term impacts to localized soils and waters and may cause some wildlife disturbances and damage to vegetation. The facility maintenance and improvement activities described are periodically conducted to accommodate daily refuge management operations and general public uses such as wildlife observation and photography. These activities would be conducted at times (seasonal and/or daily) to cause the least amount of disturbance to wildlife. Siltation barriers will be used to minimize soil erosion, and all disturbed sites will be restored to as natural a condition as possible. During times when roads are impassible due to flood events or other natural causes those roads, parking lots, trails and boat ramps impacted by the event would be closed to vehicular use.

Overall, the cumulative impact of hunting on the facilities at White River NWR would be negligible.

Cultural Resources

Hunting, regardless of method or species targeted, is a consumptive activity that does not pose any threat to historic properties on or near the refuge. In fact, hunting meets only one of the two criteria used to identify an “undertaking” that triggers a federal agency’s need to comply with Section 106 of the National Historic Preservation Act. These criteria, which are delineated in 36 CFR Part 800, state:

1. an undertaking is any project, activity, or program that can alter the character or use of an archaeological or historic site located within the “area of potential effect;” and
2. the project, activity, or program must also be either funded, sponsored, performed, licensed, or have received assistance from the agency.

Consultation with the pertinent State Historic Preservation Offices and federally recognized tribes are, therefore, not required.

Environmental Justice

Executive Order 12898 "Federal Actions to address Environmental Justice in Minority Populations and Low-income Populations" was signed by President Bill Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations to achieve environmental protection of all communities. In part the order intended to promote nondiscrimination in federal programs substantially affecting human health and the environment and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

There are low-income and minority populations in the area but there is no evidence of adverse disproportionate environmental justice issues associated with the refuge’s existing or proposed hunting programs. Any affected populations would generally be affected in the same ways as the regional population as a whole.

Environmental Resources

We expect no appreciable adverse impacts of the proposed action on refuge environments, which consist of soils, vegetation, air quality, water quality and solitude. Some disturbance to surface soils and vegetation would occur in areas selected for hunting; however impacts would be minor and localized. Litter left behind by hunters would also be expected, although unlike the litter associated with fishing, which often concentrates near or at certain heavily fished locations, litter from hunters is likely to be more widely dispersed and therefore less conspicuous. Hunting would be expected to benefit vegetation, since it is used to maintain many resident wildlife populations, particularly deer, in balance with the habitat’s carrying capacity. When and where necessary, the refuge would also control access or close areas to minimize habitat degradation.

The refuge expects impacts to air and water quality to be minimal and only due to refuge visitors’ automobile and outboard motor emissions. The effect of these refuge-related activities, as well as other management activities, on overall air and water quality in the region are anticipated to be negligible, compared to the contributions of industrial centers, power plants, and non-refuge vehicle traffic in this part of Arkansas. Existing state water quality criteria and use classifications are adequate to achieve desired on-refuge conditions; thus, implementation of the proposed action and alternatives would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws.

Overall, negative impacts on solitude are expected to be minor, given time and space zone management techniques, such as seasonal access and area closures, used to avoid conflicts among user groups. However, at those times (less than one-quarter of the year) when the refuge is being heavily hunted, those users seeking solitude rather than game may be disappointed and want to avoid the refuge.

Surrounding Communities

The refuge would cooperate with state, federal, and private partners to minimize adverse impacts on adjacent lands and their natural resources. The nature of impacts on surrounding communities is less cumulative than it is long-running and persistent. Hunting is generally popular in this part of rural Arkansas, but it can contribute to certain conflicts with adjacent landowners. Yet many residents in the wider area and neighboring communities are likely to view continued hunting opportunities favorably. The refuge expects continuing visitation and tourism, some of it due to hunting, to generate revenues to local communities, but this spending would be very small in comparison with the size of the local economy.

Any concerns of neighboring landowners can best be addressed through increased education and enforcement, which are contemplated under each of the alternatives.

DIRECT AND INDIRECT EFFECTS OR IMPACTS

Direct effects are caused by an action and occur at the same time as the action. Indirect effects are caused by an action but are manifested later in time or further removed in distance, but still reasonably foreseeable.

The actions proposed for implementation under the proposed alternative include facility development, wildlife and population management, resource protection, public use, and administrative programs. These actions would result in both direct and indirect effects. Facility development, for example, would most likely lead to increased public use, a direct effect; and it, in turn, would lead to indirect effects such as increased littering, noise, and vehicular traffic.

Other indirect effects that may result from implementing the proposed alternative include minor impacts from siltation due to the disturbance of soils and vegetation while expanding the water control structures, as well as expanding or creating new foot trails; construction of the observation tower and visitor center; and providing greater visitor access through improvements to the boat ramps.

SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The habitat protection and management actions proposed under the proposed alternative are dedicated to maintaining the long-term productivity of refuge habitats. The benefits of this plan for long-term productivity far outweigh any impacts from short-term actions, such as the construction of boat ramps, kioks, photography blinds, or creation of new trails. While these activities would cause short-term negative impacts, the educational values and associated public support gained from the improved visitor experience would produce long-term benefits for the refuge’s entire ecosystem.

The key to protecting and ensuring the refuge’s long-term productivity is to find the threshold where public uses do not degrade or interfere with the refuge’s natural resources. The plans proposed under the proposed alternative have been carefully conceived to achieve that threshold. Therefore, implementing the proposed alternative would lead to long-term benefits for wildlife protection and land conservation that far outweigh any short-term impacts.

V. Consultation and Coordination

This chapter summarizes the consultation and coordination that has occurred to date in identifying the issues, alternatives, and proposed alternative, which are presented in this Draft CCP/EA. It lists the meetings that have been held with the various agencies, organizations, and individuals who were consulted in the preparation of the Draft CP/EA.

The following meetings, contacts, and presentations were undertaken by the Service during the preparation of the Draft CCP/EA:

Prior to public scoping in 2009, a Biological Review and a Visitor Services Review were conducted. In August 2008, a diverse team of some 22 federal and state personnel undertook a comprehensive review of habitat and wildlife management programs at the refuge. The team then considered how the refuge might fit into achieving a number of relevant regional and system-wide and landscape conservation needs. The Biological Review team included staff from the refuge, as well as Service fish and wildlife biologists from the Regional Office as well as the Division of Ecological Services and Division of Migratory Birds. In addition, wildlife biologists from the Arkansas Game and Fish Commission, U.S. Forest Service, and Arkansas Natural Heritage Commission, and Ducks Unlimited participated. The team's recommendations were set forth in its final report entitled, *White River National Wildlife Refuge Biological Review*, and will be instrumental in the planning process.

The Visitor Services Review was conducted in 2008 by Service public use and outreach specialists. The review team toured the refuge, identified and discussed the current status of public use programs, and debated the pros and cons of various recommendations for enhancing and improving these programs.

The comprehensive conservation plan core planning team, which consists of the refuge manager, deputy refuge manager, refuge forester, refuge biologist, law enforcement officer, visitor services manager, and a contractor with experience in comprehensive conservation planning met for the first time in March 2009, for an initial tour of the refuge and an overview of its habitat and wildlife resources and public use programs, facilities, and opportunities. The core planning team also conducted additional internal scoping and prepared a preliminary schedule and plans for public involvement. The core team developed a mailing list of the public, landowners, state and tribal agencies, non-profit organizations, and local governments. Letters were sent notifying these parties of the planning process being initiated, and encouraging their participation in the scoping of issues in preparation for developing the draft plan for this refuge.

External (public) and additional internal scoping were conducted in June 2009. Three public meetings were held in three towns near different parts of the refuge:

- Phillips Community College in Helena, AR
- Clarendon City Hall in Clarendon, AR
- Phillips Community College in DeWitt, AR.

Each of these scoping meetings consisted of presentations by Service personnel and gave attendees the opportunity to make comments orally or in writing. These comments are shown in Section A, Chapter III.

Appendix A. Glossary

Adaptive Management: Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in a management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alluvial: Sediment transported and deposited in a delta or riverbed by flowing water.

Alternative: 1. A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2). 2. Alternatives are different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1.6B).

Anadromous: Migratory fishes that spend most of their lives in the sea and migrate to fresh water to breed.

Biological Diversity: The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as biodiversity.

Carrying Capacity: The maximum population of a species able to be supported by a habitat or area.

Categorical Exclusion: A category of actions that does not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

CFR: Code of Federal Regulations.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge [50 CFR 25.12 (a)]. A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

Comprehensive Conservation Plan:	A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (Service Manual 602 FW 1.6 E).
Concern:	See Issue
Cover Type:	The present vegetation of an area.
Cultural Resource Inventory:	A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).
Cultural Resource Overview:	A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field office's background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).
Cultural Resources:	The remains of sites, structures, or objects used by people in the past.
Designated Wilderness Area:	An area designated by the U.S. Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).
Disturbance:	Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).
Ecosystem:	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
Ecosystem Management:	Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and basic ecosystem processes are perpetuated indefinitely.

Endangered Species (Federal):	A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
Endangered Species (State):	A plant or animal species in danger of becoming extinct or extirpated in the state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.
Environmental Assessment (EA):	A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).
Environmental Impact Statement (EIS):	A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).
Estuary:	The wide lower course of a river into which the tides flow. The area where the tide meets a river current.
Finding of No Significant Impact (FONSI):	A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).
Goal:	Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Service Manual 620 FW 1.6J).
Habitat:	Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.
Habitat Restoration:	Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.
Habitat Type:	See Vegetation Type.
Improvement Act:	The National Wildlife Refuge System Improvement Act of 1997.
Informed Consent:	The grudging willingness of opponents to “go along” with a course of action that they actually oppose (Bleiker).

Issue:	Any unsettled matter that requires a management decision [e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or other presence of an undesirable resource condition (Service Manual 602 FW 1.6K)].
Management Alternative:	See Alternative
Management Concern:	See Issue
Management Opportunity:	See Issue
Migration:	The seasonal movement from one area to another and back.
Mission Statement:	Succinct statement of the unit's purpose and reason for being.
Monitoring:	The process of collecting information to track changes of selected parameters over time.
National Environmental Policy Act of 1969 (NEPA):	Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision-making (40 CFR 1500).
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57):	Under the Refuge Improvement Act, the Fish and Wildlife Service is required to develop 15-year comprehensive conservation plans for all national wildlife refuges outside Alaska. The Act also describes the six public uses given priority status within the Refuge System (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation).
National Wildlife Refuge System Mission:	The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
National Wildlife Refuge System:	Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management areas; or waterfowl production areas.

National Wildlife Refuge:	A designated area of land, water, or an interest in land or water within the Refuge System.
Native Species:	Species that normally live and thrive in a particular ecosystem.
Noxious Weed:	A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (P.L. 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.
Objective:	A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).
Plant Association:	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.
Plant Community:	An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.
Preferred Alternative:	This is the alternative determined (by the decision-maker) to best achieve the refuge purpose, vision, and goals; contribute to the Refuge System mission, address the significant issues; and is consistent with principles of sound fish and wildlife management.
Prescribed Fire:	The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May occur from natural ignition or intentional ignition.
Priority Species:	Fish and wildlife species that require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.
Public Involvement Plan:	Broad long-term guidance for involving the public in the comprehensive conservation planning process.

Public Involvement:	A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.
Public:	Individuals, organizations, and groups; officials of federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.
Purposes of the Refuge:	"The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit." For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (Service Manual 602 FW 106 S).
Recommended Wilderness:	Areas studied and found suitable for wilderness designation by both the Director of the Fish and Wildlife Service and the Secretary of the Department of the Interior, and recommended for designation by the President to Congress. These areas await only legislative action by Congress in order to become part of the Wilderness System. Such areas are also referred to as "pending in Congress" (Draft Service Manual 610 FW 1.5).
Record of Decision (ROD):	A concise public record of decision prepared by the federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).
Refuge Goal:	See Goal
Refuge Purposes:	See Purposes of the Refuge
Songbirds: (Also Passerines)	A category of birds that is medium to small, perching landbirds. Most are territorial singers and migratory.
Step-down Management Plan:	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, and safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).

Strategy:	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).
Study Area:	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP, the study area includes the lands within the currently approved refuge boundary and potential refuge expansion areas.
Threatened Species (Federal):	Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Threatened Species (State):	A plant or animal species likely to become endangered in the state within the near future if factors contributing to population decline or habitat degradation or loss continue.
Tiering:	The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).
U.S. Fish and Wildlife Service Mission:	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.
Unit Objective:	See Objective
Vegetation Type, Habitat Type, Forest Cover Type:	A land classification system based upon the concept of distinct plant associations.
Vision Statement:	A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 602 FW 1.6 Z).

Wilderness Study Areas: Lands and waters identified through inventory as meeting the definition of wilderness and undergoing evaluation for recommendation for inclusion in the Wilderness System. A study area must meet the following criteria:

- Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
- Has outstanding opportunities for solitude or a primitive and unconfined type of recreation; and
- Has at least 5,000 contiguous roadless acres or is sufficient in size as to make practicable its preservation and use in an unimpaired condition (Draft Service Manual 610 FW 1.5).

Wilderness: See Designated Wilderness

Wildfire: A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildland Fire: Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3

ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
ADEQ	Arkansas Department of Environmental Quality
AFC	Arkansas Forestry Commission
AGFC	Arkansas Game and Fish Commission
AIRFA	American Indian Religious Freedom Act
ANHC	Arkansas Natural Heritage Commission
ANRC	Arkansas Natural Resources Commission
ARPA	Archeological Resources Protection Act
ASSHTO	American Association of State Highway and Transportation Officials
ASU	Arkansas State University
ASWCC	Arkansas Soil and Water Conservation Commission
ATV	All-Terrain Vehicle
AWAP	Arkansas Wildlife Action Plan
BCC	Birds of Conservation Concern
BHCO	Brown-headed Cowbird
BLH	Bottom Land Hardwood
BMP	Best Management Practice
BP	before present
BRT	Biological Review Team
CCC	Civilian Conservation Corps
CCP	Comprehensive Conservation Plan
CFHI	Continuous Forest Habitat Inventory
CFR	Code of Federal Regulations
cfs	cubic feet per second
COE	Army Corps of Engineers
dbh	Diameter at breast height (in measurement of trees)
DDT	dichlorodiphenyltrichloroethane
DED	Duck Energy Day
DFC	Desired Future Conditions
DOI	Department of the Interior
DU	Ducks Unlimited
DUD	Duck Use Day
EA	Environmental Assessment
EE	environmental education
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPI	Equipment Priority Index
ESA	Endangered Species Act
FHMP	Forested Habitat Management Plan
FHWA	Federal Highway Administration
FMP	Fire Management Plan
FR	Federal Register
FRCWG	Forest Resources Conservation Working Group
FTE	full-time equivalent
FWS	U.S. Fish and Wildlife Service (also Service)
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
GTR	Green-tree Reservoir

IBWO	Ivory-Billed Woodpecker
IMP	Inventory and Monitoring Plan
LMDA	Land Management Demonstration Area
LMRE	Lower Mississippi River Ecosystem
LMV	Lower Mississippi Valley
LMVJV	Lower Mississippi Valley Joint Venture
MAV	Mississippi Alluvial Valley
MBTA	Migratory Bird Treaty Act
MMS	Management Maintenance System
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NABCI	North American Bird Conservation Initiative
NAWMP	North American Waterfowl Management Plan
NCTC	National Conservation Training Center
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NGO	Non-Governmental Organization
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
OCP	organochlorine pesticide
PEC	probably effect concentration
PFT	Permanent Full Time
PIF	Partners in Flight
PUNA	Public Use Natural Area
PUP	Pesticide Use Proposal
RM	Refuge Manual
RNA	Research Natural Area
ROD	Record of Decision
RONS	Refuge Operating Needs System
ROW	right-of-way
RRP	Refuge Roads Program
SAMMS	Service Asset Maintenance Management System (SAMMS)
SGCN	Species of Greatest Conservation Need
SUP	Special Use Permit
TFT	Temporary Full Time
TNC	The Nature Conservancy
VSM	Visitor Services Manager
WMA	Wildlife Management Area
USC	United States Code
USFWS	U.S. Fish and Wildlife Service (also Service)

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Appendix C. Relevant Legal Mandates and Executive Orders

Several procedural and substantive requirements of federal and applicable state and local laws and regulations affect refuges. The key laws, treatises, conventions, and executive orders are listed.

Lacey Act (1900), as amended
Antiquities Act (1906)
Weeks-McLean Law (1913)
Canadian United States Migratory Bird Treaty (Convention between the United States and Great Britain for Canada for the Protection of Migratory Birds) (1916)
Migratory Bird Treaty Act (1918 and 1978)
Migratory Bird Conservation Act (1929), as amended
Migratory Bird Hunting and Conservation Stamp Act (1934)
Fish and Wildlife Coordination Act (1934), as amended
Historic Sites Act (1935)
Refuge Revenue Sharing Act (1935), as amended
Convention between the United States of America and the Mexican States for the Protection of Migratory Birds and Game Animals (1936)
Federal Aid in Wildlife Restoration Act, as amended (1937)
Bald and Golden Eagle Protection Act (1940), as amended
Convention of Nature Protection and Wildlife Preservation in the Western Hemisphere (1940)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1943)
Flood Control Act (1944), as amended
Transfer of Certain Real Property for Wildlife Conservation Purposes Act (1948)
Refuge Trespass Act (1948)
Federal Property and Administrative Services Act (1949), as amended
Federal Aid in Fish Restoration Act (1950)
Fish and Wildlife Act (1956), as amended
Waterfowl Depredations Prevention Act, as amended (1956)
Fish and Wildlife Coordination Act (1958)
Cooperative Research and Training Units Act (1960)
Wetlands Loan Act (1961)
Refuge Recreation Act (1962), as amended
Water Resources Planning Act (1962), as amended
Refuge Revenue Sharing Act (1964), as amended
Wilderness Act (1964)
Land and Water Conservation Fund Act (1965), as amended
National Wildlife Refuge System Administrative Act (1966)
National Historic Preservation Act (1966)
Feedom of Information Act (1967)
Architectural Barriers Act (1968)
National Trails System Act (1968)
Wild and Scenic Rivers Act (1968)
National Environmental Policy Act (1969)
Executive Order 11514, Protection and Enhancement of Environmental Quality (1970)
Executive Order 11593, Protection and Enhancement of the Cultural Environment (1971)
Clean Water Act (1972)
Convention on Wetlands of International Importance (1972)

Executive Order 11644 - Use of Off-road Vehicles on Public Lands (1972), as amended (Executive Order 11989, 1977)
Federal Environmental Pesticide Control Act (1972), as amended
Federal Water Pollution Control Act Amendments (1972), as amended
Endangered Species Act (1973), as amended
Rehabilitation Act (1973)
Archaeological and Historic Preservation Act (1974)
Environmental Education Act (1975)
Federal Land Policy Management Act (1976)
Clean Air Act (1977), as amended
Clean Water Act (1977)
Executive Order 11988, Floodplain Management and Wetlands Preservation (1977)
Executive Order 11989, Use of Off-road Vehicles on Public Lands (1977)
Executive Order 11990, Protection of Wetlands (1977)
Fish and Wildlife Improvement Act (1978)
American Indian Religious Freedom Act (1978)
Archaeological Resources Protection Act (1979)
Administrative Procedures Act (1979)
Fish and Wildlife Conservation Act (1980)
Executive Order 12372 - Intergovernmental Review of Federal Programs (1982)
The Food Security Act (1985)
Emergency Wetlands Resources Act (1986)
North American Wetlands Conservation Act (1989)
Federal Noxious Weed Act (1990)
Native American Graves Protection and Repatriation Act (1990)
Americans with Disabilities Act (1992)
Wild Bird Conservation Act (1992)
Executive Order 12898, Environmental Justice in Minority Populations and Low-income Populations (1994)
Secretarial Order 3127 (602 DM 2), Contaminants and Hazardous Waste Determination (1995)
Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)
Executive Order 13007, Indian Sacred Sites (1996)
National Refuge System Improvement Act (1997) (and subsequent policies)
Executive Order 13084, Consultation and Coordination with Indian Tribal Governments (1998)

Appendix D. Public Involvement

PRE-PLANNING

Prior to public scoping in 2009, a Biological Review and a Visitor Services Review were conducted. In August 2008, a diverse team of some 22 federal and state personnel undertook a comprehensive review of habitat and wildlife management programs at the refuge. The team then considered how the refuge might fit into achieving a number of relevant regional and system-wide and landscape conservation needs. The Biological Review team included staff from the refuge, as well as Service fish and wildlife biologists from the Regional Office as well as the Division of Ecological Services and Division of Migratory Birds. In addition, wildlife biologists from the Arkansas Game and Fish Commission, U.S. Forest Service, and Arkansas Natural Heritage Commission, and Ducks Unlimited participated. The team's recommendations were set forth in its final report entitled, *White River National Wildlife Refuge Biological Review*, and will be instrumental in the planning process.

The Visitor Services Review was conducted in 2008 by Service public use and outreach specialists. The review team toured the refuge, identified and discussed the current status of public use programs, and debated the pros and cons of various recommendations for enhancing and improving these programs.

The comprehensive conservation plan core planning team, which consists of the refuge manager, deputy refuge manager, refuge forester, refuge biologist, law enforcement officer, visitor services manager, and a contractor with experience in comprehensive conservation planning met for the first time in March 2009, for an initial tour of the refuge and an overview of its habitat and wildlife resources and public use programs, facilities, and opportunities. The core planning team also conducted additional internal scoping and prepared a preliminary schedule and plans for public involvement. The core team developed a mailing list of the public, landowners, state and tribal agencies, non-profit organizations, and local governments. Letters were sent notifying these parties of the planning process being initiated, and encouraging their participation in the scoping of issues in preparation for developing the draft plan for this refuge.

External (public) and additional internal scoping were conducted in June 2009. Three public meetings were held in three towns near different parts of the refuge.

PUBLIC INVOLVEMENT AND PLANNING PROCESS

Three public scoping meetings were held – in Helena, Clarendon, and DeWitt – on June 2, 3, and 4, 2009, respectively. These locations provided geographic proximity to different segments of this long refuge. The scoping meetings introduced the Draft CCP/EA to the public and allowed the Service to receive input, perspectives, and comments as to the issues, concerns, and opportunities that the public feels should be addressed. The following bullet points summarize the issues raised orally by the public at these meetings, and later, in written comments received as emails, faxes, letters, and on comment forms.

SUMMARY OF PUBLIC SCOPING COMMENTS

WILDLIFE AND FISH POPULATION AND HABITAT MANAGEMENT

- Raise the water level of the Graham Burke Pumping Station during the duck season; holding the water at or above 145 ft. 6 inches would help tremendously
- High water levels after the crops have been harvested and during the duck hunting season, and lowering the water level after duck season would greatly enhance duck hunting, provide waterfowl rest areas and not harm anybody
- Habitat and timber management plans are adequate
- Intensify forest management
- Timber management is important, but don't construct permanent bridges and new gravel roads
- Keep the refuge a remote, difficult to access place for wildlife; control wildlife to people ratio
- Control travel associated with timber management; keep limited access to points within the refuge
- The refuge is for wildlife

PUBLIC USE

- Role of duck hunting guides
- Commercial waterfowl permits are very underpriced; a guide has the potential to have his permit paid for in one day; in few businesses is the cost of doing business so low
- Guides should not be allowed to operate on refuge
- Don't turn refuge into a park
- Hunting and fishing on refuge should be supported; refuge has done a great job correlating its seasons with state seasons
- Government always wants to improve public use and turn refuge into a park, which it shouldn't
- Cutting non-permit deer hunt on North Unit by two days
- Increase in the number of bow hunters
- Refuge reneged on original deal; they said nothing would change when they took over and now we have 1 week of muzzle-loader season and 1 week of rifle; Kansas Lake was closed to duck hunting
- Kansas Lake should be reopened to duck hunting and seasons should be longer

- Need fewer gun hunters on south unit; too crowded
- Coon hunters need to obey the rules; they should have to keep their 4-wheelers on the marked trails
- Improve ATV trails
- Not enough enforcement of ATV's on North Unit; lots of joy riding
- Keep parts of North Unit relatively inaccessible (hard to reach); keep it primitive; more roads and ATV's would only add to disturbance
- ATV's are needed for older, more physically challenged folks
- Provide better access to ATV roads off East Lake
- Allow reasonable but not unlimited utilization of ATVs; develop an ATV use plan that would license ATV's, improve or reduce ATV trails
- ATV's are necessary on the refuge, but should be restricted within reason; consider annual license
- Charge ATV's a trail fee of $24/year
- ATV trails on the North Unit should be repaired such as by removing logs and filling big holes
- Over time, phase in permit system for boats left on refuge; any boats without a permit can be presumed to be abandoned and can therefore be cleaned up rather than left on the refuge due to lack of clarity as to ownership
- Institute an inexpensive license program for boats; remove boats left on refuge with no license
- Charge docking fee of $15 for boats that stay on refuge a full year
- Boats due litter the refuge; charge use fee for them and ATV's
- Refuge is suffering from overuse; it is changing from a refuge to a high-use park-like facility
- ATV trails and campgrounds are the two most important issues facing the refuge; there should be stricter rules for ATV use
- ATV trails are crucial to travel on the refuge due to its size
- Add more access points (4-wheeler trails) that connect t the river for ease of access to body of refuge
- Camping should be allowed in designated sites

- Charge camping fee for campgrounds or just eliminate them; only problem with eliminating them is that most are built around a lake and still require a nice parking area for public use

- Improve on refuge hunting and fishing; put length limits on fish (e.g., 10-inch minimum crappie length

- Most lakes are overfished

- Public access to crooked lakes from Holly Grove should not be encouraged due to litter, poaching, and pressure that would cripple that specific resource

- There should be fewer gun-hunting permits issued on the south unit; density of hunters is too high

- Refuge should offer occasional nature or education program for adults or children; possible programs include campfire and/or Dutch oven cooking, basic fishing, trains maintenance, canoe and kayak paddling, compass use and orienteering; these could be scheduled during fall festival; such programs would need to be advertised to attract the public

- Offer guided nature or birding hikes, canoe/kayak and van tours on the refuge; these would help familiarize visitors with what the refuge has to offer

- Deer hunting on the North Unit should be nine days as it was previously set

- Consider 2-3 day hunts for modern gun hunt – 1 for permit hunt and 1 for those not able to get permit; make the hunts on weekends for those who have to work

- Reopen the borrow pits below the pumping station to duck hunting outside the levee

- Horseback riding should be permitted outside spring turkey and fall gun deer seasons

ADMINISTRATION (STAFFING AND FACILITIES)

- Setting priorities given staffing shortages

- Status of extending road on North Unit

- Navigation under bridge at Maddox Bay

- Extension of road north from Brow Shanty

- Having groups maintain roads to save the Service money and extend its management would not reach because they would eventually think they own the road and may try to exclude others who aren't part of the "club"

- Green Lake access needs a parking area and right of way or easement so that users to not have to cross private land

- Refuge should investigate online permit applications and notifications; this would require less manpower and funds; money left over from permit fees could be put to deer management or refuge maintenance

- Maintaining existing roads is a major concern of the public

- Roads that have been closed to vehicles including ATVs should still be maintained for foot traffic. Thick undergrowth impedes travel in much of the refuge

- Refuge staff face overwhelming demands and thus refuge should avail itself of the willingness of volunteers to pitch in

- Avoid overdevelopment of roads

- The following roads should be opened to provide refuge access:
    - The old road in Gregory Slough, from East lake to the North-South roads that runs along East Lake about a mile south of Horseshoe Lake
    - The road that would allow fishing on the south side Mud Lake in the summer
    - The road to the south in the River Rat hole that would allow fishing and duck hunting in this area.

- Refuge understaffing and underfunding are its too biggest issues

- Some trails should be closed and others opened

- Some trails should be cleaned up and kept that way by volunteers under the supervision of refuge employees

- There should be more trails for non-hunters like the one at the visitor center

- Road to Lost Lake at Clarendon should be graded at least annually

- Don’t construct any new gravel roads

- Bridge coming from Kansas Lake needs to be wider so boats can be carried in

- If possible, the pipeline needs to be maintained better; being mowed every 3 years has resulted in too much vegetative growth and when mowed leads to many flats on 4-wheelers

Appendix E. Appropriate Use Determinations

White River National Wildlife Refuge Appropriate Use Determinations

An appropriate use determination is the initial decision process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find that a use is appropriate before undertaking a compatibility review of the use. This process clarifies and expands on the compatibility determination process by describing when refuge managers should deny a proposed use without determining compatibility. If a proposed use is not appropriate, it will not be allowed and a compatibility determination will not be undertaken.

Except for the uses noted below, the refuge manager must decide if a new or existing use is an appropriate refuge use. If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. Uses that have been administratively determined to be appropriate are:

- Six wildlife-dependent recreational uses - As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.

- Take of fish and wildlife under state regulations - States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

Statutory Authorities for this policy:

National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee. This law provides the authority for establishing policies and regulations governing refuge uses, including the authority to prohibit certain harmful activities. The Act does not authorize any particular use, but rather authorizes the Secretary of the Interior to allow uses only when they are compatible and “under such regulations as he may prescribe.” This law specifically identifies certain public uses that, when compatible, are legitimate and appropriate uses within the Refuge System. The law states “. . . it is the policy of the United States that . . .compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System . . .compatible wildlife-dependent recreational uses are the priority general public uses of the System and shall receive priority consideration in refuge planning and management; and . . . when the Secretary determines that a proposed wildlife-dependent recreational use is a compatible use within a refuge, that activity should be facilitated . . . the Secretary shall . . . ensure that priority general public uses of the System receive enhanced consideration over other general public uses in planning and management within the System . . . .” The law also states “in administering the System, the Secretary is authorized to take the following actions: . . . issue regulations to carry out this Act.” This policy implements the standards set in the Act by providing enhanced consideration of priority general public uses and ensuring other public uses do not interfere with our ability to provide quality, wildlife-dependent recreational uses.

Refuge Recreation Act of 1962, 16 U.S.C. 460k. The Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Other Statutes that Establish Refuges, including the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) (16 U.S.C. 410hh - 410hh-5, 460 mm - 460mm-4, 539-539e, and 3101 - 3233; 43 U.S.C. 1631 et seq.).

Executive Orders. The Service must comply with Executive Order 11644 when allowing use of off-highway vehicles on refuges. This order requires the Service to designate areas as open or closed to off-highway vehicles in order to protect refuge resources, promote safety, and minimize conflict among the various refuge users; monitor the effects of these uses once they are allowed; and amend or rescind any area designation as necessary based on the information gathered. Furthermore, Executive Order 11989 requires the Service to close areas to off-highway vehicles when it is determined that the use causes or will cause considerable adverse effects on the soil, vegetation, wildlife, habitat, or cultural or historic resources. Statutes, such as ANILCA, take precedence over executive orders.

Definitions:

Appropriate Use
A proposed or existing use on a refuge that meets at least one of the following four conditions.

1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.
2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
3) The use involves the take of fish and wildlife under state regulations.
4) The use has been found to be appropriate as specified in section 1.11.

*Native American***.** American Indians in the conterminous United States and Alaska Natives (including Aleuts, Eskimos, and Indians) who are members of federally recognized tribes.

Priority General Public Use. A compatible wildlife-dependent recreational use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Quality. The criteria used to determine a quality recreational experience include:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.

- Promotes public understanding and increases public appreciation of America's natural resources and the Service's role in managing and protecting these resources.
- Provides reliable/reasonable opportunities to experience wildlife.
- Uses facilities that are accessible and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

Wildlife-Dependent Recreational Use. As defined by the Improvement Act, a use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Amateur Ham Radio Operation

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Camping

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Commercial Duck Hunting

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Commercial Fishing

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Commercial Guiding for Wildlife Observation/Photography

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Cooperative Farming

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Dredge Spoil Disposal

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓ **Appropriate**_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Furbearer Trapping

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Grazing

This form is not required for wildlife dependent recreational uses listed in the Refuge Act, uses already determined to be compatible, or stopover management plan approved after October 9, 1997.

Decision Criteria	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an environmentally documented analysis not determined the use or activity to be inappropriate been completed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will the use be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing or interfering with the department's mandated uses or reducing the potential to provide quality public use (see Section 1 of the NWRS Act for definition of compatible and Refuge Improvement Act for mandated uses)?	✓	

If any answer in (a) through (e) is "no" or any answer in (f) through (j) is "no", the use is not appropriate. If the use is part of, contains the use, or leads to an illegal action, conflicts with existing policy or mission, or is not compatible, it may not be found appropriate. If the answer is "no" to any of the other questions above, it is **generally** not a compatible use.

Indicate the refuge manager has consulted with State fish and wildlife agencies: Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and return the refuge supervisor's signature on it.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓ Appropriate

Refuge Manager Date

If found to be **Not Appropriate**, the refuge supervisor does not need to sign unless the use is a new use.

For existing uses found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor _____ Date _____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Haying

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name White River NWR

Use Horseback Riding

This form is to be used for wildlife-dependent recreational uses not regulated by the State or uses not described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Fish and Wildlife Service and Department mission and policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with adjacent Federal, tribal, State, and private land management plans or other documents?		✓
(f) Has an institutional framework been established that provides the basis for the refuge to work with the tribal, State, or local governments?	✓	
(g) Is the use manageable within available budget and staff?		✓
(h) Will it be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing or interfering with wildlife-dependent recreational uses or jeopardizing the potential to provide quality wildlife-dependent recreational opportunities compatible with wildlife-dependent recreational uses in the future?		✓

If the use does not have jurisdiction over the use (a) or fails to comply with applicable laws (b), there is no need to evaluate further. If the use does not comply with applicable laws (b), or is not consistent with public safety (d), or is not consistent with adjacent plans (e), or is not manageable (g), or is not manageable in the future within existing resources (h), or is not beneficial to the refuge's natural or cultural resources (i), or cannot be accommodated without impairing or interfering with wildlife-dependent recreational uses or jeopardizing the potential to provide quality wildlife-dependent recreational opportunities compatible with wildlife-dependent recreational uses in the future (j), the use is found generally not appropriate.

Has the refuge manager consulted with State fish and wildlife agencies? Yes ✓ No

Where the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing and find it compatible with the refuge's purpose(s) and the National Wildlife Refuge System mission.

Based on an overall assessment of the factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓ Appropriate ____

Refuge Manager Date

If found to be **Not Appropriate**, the refuge supervisor does not have to go any further in the use summary.

If an appropriate use is found **Not Appropriate** during the CCP process, the refuge supervisor must give concurrence.

If found to be **Appropriate**, the refuge supervisor must sign and date.

Refuge Supervisor Date

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Houseboat Mooring and Use

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?		✓
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		✓
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓ **Appropriate**_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Nuisance Animal Control

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Research and Monitoring

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: White River NWR

Use: Tournament Fishing

[illegible]

Decision Criteria	YES	NO
a. Is the use manageable from the refuge?	✓	
b. Does the use comply with applicable laws and regulations (Federal, State, local, and tribal)?	✓	
c. Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
d. Is the use consistent with public safety?	✓	
e. Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
f. Has adequate funding been provided for the use or will the use not be allowed until adequate funding has been obtained?	✓	
g. Will the use be manageable with available personnel?	✓	
h. Is the use compatible with other refuge purposes?	✓	
i. Does the use contribute to the public understanding and appreciation of the refuge's natural and cultural resources or to the conservation of fish and wildlife or their habitats on refuge lands or in the surrounding ecosystem?	✓	
j. Will the use be allowed without adversely affecting wildlife populations or their habitats, or interfering with the refuge's natural or cultural resources?	✓	

[illegible] **generally** [illegible]

Has the refuge manager consulted with State fish and wildlife agencies? Yes ✓ No ___

Does the refuge manager find the use appropriate based on sound professional judgment? The refuge manager must sign the form and attach the signed form to the refuge's compatibility determination.

Based on [illegible]

Not Appropriate **Appropriate** ✓

Refuge Manager Date

If the use is **Not Appropriate** the refuge supervisor does not need to sign concurrence. The use is not allowed.

If the refuge use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If the use is **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor, [illegible] Date

A compatibility determination is required before the use may be allowed

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Appendix F. Compatibility Determinations

White River National Wildlife Refuge Compatibility Determination

Uses: The following uses were found to be appropriate and evaluated to determine their compatibility with the mission of the Refuge System and the purposes of the refuge.

1. Amateur ham radio operation
2. Camping
3. Commercial fishing
4. Commercial guiding for wildlife observation and photography
5. Commercial video and photography
6. Commercial waterfowl guiding
7. Cooperative farming
8. Environmental education and interpretation
9. Field trials
10. Fishing
11. Forest products harvesting
12. Furbearer trapping
13. Haying
14. Hunting
15. Nuisance animal control
16. Research and monitoring
17. Wildlife observation and photography
18. Tournament Fishing

Refuge Name: White River National Wildlife Refuge.

Date Established: September 5, 1935

Establishing and Acquisition Authority(ies):

- Executive Order 7173 of President Franklin D. Roosevelt
- Migratory Bird Conservation Act (16 U.S.C. 715d)
- Fish and Wildlife Coordination Act (16 U.S.C. 661-667e, as amended)
- Refuge Recreation Act (16 U.S.C.460k-460k-4)

Refuge Purpose: to protect and conserve migratory birds and other wildlife resources in accordance with the following laws:

- "... As a refuge and breeding ground for migratory birds and other wildlife...." (Executive Order 7173);

- ".....For use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act);

- "... Shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements...and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon...(Fish and Wildlife Coordination Act);

- "...Suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species.." 16 U.S.C., 460k-1; "... the Secretary...may accept and use ...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. 460k-2 (Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended).

National Wildlife Refuge System Mission:

The mission of the 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.*

Other Applicable Laws, Regulations, and Policies:

Antiquities Act of 1906 (34 Stat. 225)
Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)
Criminal Code Provisions of 1940 (18 U.S.C. 41)
Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; 54 Stat. 250)
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat.1119)
Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd, 668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq; 83 Stat. 852)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 10989)
Endangered Species Act of 1973 (16 U.S.C. 1531 et seq; 87 Stat. 884)
Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)
National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)
Emergency Wetlands Resources Act of 1986 (S.B. 740)
North American Wetlands Conservation Act of 1990
Food Security Act (Farm Bill) of 1990 as amended (HR 2100)
The Property Clause of the U.S. Constitution Article IV 3, Clause 2
The Commerce Clause of the U.S. Constitution Article 1, Section 8
The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, USC668dd)

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System March 25, 1996
Title 50, Code of Federal Regulations, Parts 25-33
Archaeological Resources Protection Act of 1979
Native American Graves Protection and Repatriation Act of 1990

Compatibility determinations for each description listed were considered separately. Although for brevity, the preceding sections from “Uses” through “Other Applicable Laws, Regulations and Policies” and the succeeding sections, “Public Review,” and “Approval of Compatibility Determinations” are only written once within the Draft CCP/EA, they are part of each descriptive use and become part of that compatibility determination if considered outside of the Final CCP.

Description of Use: Amateur Ham Radio Operation

Allow amateur radio enthusiasts permission to set up broadcast as an amateur ham radio operators during the Annual Refuge Week, or other refuge sponsored events. Amateur ham radio operators are those who use radio transmitters and receivers (transceivers) to communicate with other amateur ham radio operators as a hobby. Ham radio operation would only be allowed within a designated area that would not interferr with another scheduled event at the refuge. Radio operators would be required to broadcast public service type announcements regarding White River NWR and the Refuge System. Operators would be allowed to use portable generators during normal business hours but would make every attempt to minimize disturbance to wildlife and not detract visitors. Equipment allowed would consist of a portable generator, tuner, transmitter, receiver, antenna, table, tent, computer, monitor, audio processor, microphone, and wiring necessary to set up shop. The refuge manager retains the authority to discontinue the activity, at any time, based upon wildlife protection and conservation goals.

Availability of Resources: The administration of issuing a special use permit and law enforcement activities to provide resource and visitor protection would be the only staff time involved with the use. No permanent physical facilities would be constructed or located on Service lands for the support of amateur ham radio operation activities. Any necessary portable facilities must be removed from the designated area at the end of the refuge event. All costs for temporary facilities and electrical needs are the responsibility of the permittee (631 FW 5). Monitoring and compliance would be handled within existing resources, programs, and staff time.

Anticipated Impacts of Use: Ham radio operations may have some adverse impacts to wildlife through disturbance. However, disturbance of wildlife would be short term and minimized by limiting the area to which the use can be conducted. No significant conflicts would be expected with other users considering the small number and low frequency in which ham radio operations would be conducted. The antenna for transmitting a radio signal is one of the aspects that has potential for impacting refuge resources if long enough. By requiring shorter antennae when erected by the portable facilities which are sufficient for ample coverage for receiving and transmission, minimal or no impacts are expected to refuge resources.

Determination (check one below):

____ Use Is Not Compatible
__X_ Use Is Compatible with Following Stipulations:

Stipulations Necessary to Ensure Compatibility:

1. Amateur radio users must apply for a special use permit in order to conduct ham radio operations on the refuge.
2. During their operations at the refuge, amateur radio users would be required to provide messages about White River NWR, other Arkansas refuges, and the Service. Transmitting public service type messages about the refuge and Refuge System would be a condition of their permit.
3. Allowance of this use would only be scheduled if it does not displace a visitor whose purpose is one of the Refuge System's wildlife-dependent public uses.
4. Amateur radio equipment and transmission would be restricted to a designated area identified in the special use permit.
5. The maxium number of people working any amateur radio booth at one time would be four.
6. Each applicant must make every attempt to minimize disturbance to wildlife and other visitors.
7. Each applicant would supply to the refuge manager a list of equipment that would be used during the operations.
8. Each applicant that signs the special use permit would obey all conditions of the request regarding public service type messages and applicable to approved refuge events only.

Justification:

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Camping

Camping in conjunction with wildlife-dependent public uses such as hunting and fishing has been an authorized public use activity at White River NWR since opening the refuge to fishing during the 1940s. Primitive camping has been permitted at up to 26 designated campgrounds, and open camping has been permitted on the North Unit, north of the pipeline.

Primitive camping has been authorized on the refuge to accommodate seasonal hunting and fishing related public use. The refuge's size and reputation for quality hunting and fishing attract a large number of wildlife-dependent users from distances that require some type of overnight accommodations. Camping use is highest in spring and early summer immediately after the river falls and again in the fall during refuge deer hunts. All designated campgrounds are marked with signs and white paint delineating campground boundries. Campers are required to provide their own sanitary facilities and to haul out all trash.

Camping on national widlife refuges is generally discouraged due to associated negative biological impacts and it is not a priority wildlife-dependent activity. Operation and maintenance of even primitive campgrounds divert limited staff and budget resources away from high-priority refuge trust resource management objectives. After reviewing and inventorying available camping opportunities

in the surrounding area and actual campsite use on the refuge, the number of refuge campgrounds would be reduced to 20 by 2014 and 17 by 2016, with 3 of those campgrounds only open seasonally during quota deer hunts. Additionally, open camping on the North Unit, north of the pipeline would be eliminated. The refuge would work with private campground owners to encourage development of additional camp sites to accommodate refuge users.

Availability of Resources: The refuge currently does not have the resources necessary to provide a basic level of campground maintenance and public use law enforcement oversight. Resources are not available on an annual basis to remark boundaries, pickup litter, grade ruts, and place gravel at campgrounds on a periodic basis. Resources are not available for trash pickup or for providing chemical toilets on a year-round basis

Anticipated Impacts of Use: Camping may result in some disturbance to wildlife, cause litter, and increase staff time associated with enforcing refuge regulations. These impacts would be reduced with the closure of some campgrounds and the elimination of open camping on the North Unit, and at this time are within allowable levels to maintain compatibility in that this use is essential to support the existing priority wildlife-dependent public uses such as hunting and fishing.

Determination (check one below):

____ Use Is Not Compatible
_X_ Use Is Compatible with Following Stipulations:

Stipulations Necessary to Ensure Compatibility:

1. The current number of designated campgrounds (26) would be reduced to 20 by 2014 and 17 by 2016, with 3 of those 17 only open during quota deer hunts. All camping is restricted to designated locations marked with signs and paint and identified in refuge publications. Open camping on the North Unit, north of the pipeline would be eliminated. All campground locations on refuge property would be primitive in nature (no facilities) and function simply as an alternative for the user public given the remote location and general absence of adequate commercial facilities.
2. Refuge staff would continue to monitor campground use patterns, types of camping equipment utilized, and any associated impacts on refuge resources.
3. Campers may stay no more than 14 days during any 30-day period in any refuge campground.
4. All camps must be occupied daily.
5. All disturbances, including the use of generators, are prohibited after 10 p.m. Consumption of alcoholic beverages in plain view is also not permitted.
6. All users must be involved in on-refuge, wildlife-dependent recreational activities. Camping on the refuge while hunting or fishing off the refuge is not permitted.
7. A moderate law enforcement presence is maintained throughout the year, with an increased presence during higher use periods, especially the hunting seasons.

Justification: Refuge multi-day visits, especially by hunters and fishermen from distant locations, are accommodated by the refuge's primitive camping sites. It should be noted that a large percent of refuge users are from non-local areas (e.g., in excess of 75-100 miles from the area). There are currently inadequate off-refuge camping accommodations (i.e., 154 campsites at 7 nearby campgrounds) to accommodate the large influx of refuge users needing or desiring camping accommodations during peak fishing or deer hunting seasons. For example during the 2010 Modern Gun Quota Deer Hunt there were approximately 2,500 hunters who participated in the hunt with 1,411 of those hunters camping during their hunt (1,184 on refuge and 227 off refuge). Providing primitive, on-refuge camping locations will need to continue, particularily during high use periods and

until potential new private campground sites can be developed. At reduced levels, this use would be compatible with the above special conditions. The refuge would monitor changes increases/decreases) in use levels and patterns and adjust opportunities available through time and space zoning as needed to eliminate overall resource impacts. Additionally, the refuge should work with surrounding businesses to encourage development of additional off-refuge campsites and encourage refuge users, particularly those with larger recreational vehicle campers to utilize off refuge campsites.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Commercial fishing

White River NWR would provide the public opportunities for controlled commercial fishing which includes the use of trot lines, hoop nets, gill nets, and trammel nets, which are legal tackle (equipment) as specified by AGFC regulations. Species that are harvested are under the category of rough fish, which are not protected by creel limits, and include gar (except alligator gar), catfish, bowfin, carp, buffalo, and drum, among others.

Commercial fishing is an important management tool used to maintain native fish populations on natural lakes, bayous, and streams that are located on White River NWR. In accordance with state regulations, commercial fishermen are only allowed to remove rough or nongame fish from refuge waters.

Commercial fishing would be permitted on the refuge during the following time period: South Unit from noon March 1 until noon September 30 during those periods when the water levels on the White River exceeds 23.5 feet as measured on the St. Charles gauge, or water levels exceed 146 feet mean sea level (msl) as measured by official tail water reading at the Corps of Engineers Lock Number One on the Arkansas Post Canal; all refuge-owned waters accessible by boat from the main channel of the White River are open to commercial fishing. From noon September 30 until noon November 30, all refuge-owned waters are open to commercial fishing, unless signed otherwise.

Commercial fishing is permitted year-round in LaGrue, Essex, Prairie, Scrubgrass, and Brooks Bayous; Big Island Chute; and all refuge waters north of Arkansas Highway 1. Commercial fishing activities can occur in any month of the year within the main channel of the White River, as this is designated as navigable waters of Arkansas and this is regulated by AGFC statutes and regulations.

Other areas affected incidental to this use would be refuge roads, parking areas, and road sides throughout the refuge on both the South Unit and the North Unit along the White River Levee. Currently, there are 30 maintained boat ramps throughout the refuge. Parking areas around each of these would be impacted from road traffic.

Availability of Resources: Adequate resources currently exist to maintain the commercial fishing program. This includes annual monitoring of harvest records by the refuge biologist, administration of special use permits by one administrative assistant, and maintaining law enforcement patrols to assure compliance with refuge and state regulations. Personnel costs associated with these items are already in place. Efforts would continue to monitor demographics of anglers, fishing success, and harvest statistics, as well as collecting data on fisheries management issues.

Anticipated Impacts of Use: The primary impact is the removal of rough fish and exotic fish. Since this is a renewable resource, there is no long-term adverse impact. The possibilities of incidental take of sport fish may occur and actions have been taken to reduce this risk. These actions include modified tackle and adjusted seasons; if take of a non-target species does occur, it would be returned immediately. Due to the high number of exotic fish species, reducing negative impacts to aquatic resources would help improve the native fisheries and enhance water quality (turbidity and oxygen levels). Commercial fishing is one of the major forms of income for a portion of the residents and positive economic benefit for communities around the refuge.

Determination (check one below):

____ Use Is Not Compatible
__X__ Use Is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: The public would be allowed to use all lakes, bayous, streams, and sections of the river whenever possible, as long as this activity does not have a negative effect on both resident or migratory fauna and flora. All other areas would be posted as closed and strict enforcement of all rules and regulations would be enforced. Plants and wildlife would be monitored to determine any impacts as a result of commercial fishing. If any impacts are determined, then a review of further restrictions may be imposed to protect the plant and animal resources of White River NWR.

The type and variety of legal tackle allowed on refuge waters are much less than that of surrounding Arkansas state waters and include the use of hoop nets, with a minimum square bar mesh size of 2.5 inches when wet, and with thread not less than fifteen (15) gauge; commercial trammel nets with a minimum square bar mesh size of 3.5, inches; and trotlines, which must be run daily. White River NWR allows commercial fishing tackle as listed by AGFC with some exceptions which include: no slat traps, snaglines, or turtle gear.

It is unlawful for any commercial fisherman to fail to report annually on forms supplied by the AGFC, harvest of alligator gar or other such species for which harvest information may be required. It is illegal to take, sell, or possess paddlefish, sturgeon, alligator gar, or turtles on White River NWR.

All commercial fishermen are required to possess a current commercial fisherman's license, and refuge special use permit. In addition, a bill of sale with state permit number and special use permit number must accompany all sales to fish markets, processors, or retailers of fish or parts thereof in each transaction for a period of 12 months and made available for inspection by either an AGFC wildlife officer or a Service refuge officer.

Justification: Commercial fishing, while not a priority public use of the Refuge System, is an effective management tool used to improve populations of native sport fish as well as native non-sporting fish (darters, sunfish, shiners, etc.). hrough the improvement of sport fish populations, recreational fishing opportunities are improved.

Today, numbers of exotic fishes are increasing and several species which include German carp, silver carp, and bighead carp have successfully invaded and established populations within refuge waters. While commercial fishermen do remove native species such as catfish and buffalo through normal commercial fishing techniques, they also remove large numbers of the nonnative carp (which have some commercial value). The removal of these exotic species is now imperative for the long-term health of the Lower White River Ecosystem.

Commercial fishing reduces competition and adverse impacts to native species, especially during early life stages of many fish. During early developmental stages, fry from these exotic species, as well as native fish species, feed on a wide array of invertebrates that in many cases are no longer present in sufficient numbers. This is due to the increased turbidity that is caused not just from influences from upstream areas, but from bottom foraging activity of the nonnative carp. Without proper controls, the bottom foraging activity would over time continue to upset this delicate balance having long-term impacts on native fish populations throughout the basin.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
___X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Commercial Guiding for Wildlife Observation and Photography

To allow commercial guiding for wildlife observation/photography in designated areas of the White River NWR. The objective is to provide the opportunity to experience wildlife observation/ photography to the segment of the public lacking the knowledge or equipment required to view fish, wildlife, plants, or their habitats, and to comply with the legal mandates of the Improvement Act concerning compatibility and priority public use.

Commercial guiding for wildlife observation/photography may involve using such equipment as motor boats, paddle boats, and canoes. Guiding would be allowed in designated areas once determined by the refuge manager as appropriate. Several miles of refuge roads, where vehicles are allowed, are also used to access remote sloughs, bayous, and lakes where wildlife observers/photographers may conduct their activities.

Guides would be allowed to operate through issuance of a special use permit, which must be renewed annually. Special conditions are attached as part of the permit designed to meet the above objectives and to provide liability protection to the Federal Government. The annual fee for the permit would be $100/year for part-time guides (less than 50 clients per year); $200/year for full-time guides. These fees would be established as the initial program fees until the number of participants and earned revenues can be determined.

The communities of St Charles, DeWitt, Stuttgart, Clarendon, and Brinkley are dependent on supporting refuge visitors throughout the year. Within these communities, grocery stores, sporting goods stores, restaurants, lodges, and other businesses obtain a large proportion of their annual income from the influx of both guided and non-guided refuge visitors.

Increased requests for special use permits to conduct wildlife observation guiding on the White River NWR are expected in the future. Special use permits would be issued on a first-come first-served basis. Increased requests for commercial wildlife observation guiding special use permits would be reviewed by management and determinations made on compatibility necessary to ensure quality wildlife observation opportunities for all refuge visitors.

Refuge compatibility has always necessitated a review process for all public use activities on national wildlife refuges. This procedure was further emphasized in 1997, with the passage of the Improvement Act. This act established six priority public uses of refuges which would be allowed when compatible with the established purposes of the refuge and the Refuge System's mission. These six public uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Although wildlife observation and wildlife photography are involved on guided trips, the commercial nature of activities associated with these uses does not qualify as one of the six priority public uses. All commercial activities, including guiding of wildlife observers and photographers, are special type uses that may be authorized when they are compatible with the purpose of the refuge, the mission of the Refuge System, and can be administered in a way that minimizes conflicts with priority uses. Commercial guiding for wildlife observation and photography is being implemented to comply with the legal mandates of the Improvement Act, including compatibility.

Availability of Resources: Refuge resources are adequate to administer the program at current levels. Refuge staff would need to administer special use permit conditions. An increase in special use permits may not be possible with the current existing staff. White River NWR is open to the public for wildlife observation and photography year-round.

Anticipated Impacts of Use: Disturbance of wildlife is the primary concern regarding this use. Visitors could cause disturbance to waterfowl, waterbirds, bald eagles, and other wildlife. While field trip routes and observation sites are usually located in areas open to the general public, disturbance caused by group tours could be more intense because the number of people, and desire to get close to wildlife, may be greater than normally occurs during general public activities. This disturbance would displace individual animals to adjacent areas of the refuge. However, the level of disturbance, through control of areas used and seasons of use, should limit the disturbance during critical feeding, resting, and breeding periods and not measurably affect overall refuge populations.

Guided tour activities may also conflict with other refuge users. For example, commercial tours would most likely use the same areas as the independent wildlife viewer, kayakers, and canoeists, and hunters and anglers during open seasons. Unregulated or inadequately regulated commercial guiding operations may adversely affect the safety of other refuge users, the quality of their experience, and the equity of opportunity. Stipulations proposed should mitigate these concerns by volume and space restraints for commercial operators.

Guide operations may increase use of some refuge facilities, such as boat launch ramps, but, if regulated, this increase would not be significant compared to overall use.

Determination (check one below):

____ Use Is Not Compatible
__X__ Use Is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: A special use permit is required.

- No special privileges are granted to the permitee other than those stated in the special use permit. Interfering with any other individual lawfully participating in any authorized activity on the refuge would be grounds for immediate revocation of the permit and for possible legal prosecution.
- The permitee and assistant each must comply with all applicable federal, state, and refuge laws, regulations, and policy.
- A copy of the permit must be in the possession of the permitee and assistant while engaged in commercial guiding activities.
- Guided parties are limited to fifteen (15) members and the permitee and his assistant who must all stay together as one (1) party on the refuge. Only one (1) party may be guided per pay. The permitee must accompany all parties. Any exception to this requirement must be applied for and approved by the refuge manager prior to such event.
- Within one (1) week after the end of the calendar year, the permitee must furnish the refuge manager a written report on the number of individuals taken onto the refuge and fees charged.
- The special use permit may be terminated or revoked at any time without refund to the permitee for non-compliance with any of the terms thereof. Any violation may be grounds for future permit denial.
- The permitee and his/her agents and guests shall save, hold harmless, defend, and indemnify the United States of America, its agents, and employees for loss, damages, or judgments and expenses on account of bodily injury, death or property damage, or claims for bodily injury, death, or property damage of any nature whatsoever, and by whomever made, arising out of the permitees, his/her employees, subcontractors, or agents with respect to conducting activities connected with the special use permit within the lands administered by White River NWR.
- Permitee must provide proof of liability insurance ($300,000 each occurrence, $500,000 aggregate) with the Fish and Wildlife Service named as co-insured prior to issuance of the special use permit.
- ALL equipment must be removed from the refuge daily.
- All guides and assistants operating motorized boats on the refuge must possess a current vessel operator license issued by the U.S. Coast Guard. Minimum license shall be Operator Uninspected Passenger Vessel. The license shall be valid for the area of operations and type(s) of vessel operated.
- All guides and assistants must possess a current CPR and First Aid training certificate issued by a recognized national organization.

Justification: Allowing commercially guided wildlife observation and wildlife photography on the refuge would not materially interfere with the purposes of the refuge or the mission of the Refuge System because:

Existing federal and state agency oversight and regulation of affected species and habitat is sufficient to ensure healthy populations. Disturbance to fish and wildlife would be local, short-term, and not adversely impact overall populations.

There are adequate state and federal enforcement officials to enforce state and federal regulations.

Qualifying standards for commercial operators would help ensure that the public is guided by competent individuals.

Restricting the number of guides and managing how guided activities are conducted would reduce adverse habitat effects, conflicts between competing guide services, and conflicts between guided operations and other refuge users.

Designated areas of operation (Guide Use Areas), operating requirements, and other regulation of guided activities would minimize conflicts with other refuge users.

Administrative (application) and special use permit fees would help off-set costs to administer and provide oversight to this use.

Regulating and limiting the number of commercial operators as stated in the refuge commercial guide program stipulations would provide a safe, quality experience to individuals who want to enjoy the resources of the refuge. It would also increase opportunities for those who wish to observe wildlife and experience the scenic and wild nature of the refuge, but may lack the required equipment, knowledge, or expertise.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Commercial Videography and Photography

To allow commercial photography and videography activities on White River NWR for the purpose of exposing the public to the refuge and to promote recognition of the diverse wildlife and habitats found there. The use includes access by individuals in vehicles on improved roads, by foot on unimproved roads, and by boat, canoe, or kayak on refuge sloughs, lakes, or other waters. Currently, commercial photography and video activities occur at many locations on the refuge, particularly in areas where migratory waterfowl congregate, alligators bask in the sun, or in areas frequented by neotropical migratory birds. However, any location that provides a desired photographic opportunity is accessed. Commercial photography occurs during daylight hours throughout the year.

Availability of Resources: Adequate resources are available to administer this activity at the current level.

Anticipated Impacts of Use: Commercial photography and video activities could result in some disturbance to wildlife. Some minimal trampling of vegetation, invertebrates, and small invertebrates may also occur. However, it is anticipated that this disturbance would be minimal, short-term, localized, and not highly repetitive. Commercial photography and video activities are not expected to indirectly or cumulatively impact refuge resources negatively.

Determination (check one below):

____ Use Is Not Compatible
__X_ Use Is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Access for commercial photography and video activities would be allowed in designated areas only under special use permit. Activities would be monitored to document any negative impacts to wildlife; if negative impacts are found, corrective action would be taken to reduce or eliminate these impacts. Access to key observation and photography areas may be closed during adverse weather conditions for protection of infrastructure (roads, levees, etc.) and visitor safety.

Public Law 106-206, signed by the President on May 26, 2000, directed the Secretary of the Interior to require a permit and establish a reasonable fee for commercial filming activities on federal lands administered by the Secretary. This law further stated that for still photography neither a permit nor a fee is assessed if the activities take place on lands where members of the public are generally allowed. The Secretary may require a permit and fee if photographic activities take place at locations where the general public is not allowed or where additional administrative costs are likely.

The Secretary shall not permit any filming, still photography, or other related activity if the Secretary determines:

1. there is a likelihood of resource damage;
2. there would be an unreasonable disruption of the public's use and enjoyment of the site; or
3. that the activity poses health or safety risks to the public.

Further guidance is found in 43 CFR 5.1 and 50 CFR 27.71, which regulates the making of pictures, television productions, or sound tracks on national wildlife refuges.

1. Permits are required of any party except amateur photographers or bona fide newsreel and news television photographers and soundmen. All other parties must obtain written permission from local officials having administrative responsibility for the area involved.
2. However, the Secretary has determined that no fee would be charged for the making of such motion pictures, television productions, or sound tracks on areas administered by the Service. (Note: this provision is currently under Departmental review.)
3. A bond shall be furnished, or deposit made in cash or by certified check, in an amount to be set by the official in charge of the area to ensure full compliance with all conditions prescribed in a permit. Such bond may be refunded to the applicant if all permit requirements are met and no costs to the Federal Government are incurred.
4. Permission to make a motion picture, television production, or sound track would be granted by the head of the Service or his/her authorized representative at his/her discretion and on acceptance by the applicant of conditions set forth in a permit. Applicants must describe the area where filming is requested, as well as the scope of the filming or production or recording. Dependent upon weather conditions, applicants would state when filming or other production would begin and end.

Other stipulations include:

1. Utmost care would be exercised to see that no natural features are injured, and after completion of the work, the area would, as required by the official in charge, either be cleaned up and restored to its prior condition or left, after cleanup, in a condition satisfactory to the official in charge.
2. Credit would be given to the Department of the Interior and the Service through the use of an appropriate title or announcement, unless there is issued by the official in charge of the area a written statement that no such courtesy credit is desired. A copy of the final product would be provided pro bono to the refuge staff.
3. Pictures would be taken of wildlife only when such wildlife would be shown in its natural state or under approved management conditions if such wildlife is confined.
4. Any special instructions received from the official in charge of the area would be complied with.
5. Any additional information relating to the privilege applied for by the applicant would be furnished upon request of the official in charge.
6. Other stipulations may be warranted depending upon the proposed location and season of the year the activity is conducted.

Further guidance on this activity is found in the Service Manual 650 FW 5.

The following stipulations apply to special use permits issued for commercial photography and video activities. To minimize impacts on refuge lands and resources, the refuge manager would ensure that filmmakers comply with policies, rules, and regulations and would monitor and assess all activities of filmmakers.

- Failure to abide by any part of a special use permit: violation of any refuge-related provision in Titles 43 or 50, Code of Federal Regulations; or any pertinent state regulation (e.g., fish or game violation) would be considered grounds for immediate revocation of the permit and could result in denial of future permit requests for lands administered by the Service. This provision applies to all persons working under the authority of this permit.

- The permitee is responsible for ensuring that all employees, party members, and any other persons working for the permitee and conducting activities allowed by this permit are familiar with and adhere to the conditions of this permit.

- This permit may be canceled or revised at any time by the refuge manager for noncompliance or in case of emergency (e.g., public safety, unusual resource problems). The permitee and permitee's clients do not have exclusive use of this site(s) or lands covered by the permit.

- Prior to beginning any activities allowed by this permit, the permitee shall provide the refuge with (1) a copy of current business license; and (2) proof of comprehensive general liability insurance.

- Prior to conducting commercial filming activities, the permitee shall provide the refuge manager with the name and method of contact for the field party chief or supervisor.

- A valid copy of this special use permit, signed by the refuge manager or designee, must be in the party leader's possession at all times while exercising the privileges of the permit.

- Endorsement of this permit signifies permitee understands and concurs with all the conditions set forth in the General Conditions found on the reverse side of the permit and the above special conditions.

Under the stipulations described above, commercially produced filmmaking, production, or sound track recording is viewed as compatible with the purpose for which the refuge was established.

Justification: Allowing commercial videography and photography are economic uses that must contribute to the achievement of refuge purposes or the mission of the refuge. The products may reach groups of people that may not normally know about the refuge, such as the elderly, handicapped, or urban youth groups. The services provided by commercial filmmakers would be beneficial to extend public appreciation and understanding of wildlife, natural habitats, and the mission of the Refuge System.

Conditions imposed in the special use permits of filmmakers ensure that these wildlife-dependent activities can occur without adverse effects to refuge resources, or other visitors. The activity would be required to have a primary focus on education and information on refuge purposes and the Refuge System mission.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Commercial waterfowl guiding

Commercial waterfowl guiding operations have been permitted on White River NWR under a waterfowl guide plan and associated compatibility determination special conditions developed in 2002. Refuge compatibility has always necessitated a review process for all public use activities on national wildlife refuges. This procedure was further emphasized in 1997, with the passage of the Improvement Act. The Act established six priority public uses on refuges which would be allowed when compatible with the established purposes of the refuge and the Refuge System's mission. These six public uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Although hunting is involved on guided hunts, the commercial nature of activities associated with this use does not qualify as one of these six priority public uses.

All commercial activities, including guiding of hunters, are special type uses that may be authorized when they are compatible with the purpose of the refuge, the mission of the Refuge System, and can be administered in a way that minimizes conflicts with priority public uses (which includes non-guided users who may be involved in a similar activity). In other words, if a guiding activity cannot be implemented without impacting non-guided users involved in a priority use, then the guiding activity should not be permitted or must be regulated at a reduced level to minimize impacts to non-guided users.

The commercial waterfowl guiding program at White River NWR is being revised to comply with the legal mandates of the Improvement Act, including compatibility. Previously, commercial waterfowl guiding special use permits were made available for up to 17 guides each year, with a provision to issue up to 10 additional guiding permits if certain flood levels were reached during the waterfowl hunting season. The guide services were granted the right to guide hunters in five assigned compartments of White River NWR. However, these exclusive rights to guide hunters did not under

any circumstances allow these guide services to exclude non-guided hunters from any site. The objectives of the commercial waterfowl guiding program were to provide the opportunity for a quality waterfowl hunt for that segment of the public lacking the knowledge or equipment required to hunt in flooded bottomland forests. The previous waterfowl guiding program was intended to minimize conflicts between non-guided hunters and commercial guides on the refuge, prevent overcrowding, and thus provide quality waterfowl hunting opportunities for all hunters. In doing so, the refuge would be in compliance with the legal mandates of the Improvement Act concerning compatibility and priority public use.

During the ensuing 8 years since the previous commercial waterfowl guiding program was initiated, the refuge has monitored the overall waterfowl guiding program and interactions with non-guided hunters to determine if program objectives were being achieved and the program was able to maintain compatibility requirements. The waterfowl guiding program has averaged 11.5 guide permits per year, with approximately 61 percent of the guides being able to fill greater than 25 percent of their available slots during the season. Conflicts between non-guided hunters and commercial guides, as well as among the guide services, continues to be a problem each year. The most common conflict occurs when a commercially guided party arrives at a certain location to hunt and finds it occupied by other hunters. This situation often results in heated arguments, profanity, and threats. Other complaints reported to refuge staff include sinking of boats, overcrowding, and commercial guides occupying the same choice lake hunting sites every day throughout the waterfowl season. The level of controversy and complaints between guides and non-guided hunters has become so common place and well known that it is causing non-guided waterfowl hunters, particularly those mentoring youth hunters, to either reduce or totally discontinue waterfowl hunting at White River NWR. The commercial waterfowl guiding program was implemented to provide hunters, who lack the necessary equipment, skills, and knowledge, an opportunity to hunt waterfowl in difficult-to-access flooded bottomland hardwood forests, However, the waterfowl guides' daily use of easily accessible hunting locations, along with recent advances in the equipment and technology available to assist non-guided waterfowl hunters efforts for a safe, quality waterfowl hunting experience, has raised concerns regarding the need for waterfowl guides and the program's overall ability to maintain compatibility requirements.

Based on the refuge's experience with the commercial waterfowl guiding program over the last 8 years and our sound professional judgment, the guiding program is being revised to meet program objectives, minimize conflicts with non-guided waterfowl hunters, and comply with guiding compatibility requirements. Guides would be selected through a random drawing of individuals who meet established requirements. They would be allowed to guide through issuance of a special use permit with special conditions designed to meet the above objectives, provide liability protection to the government and to collect guided hunter use and harvest data. The annual fee for the permit would be computed by using the prevailing rate method of computation established by policy in section 5RM 17.5 of the Refuge Manual.

There are two specific sections of the refuge opened to waterfowl hunting, Jacks Bay, which is located in the South Unit, and the entire North Unit. Together these two hunt areas comprise approximately 55,275 acres. In reality, only a small portion (4,395 acres) actually provides waterfowl habitat and hunting opportunity under normal (low) water conditions. The actual area available for hunting during low water conditions is restricted to permanent water areas such as oxbow lakes, sloughs, and beaver ponds. The Jacks Bay Unit of the refuge does have artificial flooding capabilities, but this encompasses only one of the areas opened to waterfowl hunting on the refuge. While flooding is a natural event and occurs in most years, flood dates are sporadic, with high-water events occurring from late November to early June. During high water, the total acres inundated may increase to approximately 45,000 acres suitable for waterfowl hunting. The number of commercial waterfowl guide permits would be reduced to one per area for a total of (5) annually. The number of hunters that each guide can take on a hunt would be reduced from (8) to (4) daily. Additionally, there would no longer be additional guide permits issued during flood events. Reducing the number of guides to one per area and the number of hunters per guide is intended to reduce conflicts between guides and other non-guided hunters to a reasonable level, thereby providing a better quality hunting experience and therefore achieving compatibility requirements.

Five special use permits to conduct commercial waterfowl guiding would be issued annually through a random drawing process. The refuge would be divided into five hunt zones, with one guide permit issued for each hunt zone. Only qualified applicants would be entered into the drawing. Only one application may be submitted by applicants including multi-individual guide services (i.e., firms, corporations, partnerships, clubs). Multi-individual guide services would be required to designate one person to guide and one person to assist the guide on the refuge, if selected. Individual guides employed by one of these entities may not apply and any selected guide would be required to forfeit his/her permit should they become later employed by one of these entities that is also a permit holder. All waterfowl zones would be filled by (5) selected qualified applicants, with unsuccessful qualified applicants being placed in a pool of alternates. These alternates would be referred to as the “A-LIST.” During the year, the “A-LIST” would be utilized to replace permitted guides that have had his/her permit revoked or denied. All persons identified must meet all standards in the application.

Availability of Resources: This revised commercial waterfowl guiding program would reduce the current expenditure of refuge staff resources. During the previous 8 years, the refuge has issued from 8 to 15 commercial waterfowl guiding permits annually. Administration and enforcement of refuge regulations and permit special conditions are now exceeding the staff resources required and are not sustainable with current staffing levels. The reduction in guides operating on the refuge and strengthened guide qualification standards would reduce the administrative and enforcement burden of the refuge significantly and to a level within the refuge’s ability to administer with current resources.

Anticipated Impacts of the Use: Because of the oversight of this activity by the refuge, the comprehensive state and federal regulations currently in place, and law enforcement efforts of refuge officers, the planned level of waterfowl guide services should have minimal impacts on wildlife populations or habitat. Some disturbance of non-targeted fish and wildlife would occur, but should not affect populations on the refuge overall. It is anticipated that this disturbance would not be measurably greater than disturbance from general hunting.

The primary concern regarding commercial guided hunting activities is the potential for conflict between guided activities and other refuge users, particularly non-guided hunters. Based on experiences on this refuge and on other national wildlife refuges, a continuation of inadequately regulated commercial guiding operations can increase user conflicts. An important part of this issue is public perception that hunting guides and clients have an advantage of equipment and technique and are taking game that would otherwise be available to non-guided hunters. Additionally, the competitiveness and conflicts

between guides and non-guided waterfowl hunters create an atmosphere that is not conducive to an overall quality hunting experience and generally prevents or certainly detracts from non-guided hunter's efforts to introduce new hunters and particularily children to the sport of waterfowl hunting. Guides, since they are operating a business, may also be viewed as more aggressive compared to non-guided hunters. Revising the current waterfowl guiding program and continuing to rigorously oversee and monitor the program should help ease user tension and minimize conflicts between guides and non-guided hunters since they would help ensure a limited number of properly licensed and qualified guides and entail time and space restrictions as needed.

Waterfowl guide operations may increase use of some refuge facilities, such as roads, ATV trails, and boat ramps, but, if regulated and reduced from previous levels, this use would not be significant compared to overall use.

Determination:

_____ Use is Not Compatible
___X_ Use is Compatible with the Following Stipulations:

Stipulations Necessary to Ensure Compatibility: A special use permit is required.

- Guiding only allowed by one guide in each of the five commercial waterfowl guide zones on the refuge. Each guide and guide assistant can only guide 4 hunters per day. All other units and zones are closed to commercial waterfowl hunting.

- No special privileges are granted to the waterfowl guide other than those stated in special use permit. Interfering with any other individual lawfully participating in any authorized activity on the refuge would be grounds for immediate revocation of permit and for possible legal prosecution.

- The waterfowl guide and assistant each must comply with all applicable federal, state, and refuge laws and regulations and policy governing hunting, commercial guiding, and use of the refuge.

- All waterfowl guides and assistants operating motorized boats on the refuge must possess a current vessel operator license issued by the U.S. Coast Guard. Minimum license shall be Operator Uninspected Passenger Vessel. The license shall be valid for the area of operations and type(s) of vessel operated.

- All waterfowl guides and assistants must possess a current CPR and First Aid training certificate issued by a recognized national organization.

- The waterfowl guide and assistant each must possess a current Commercial Guide License issued by the AGFC.

- Guided parties are limited to four hunters, the waterfowl guide and assistant must all stay together (total 6) as one hunt party on the refuge. Only one party may be guided per day. Non-paying hunters (Buddies) may hunt with permitted guides, as long as the total number of hunters in the party does not exceed six. The waterfowl guide must accompany all hunt parties.

- The waterfowl guide must maintain accurate, legible daily records indicating the following information: the name and complete hunting license identification number of all hunters in each day's hunt party, fees charged, and the number of ducks killed by species for each individual would be logged on forms provided. This information shall be furnished to a wildlife officer or the refuge manager upon request. The completed forms would be notarized and returned to the refuge manager by the end of one business week from the close of duck season. All names of hunters and license information must be recorded prior to each day's hunt.

- The waterfowl guide's special use permit may be canceled or revised at any time by the refuge manager in case of emergency (e.g., high fire danger, flooding, unusual resource problems, or violation of permit). Any violation may be grounds for future permit denial.

- The waterfowl guide agrees to forever hold harmless the United States, its officers, agents, employees, contractors, and or assigns from any and all damages to property or injuries to persons which may arise or be incidental to the activities associated with a waterfowl guide special use permit, above and beyond the required liability insurance policy.

- Each waterfowl guide would acquire general liability insurance policy for $500,000 each occurrence, $1,000,000 aggregate, with the Fish and Wildlife Service named as additional insured prior to issuance of a waterfowl guide special use permit. Each waterfowl guide would maintain this same policy through the duration of this permitted waterfowl season. Any changes in policy would be approved by the refuge manager prior to implementation.

- Guides and hunters may enter the refuge no earlier than 4 a.m. and all waterfowl guiding equipment, including decoys, blinds, boats, motors, and ATVs) must be removed from the refuge daily.

- All boats and other vehicles used in the waterfowl guide operations must be marked with a guide identification sticker, Boats – on the side of the motor hood, Trucks – on the back glass of the cab, and ATV's – on the side of the fuel tank. Stickers would be provided by the refuge.

- Only one set-up of decoys (regardless of number) may be used per guide party.

- Selected applicants and their assistants may have a maximum of one conviction each for any state , refuge, or federal fish, game, or boating violation in the last (5) years. Any convicted felons are ineligible for a guide or guide assistant permit. Violations occurring after issuance of the special use permit would result in automatic revocation of the permit. Special use permit fees would not be reimbursed.

- Waterfowl guides must utilize at least 25 percent of the possible guided hunter slots. This includes only those hunters that pay a fair market value (greater than $125) for guide services. The maximum number of guided hunters allowed per party is (4) each day. The waterfowl guide hunter logs must reflect an average of (1) guided hunter per day was commercially guided on refuge property. Example; for a 60-day duck season, the minimum number of hunters would be 60 days X 1 hunters/day = 60 hunters total for the season or an average of 1 hunter per day. Failure to meet this standard of use would result in the waterfowl guide being ineligible for the following year's waterfowl guide drawing. An appeal process would be provided to any and all past waterfowl guides upon request for any permit application denial due to this special condition of the permit.

Justification: The waterfowl guiding program at White River NWR is being revised so that it would not materially interfere with the purposes of the refuge, the mission of the Refuge System, and minimizes conflicts with priority public uses. The existing federal and state agency oversight and regulation of affected species and habitat are sufficient to ensure healthy populations. Disturbance to nongame wildlife would be local, short-term, and not adversely impact overall populations. The refuge has adequate management and law enforcement staff resources to administer and oversee the revised level of commercial waterfowl guiding. Qualifying standards have been strengthened to help ensure that hunters are guided by competent individuals. Reducing the number of guides and managing how guided activities are conducted would reduce adverse habitat effects, conflicts between competing guide services, and conflicts between guided operations and other refuge users. Designating five areas of operation with only one guide per area with corresponding operating requirements would minimize conflicts with other refuge users. The administration and special use permit fees generated from the commercial waterfowl guiding program would help off-set the costs to administer and provide oversight to this use. Regulating and limiting the number of waterfowl hunting guides as stated in the refuge commercial waterfowl guide program stipulations would provide a safe, quality experience to individuals who hunt on the refuge. It would also provide opportunities for those who wish to hunt on the refuge, but may lack the required equipment, knowledge, or expertise.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Cooperative Farming

White River NWR currently allows cooperative farming on approximately 334 acres at the Farm Unit. White River NWR is dependent upon cooperative farming to provide the grain crop component of waterfowl (ducks and geese) foraging habitat, and, therefore, fulfills a primary refuge purpose in addition to providing incidental benefits to resident wildlife including white-tailed deer, black bear, and wild turkey. Historically, farming operations on the Farm Unit were implemented to support Canada goose populations at an annual objective level of 400,000 goose-use days. In recent years, however, Canada geese have altered migration patterns and do not depend on the southern wintering grounds, like White River NWR, that were once important to them. Consequently, management of the Farm Unit is gradually being shifted to focus on providing resources to wintering ducks, rather than Canada geese.

Farming operation activities are conducted by local farmers that have met all obligations and qualifications required to farm on refuge property. Farming is conducted on a crop-share basis with the farmer providing all equipment, seed, fertilizer, and other costs associated with growing and selling a crop. Shares are based on acreage with cooperative farmers receiving 75 percent and the refuge receiving 25 percent. Crops that are encouraged on the Farm Unit are preferred foods for ducks, including rice, corn, milo, millet, buckwheat, and natural (moist-soil) foods. The refuge share of the crops is typically taken in areas with a reliable water source to enhance availability for waterfowl through flooding.

Amid growing concerns about the use of genetically modified crop (GMC) varieties, efforts would be made to reduce the acreage planted with GMC varieties. The planting of some GMC varieties would be necessary, however, to meet waterfowl foraging objectives of the refuge. Such varieties include, but are not limited to, tropical and "roundup ready" varieties of corn and milo and Liberty Link rice. Impacts of "roundup ready" varieties are reduced through proper crop rotation in which a conventional crop is planted once in 3 years.

Availability of Resources: Current refuge staffing, funds, and equipment are inadequate to accomplish this critical habitat management practice internally. The refuge does, however, have the staff it requires to administer a cooperative farming program. Administration costs of overseeing this program are greatly outweighed by benefits to wildlife.

Anticipated Impacts of Use:

- Minor soil disturbance can be expected during spring planting season but these impacts are reduced through soil conservation measures and buffer areas that trap sediment.
- Because farming is conducted on such a small acreage of the refuge, it increases habitat diversity and suitability for some migratory and resident wildlife species.
- High-energy foods are produced that help meet refuge goals and objectives.
- Increased numbers and diversity of waterfowl and other migratory birds using refuge habitats for wintering, staging and migration.

Determination (check one below):

____ Use Is Not Compatible
_X__ Use Is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Special conditions must be followed and are identified in an annual cooperative farming agreement between the refuge and farmers. Failure to meet these conditions can result in revocation of farming privileges. These special conditions are:

- The cooperative farmer may begin farming operations March 1. Farm field access after November 15 would be limited to that necessary to remove equipment or to complete final waterfowl management practices as directed by the refuge manager.
- The cooperator would participate in FSA programs to extent possible to protect crop bases. All acreage reporting would be jointly completed by the refuge and the cooperator.
- Land alterations included but not limited to ditching, land leveling, filling, clearing, and mowing would be done only upon approval of refuge manager. No drainage and levee removal would be permitted prior to March 1 of each year, unless authorized by the refuge manager.
- All crops shall be planted and harvested as early as possible, with a target date for completion of harvesting operations of November 1. Refuge crops would be fertilized at the same rate as cooperator's and receive every other like kind treatment (pesticides, tillage, irrigation, etc).
- The refuge's share of the crop would be left in the field unharvested. If soybeans are planted, the refuge would receive 25 percent of acreage in millet, milo, or other preferred waterfowl forage planted as its share of the soybeans.
- All irrigation levees for all crops (except soybeans) would be re-pulled and levee gates re-set (if needed) in order to allow winter flooding of fields. Harvested crop stubble would be rolled as directed by the refuge manager. These practices shall be accomplished no earlier than November 1 and no later than November 30.
- Only approved chemicals (pesticides) may be used on crops. All use of approved post-emergent pesticides would not be used unless crop scouting indicates pest density is at or beyond the economic threshold. Chemical application on any other vegetation is prohibited.

Pesticide application instructions would be adhered to and efforts would be made by the cooperator to reduce use of chemicals through alternative non-chemical pest control methods. The cooperator would keep accurate records of pesticide application and furnish a completed report to the refuge manager by November 1 or earlier.

- The cooperator would abide by all appropriate state and federal regulations pertaining to storage, use, and disposal of hazardous materials (i.e., oils, solvent, pesticides, and fuels). The cooperator would immediately notify the refuge manager in the event of any accidental hazardous materials release and take appropriate measures to contain the release. Secondary containment systems would be in place prior to use of power units.
- No fall disking would be allowed without prior approval of refuge manager. Any acreage disked in the fall would require a winter cover crop.
- All refuge crop share fields would be left standing and not manipulated in anyway, unless there were specific orders from the refuge manager to do so.
- Firearms are not permitted on the refuge and would not be used as a scare device.
- No burning of any kind would be allowed on the refuge.
- The cooperator shall report surface and groundwater usage annually to county NRCS office with a copy of report provided to refuge staff. Cooperator would pay all reporting fees.
- The cooperator would leave all refuge boundary signs in existing locations. Any refuge boundary signs destroyed as a result of cooperators operations would be replaced by the cooperator.
- The Service reserves the right to install pipes and water control structures and construct levees, which may spot damage or destroy cooperators crops.
- The refuge staff would conduct periodic inspections of all well locations and equipment storage areas to ensure that refuge property is being properly maintained and protected. Efforts should be made to maintain clean areas around wells/pumps.

Justification: The practice of farming to benefit waterfowl on White River NWR was adopted by refuge staff when the refuge was acquired in 1935. Since that time, hydrologic modifications of the White River and a reduction in refuge staff have made this a more difficult task, rendering less than 1 percent of the refuge suitable for agricultural practices (e.g., 334 acres on Farm Unit). The ground that is currently being farmed (i.e., Farm Unit) is equipped with 2 electric irrigation wells and 1 diesel irrigation well that allows for efficient farming and winter flooding for waterfowl. Management of lands that were once planted in agricultural crops but are no longer suitable, are now managed by refuge staff for native grasses (moist-soil) that are beneficial to waterfowl. Moist-soil management capability on White River NWR, however, is minimal and it is impossible to meet duck-use habitat objectives identified by the LMVJV and the North American Waterfowl Management Plan with current moist-soil capabilities (250-300 acres of moist-soil), especially considering that over 60 percent of these impoundments are subject to backwater flooding during the growing season, making effective moist-soil management impossible in certain years. Moreover, when considering the intensity of waterfowl hunting including commercial hunting that occurs around White River NWR, it is important that waterfowl have access to diverse, undisturbed foraging habitats that are free of human disturbance during winter on White River NWR (i.e., sanctuary containing high-quality foraging habitat). Therefore, agricultural crops in close juxtaposition with natural habitats (e.g., bottomland hardwood and moist-soil wetlands) are needed to meet migratory waterfowl needs identified by plans of the LMVJV and the North American Waterfowl Management Plan for White River NWR.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Environmental Education and Interpretation

Environmental Education and Interpretation are priority public uses at White River NWR which seek to increase the public's knowledge and understanding of wildlife and their habitats, and to contribute to wildlife conservation. Abundant wildlife and convenient access make White River NWR a destination for visitors hoping to learn more about wildlife distinctive to bottomland hardwoods and their habitats. Activities would include traditional environmental education such as teacher-led or staff-led on-site field trips, off-site programs in classrooms, nature study such as teacher and student workshops, and interpretation occurs when information is interpreted for the public by refuge staff or others using exhibits, displays, signs, kiosks, facilities, and brochures. Much of the refuge is subject to flooding, which may result in parts or all of the refuge being closed for safety reasons. Access is by vehicle, boat, or walking. Vehicles may only be used on designated roads and parking areas, and are not allowed in fields or other areas. White River NWR has many exhibits in the visitor center that address fish and animal identification, food chain, flood cycle, neotropical migratory birds, migratory flyways of abundant waterfowl, and other things specific to bottomland hardwood habitat. Refuge staff can utilize the classroom along with its amenities, which are designed for environmental education and interpretation throughout the year, but are normally scheduled mostly in the spring and fall. All environmental education and interpretation activities are conducted with the refuge's primary goals, objectives, and habitat management requirements as the guiding principles.

Availability of Resources: Refuge staff and resources, such as the exhibits, classroom, and audio visual room located in the visitor center are adequate to administer the program at current levels. However, it is anticipated that an increase in these uses would occur over the coming years. In order to provide safe and quality environmental education and interpretation opportunities, additional resources and staff would be needed to develop or provide enhanced programs and interpretive facilities (such as more observation platforms, interpretive trails, kiosks, and other facilities). Another component of the uniqueness at White River NWR is a partnership with the Potlatch Conservation Education Center at Cook's Lake that is operated by the AGFC. The center can be used in conjunction with the refuge as an outdoor classroom and environmental education site for a variety of groups. Plans include developing additional or improved facilities that would enhance environmental education and interpretation.

Anticipated Impacts of Use: Outdoor environmental education and interpretation activities may result in minimal disturbance to wildlife from visitors. It is possible that some small vertebrates, invertebrates, and vegetation could be trampled. Littering may also occur. Significant indirect or direct cumulative adverse impacts to refuge resources are not expected from these activities. Environmental education and interpretation facilities, such as trails, boardwalks, exhibits, kiosks,

platforms, and towers, would be designed and established as feasible to minimize potential disturbance to wildlife and impacts to resources.

Determination (check one below):

____ Use Is Not Compatible
__X_ Use Is Compatible with Following Stipulations:

Stipulations Necessary to Ensure Compatibility: A majority of the refuge would be open for public use during daylight hours only, except for areas noted on the annual user permit. Some areas of the refuge may be zoned or restricted to seasonal use while others areas may be closed to all public use. The general public that uses the refuge is encouraged to read and acknowledge the regulations on the annual user permit to be aware of these areas before entry. Regulations concerning public use are reviewed annually and any necessary modifications are incorporated into refuge brochures or otherwise conveyed to visitors. Vehicle use would be limited to open, maintained roads. Refuge law enforcement would ensure compliance with regulations and protect refuge resources. Public access to environmental education and interpretation areas or facilities may be closed periodically for appropriate visitor and/or resource protection.

Justification: According to the Improvement Act, environmental education and interpretation are priority public use activities that should be encouraged and expanded where possible. It is through compatible wildlife-dependent public uses such as this that the public becomes aware of and provides support for national wildlife refuges.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date:

Description of Use: Field Trials

Field trials are dog competitions that are wildlife-dependent, but are not hunting related and are, therefore, not considered one of the priority wildlife-dependent recreational activities identified in the Improvement Act. Raccoon dog field trials are generally the only request received at White River NWR. Given the popularity of squirrel and waterfowl hunting in the area, it is likely that a request would be made to have squirrel dog and retriever field trials as well. Raccoon dog field trials are conducted at night and dogs race against a clock for locating and treeing a raccoon. Squirrel dog field trials are conducted during the day as dogs attempt to locate and tree as many squirrels as possible and as fast as possible. These trials are strictly a test of the handler and dog's skills and no raccoons or squirrels are killed in the process. Retriever dog field trials are conducted during the day and are designed to test the dog's ability to fetch, retrieve, and obey its handler, usually over both land and water.

Availability of Resources: Adequate funding and staff required to allow field trials currently exist. This includes evaluating and selecting trial applications, administration of special use permits by an administrative assistant and maintaining law enforcement patrols to assure compliance with refuge regulations. Personnel costs associated with these items are already in place.

Anticipated Impacts of Use: Field trials may have some adverse impacts to wildlife through disturbance. However, disturbance of wildlife would be short term and minimized by not conducting trials where wildlife are concentrated and not during local breeding seasons. No significant conflicts would be expected with other users considering the small number and low frequency in which field trials would be conducted.

Determination (check one below):

____ **Use Is Not Compatible**
_X__ **Use Is Compatible with Following Stipulations**

Stipulations Necessary to Ensure Compatibility:

- Field trials would be conducted under a special use permit issued by the refuge. Special use permit fees will apply.
- In order to schedule a field trial, all interested permittee(s) would be required to submit a written proposal outlining the following information: name of the organization or club affiliation, requested field trial date, number of dogs entered, estimated number of participants and spectators, a brief narrative explaining how the tournament is to be organized, and club contact person.
- All field trial activities conducted on the refuge would be fully sanctioned by a recognized sponsoring organization, such as UKC, PKC, or AKC.
- No trials would be conducted during, or within three days before, any quota hunting seasons on the refuge.
- Raccoon dog field trials would be limited to 2 per season (no more than 4 in a given year) and would be allowed during 2 seasons: December 1 – March 31 and August 16 – October 31. Trials would be permitted for no more than two calendar days for local trials and no more than three calendar days for regional or national trials.
- Squirrel dog field trials would be limited to 2 per season and would be allowed from August 16 – March 31.
- Raccoon and squirrel dog field trials are to be held on the North Unit in areas that can accommodate the trial without undue disturbance to refuge operations. Trials would not be allowed when circumstances have caused wildlife to be concentrated on the refuge (i.e., flooding of the river), during “high-use” periods or in “high-use” areas in which conflicts are likely to arise. Raccoon trials would only be permitted to occur from sunset to sunrise only. Trials on the North Unit of the refuge would not be permitted when the White River gauge at St. Charles is at or above 23 feet (this does not include the retriever trials to be conducted at the Farm Unit).
- Retriever dog field trials would be limited to 2 per season and would be allowed from September 1 (or when all farming operations are complete) – November 1.
- Retriever dog field trials would be conducted at the Farm Unit on the Fishing Derby pond, during a time that would not interfere with farming or wildlife management operations on the Farm Unit.
- No firearms of any type are allowed on the refuge during field trials.
- All vehicles are restricted to designated roads and ATV trails.
- Injury and/or destruction of any plant or animal life is prohibited.
- No permanent physical facilities would be constructed or located on Service lands for the support of field trial activities. Any necessary portable facilities must be removed from the field office at the end of each field trial. All costs for temporary facilities and the conduct of a trail are the responsibility of the permittee (631 FW 5).

Justification: People in this area have, historically, had a strong interest in hunting with dogs. Refuge raccoon and squirrel populations are healthy and would provide good opportunities for field trials. White River NWR is located in a remote part of eastern Arkansas where there is limited suitable habitat for running and testing dogs outside of publically owned lands. Additionally, because raccoon dog field trials are typically held at night when few other refuge uses are authorized, there is less chance of refuge user conflicts.

Field trials are a means of enjoying the outdoors and hunting and are considered wildlife-dependent recreation as listed in Part 631 of the Fish and Wildlife Service Manual. These trials are used to judge a dog's performance and not the actual taking of wildlife. They would likely have no long-term or cumulative effects to refuge biological resources, can be allowed without conflict with other wildlife-dependent priority public uses, and can be managed within existing refuge resources. The objective of permitting field trials on the refuge is to encourage practices and techniques that enhance the tradition and quality of hunting experiences. The use of dog field trials may be stopped at any time necessary, if it is determined to be a detriment to refuge resources, particularly bears.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Fishing

White River NWR is open to the public for sport fishing, including frogging and crawfishing in accordance with AGFC regulations. All sport fishermen are required to possess an annual refuge user permit in addition to applicable state fishing license. Fishing with rod and reel, pole and line, limb line, yo-yo, jug line, trotline, and bow and arrow (on line) is permitted. Fishermen are also allowed to collect crawfish with rakes and/or traps for personal use only. Harvesting turtles and mussels is prohibited. Commercial fishing is authorized only by special use permit and is covered under a separate compatibility determination. Access to fishing areas are by vehicle, motor boat, canoes, kayaks, walking or all-terrain vehicles (ATVs). Vehicles must remain on designated roads and parking areas, while ATVs are restricted to trails marked specifically for ATV use.

The entire refuge would be open to sport fishing with the following stipulations. All or any portion of the refuge may be closed if fishing adversely impacts on higher priority refuge objectives. Designated areas of the refuge may be seasonally closed to fishing in order reduce disturbance to wintering waterfowl or to nesting bald eagles. In order to effectively administer sport fishing on the refuge and to meet legislative mandates related to the acquisition of various tracts of land, the refuge is divided into two fishing zones separated by Arkansas Highway 1. Sport fishing would be allowed year-round on all refuge waters located north of Arkansas Highway 1 (north unit) except for the Kansas Lake Waterfowl Sanctuary which is only open for fishing from March 1 to November 30, the Cooks Lake Conservation Education, which is only open to fishing by scheduled youth and mobility impaired groups or other designated areas required to protect refuge resources as described above. Bullfrogs and crawfish may be taken from these waters during the established state season.

On those waters located south of Arkansas Highway 1 (south unit), fishing is permitted year-round on LaGrue, Essex, Prairie, Scrubgrass and Brooks Bayous, Big Island Chute, Moon and Belknap Lakes next to Highway 1, Indian Bay, the Arkansas Post Canal and adjacent drainage ditches, those borrow ditches located adjacent to the west bank of that portion of the White River Levee north of the Arkansas Power and Light Company powerline right-of-way, except for other designated areas required to protect refuge resources as described above. All other refuge waters on the South Unit are only open for fishing from March 1 to November 30, unless posted otherwise.

Availability of Resources: Refuge staff and resources are adequate to cover management of fishing at current levels. However, it is anticipated that an increase in this use may occur over the coming years. In order to provide safe and quality fishing, additional resources and staff would be needed to enhance or maintain access areas and provide law enforcement. A portion of the refuge budget is spent annually managing for the benefit of freshwater fisheries, maintaining boat launching ramps, improving access, conducting law enforcement patrols, and ensuring refuge visitors are in accordance with boater safety, and following refuge regulations.

Anticipated Impacts of Use: Fishing is not expected to have substantial, long-term adverse impacts on fisheries or other wildlife resources at White River NWR, including wildlife habitat. The activities associated with fishing, including travel to and from fishing areas, may cause trampling of vegetation, small invertebrates and vertebrates; however, these are short-term, relatively minor, and not highly repetitive. Also, fishing is not expected to result in negative indirect or cumulative impacts to refuge resources. As a consumptive use, fishing would have some minimal and short-term direct, localized impacts on refuge resources, including populations of target sport fish.

Problems associated with litter and illegal take of fish are addressed through law enforcement activities. Fishing in itself does not impact the refuge. Fishing frequently results in litter on the refuge (fishing line, food, bait containers, soda/beer cans, and other “trash”). Trash is detrimental to the aesthetics of the refuge and can impact the digestive tracts of birds, turtles, fish, alligators, and other resident and migratory wildlife. The refuge would strive to reduce this problem by working with partners to pick up litter, educating anglers not to litter, and through law enforcement. Information contained in the refuge brochure concerning rules and regulations also keeps negative impacts to a minimum. Regulations are reviewed annually and modifications are made as necessary to maintain compatibility and ensure a safe and quality fishing program.

In order to access the numerous remote lakes of the refuge, users have historically utilized ATVs throughout the area. White River NWR has 407 miles of ATV trails that have resulted in a “web” of trails to almost every lake on the refuge. This use has resulted in degraded trails that function as waterways characterized by eroding soil that likely increase sedimentation. ATV users often veer off ATV trails into the forest on trails that are highly degraded causing an increase in soil erosion, disruption or diversion of water flow and may cause destruction to plant root systems. This use has resulted in severe rutting in the lowest areas of the refuge. As a part of the comprehensive conservation planning process, ATV trail access would be evaluated to determine which trails are causing the most damage and may not be necessary to access areas that can be reasonably accessed by other methods (e.g., boat, foot travel, and vehicle).

Determination:
_____ Use is Not Compatible
___X___ Use is Compatible with the Following Stipulations:

Stipulations Necessary to Ensure Compatibility: Fishing, including frogging and crawfishing, is permitted in accordance with AGFC regulations and licensing requirements. Conflicts between

fisherman and hunters or other visitors using the refuge for non-consumptive wildlife recreation have not been a problem in the past and are not expected to be a problem in the future. Associated violations such as taking under-sized fish, open fires, and littering can be minimized by public outreach and a continued law enforcement presence. All refuge users including anglers are required to possess a signed refuge user permit, which explains hunting, fishing, and refuge-specific regulations, while participating on the refuge. Law enforcement patrols are frequently conducted throughout hunting seasons to ensure compliance with refuge laws and regulations. ATV use and access would be monitored and may be modified to ensure compliance with Executive Orders 11644 and 11989, which states that "the use of off-road-vehicle use on public lands would be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands." Public access to hunting areas may be closed at any time necessary to protect refuge resources or visitors.

The following stipulations would help ensure the refuge fishing program is compatible with refuge purposes.

- Only fishing with rod and reel, pole and line, limb line, yo-yo, jug and line, trotline, and bow and arrow (on line) would be allowed; no other methods or tackle would be permitted unless issued under a refuge special use permit.

- Waterfowl sanctuaries and other areas as designated on refuge user maps are seasonally closed to sport fishing.

- Personal watercraft (e.g., jet-skis), hover craft, and airboats are prohibited.

- All vehicles may only be used on designated roads or parking areas to provide access for priority public uses.

- ATVs used to access refuge waters for fishing must remain on designated ATV trails.

- ATVs may not be left unattended overnight on the refuge.

- Harvesting of mussels and turtles is prohibited.

- Boats with the owners name and address permanently displayed or valid registration may be left on the refuge from March 1 – October 31.

- Crawfish may be collected for personal use only. All crawfish traps must have the owner's name and address permanently affixed.

- Public access to refuge waters may be closed at any time necessary to protect refuge natural resources, roads and trails, or public safety.

Justification: According to the Improvement Act, fishing is a priority public use activity that should be encouraged and expanded where possible. It is through compatible wildlife-dependent public uses such as this that the public becomes aware of and provides support for national wildlife refuges.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 15-year Re-evaluation Date:

Description of Use: Forest Products Harvesting

White River NWR has primarily forested habitat, being about 150,000 acres of forest on about 160,000 acres of land owned by the Service. Among habitat management plans, the approved Forest Habitat Management Plan of 2002 and the 2007 Update details the concepts and specifics of Desired Future Conditions (DFC's) of the forests, to provide enhanced habitat for wildlife by increasing the availability of cover and food. The basic tenets of the 2001 Forest Habitat Management Plan were as follows:

- Increase the proportion of forest in a multi-canopied condition.
- Increase the proportion of forest that is species diverse.
- Increase the proportion of forest containing larger diameter class trees.

The 2007 Update also adopts the Desired Forest Conditions of the publication from the Forest Resource Conservation Working Group (FRCWG) of the LMVJV. These later "DFC's" are fully described in "Restoration, Management, and Monitoring of Forest Resources in the Mississippi Alluvial Valley: Recommendations for Enhancing Wildlife Habitat" edited by R. Wilson, K. Ribbeck, S. King, and D. Twedt. The FRCWG table of DFC's has been collaboratively developed to elucidate favorable habitat conditions for priority birds and other forest-dependent wildlife. The thrust is to achieve 35 – 50 percent of the landscape at any point in time on appropriate sites:

- Overstory canopy cover of 60 – 70 percent
- Mid-story canopy cover of 25 – 40 percent
- Understory canopy cover of 25 – 40 percent
- Dominant trees >2/ac
- recent Coarse Woody Debris (rCWD) of ≥200 ft^3/ac
- Cavity trees (holes <10") of >4 snag stems/ac ≥4" dbh or ≥2 stem/ac ≥20"
- Den trees (holes >10") of ≥2 trees/ac ≥26" dbh or ≥8 ft^2 BA ≥26 inch dbh
- Standing dead and/or stressed trees of >6 stems/ac ≥10" or ≥2 stems/ac ≥20"
- Shade intolerant regeneration with sufficient numbers on 30 – 40 percent of area

Each of these efforts complements the other, as both endeavor to increase structural and species diversity to provide wildlife habitat. The definition of multi-canopied forest includes a significant presence of a mid-story and/or understory along with an overstory. For instance, assuming an overstory is present, if the midstory has 25 percent + cover or the understory has 25 percent + cover, then the stand is multi-canopied. If both of those lower layers are less, then the stand is single canopied. A multi-canopied forest would have trees in a dominant crown position. Larger trees would have more cavities, dens, and contribute to large size rCWD.

To achieve DFC's over the next 15 years, manipulation of the forest is essential. Creating gaps in the overstory and midstory canopies provide sunlight penetration to the forest floor to stimulate the growth of vegetation vital as food and cover for wildlife to meet refuge objectives. Also, crowded trees can be thinned to encourage development of habitat characteristics such as large, full crowns for perching, nesting, and mast production, cavities for den sites, dead limbs or trunks for insects and cavity excavation, etc. Thinnings and canopy gaps are made by removing selected trees that are surplus to the needs of the habitat. Trees to be removed may be girdled, wounded, or cut so that their shade is eliminated. Wounding the trees has relatively high costs, while selling the trunks of the trees has a lower cost. There are commercial buyers (mills) and operators (loggers) that would pay market value for portions of the trees removed. The objective of obtaining sunshine via canopy gaps and thinning are accomplished with limited negative consequences. A collateral benefit is the proceeds of the sales contribute to the Refuge Revenue Sharing fund that provides payments to the counties in lieu of property taxes.

Long-term and short-term planning is conducted prior to any manipulation of the forest. The current FHMP was completed in 2001 and approved in early 2002, after an extensive and exhaustive process that included 2 solicitations for public comments. Most of the collaboration occurred from the formation of a large interagency and interdisciplinary workgroup. The workgroup was fundamental in formulating the DFC's and management techniques to achieve those conditions. The approved FHMP includes a profusion of information not reiterated in this compatibility determination, and thus is an integral part of this compatibility determination. The 2007 Update to the FHMP was approved after review by a wide range of Service staff. Data is recorded during forest inventories and observations made during inspections of the forest. An analysis of the data is made and used in the preparation of management decisions detailed in the annual Forested Habitat Analysis and Management Prescription. The Rx is prepared at the refuge before undergoing a review and approval process through the Regional Office.

The FMHP has a 15-year cycle, where all areas of the refuge are examined over the course of that cycle. Each year, a number of compartments are inspected with a habitat inventory by sampling portions of the compartment. Thus, removal of some trees from any portion could occur as often as every 15 years, but actual thinning has occurred on about 20 – 40 year intervals. Removals by heavy equipment are limited to dry periods to minimize risk of rutting or other adverse effects on the site. Trees to be removed are most often individually selected and marked by refuge staff. Occasionally trees to be removed are designated by rules, such as to remove all pine trees (which are nonnative), or remove many of smaller trees that are of less importance to the habitat.

Some trees or plants may be removed by refuge staff to accomplish the same objective or to remove nonnative or invasive species.

Acorns may be commercially collected to supply sufficient quantities for nurseries to provide native species of seedlings used to reforest other degraded areas in the LMV.

Other plant material may also be permitted to be removed by the public for personal use, such as collecting firewood, pecans, muscadines, acorns, mushrooms, etc. Personal use is defined as the items collected are not sold or exchanged for money or other goods or services.

Commercial activities are permitted via special use permits issued individually by the Refuge Office. Personal use activities may be permitted via the general user permit or other legal means.

Availability of Resources: Some elements of needed resources are already in place, such as salary and positions of the refuge, including the supervisory forester, forester, and forestry technician. Other refuge staff assist in the administration and/or field work, such as an office assistant, project leader, wildlife biologist, refuge operations specialists, etc. Additionally, foresters and forestry technicians in

temporary or term positions assist with designating the trees to be removed by marking them with paint. Some amount of time needed by other positions in maintenance, law enforcement, management, and administration. The tefuge receives expense for sales funds that are used for implementing sales of the surplus trees. Additional expenses for equipment maintenance, operating expenses, and habitat restoration are funded out of the refuge's budget. The forest management plan allows that management would be carried out to the extent of available resources.

Anticipated Impacts of the Use: Commercial harvesting operations would result in short-term disturbances and long-term benefits to forest habitats. Short-term impacts would include disturbance and displacement typical of any noisy heavy equipment operation. Operation of heavy equipment and removal of some vegetation would also result in a short-term increase in soil erosion, but with limited soil displacement distances. Additionally, wildlife species utilizing undisturbed forest habitat would be temporarily displaced. As vegetation is disturbed, other wildlife species may also be temporarily displaced. An existing network of roads and trails should be utilized, maintained, and optimized to minimize adverse effects to wildlife and the ecology of the area, yet remain efficient for accommodating refuge management and public use. Over time, these short-term impacts would wane as the effects of increased sunshine quickly results in enhanced productivity of the habitat. As nearly all the wildlife species are dependent upon habitat found in disturbed forests, the overall effect of these disturbances is positive.

Firewood cutting and collecting of fruits of the forest for personal use would result in only minor disturbances to wildlife. Historically, local participation in these activities has been low, and future participation is also expected to be low. The quantity and frequency of these activities is not expected to result in significant disturbance, diminish wildlife food resources, or jeopardize wildlife survival. Short-term disturbance to wildlife may occur during these activities, but would be insignificant because of the small scale of the projects. Most of the use would occur in late summer or fall, after ground-nesting birds have completed the nesting season.

Forest product harvesting should not result in short- or long-term impacts that adversely affect the purpose of the refuge or the mission of the Refuge System.

Determination (check one below):

____ Use Is Not Compatible
_X__ Use Is Compatible with Following Stipulations:

Stipulations Necessary to Ensure Compatibility: Operations may be conducted throughout the year as ground conditions allow, but only according to the guidelines detailed in the approved 2002 Forested Habitat Management Plan and subsequent updates. In order to confirm harvest procedures and address any questions, a pre-entry conference would be held between the refuge forester, permittee, and the logger, if different than the permittee. The permittee is to notify the refuge when harvesting operations begin and are completed.

Close inspection and supervision of all timber sales is necessary to ensure that harvesting operations meet the conditions of the permit and refuge objectives. Frequent and variably timed inspections of harvesting operations would ensure that only designated trees are cut, and that problems are rectified before becoming major issues. Timber harvesting operations may be suspended or restricted any time that continued operation might cause excessive damage to the forest stands, soil, or wildlife habitat. Reasons for suspension or restriction may include, but are not limited to: periods of high wildfire, insect, or disease hazard; times when harvesting activities may interfere with essential refuge operations; during periods of heavy rains or wet conditions, which may cause soil rutting, erosion, or flooding; or when harvesting operations present a safety hazard. Furthermore, operations may be suspended or terminated if the special use permit conditions are violated.

When harvesting is complete, the refuge rorester would inspect the site for compliance with all requirements of the permit. If any deficiencies are found, the permittee would be notified and given reasonable time to achieve compliance. If full compliance is achieved, the permittee's performance deposit would be returned in full. If not, an amount to mitigate damages would be deducted from the performance deposit and the remaining amount returned.
Special conditions are included in the bid invitation and permit to further protect the resources of the refuge, such as:

1. The permittee would maintain any refuge road used. In addition, permittee would repair any damages to the primary graveled roads resulting from logging operations to standards specified by the refuge manager. This may include, but is not limited to, grading, graveling, or rocking. Reasonable actual costs for work on refuge graveled roads would be refunded from performance deposits. The expense of work on dirt roads within the sale area is the sole responsibility of the permittee.

2. The location of loading decks and logging roads would be mutually agreed to by permittee (or his representative) and refuge forester prior to their placement. All primary haul roads used by permittee would be left in good condition or blocked after operations are completed by placing logging slash and/or dirt mounds across all entrance points as directed by refuge forester. Those roads to be left open would be built up enough so that the road would not hold standing water any more than the adjacent area. This would require the use of equipment such as a bulldozer and/or road grader.

3. No unmarked trees would be cut. Penalties may be assessed for cut unmarked trees at $5 per inch of stump diameter up to 22" and $10 per inch of stump diameter for larger stumps. All marked trees would be cut. Penalties may be assessed for uncut marked trees at $1 per inch DBH.

4. Any of the penalties imposed would be charged against the performance deposit. If the value of the deposit becomes substantially diminished, additional deposits may be required to return it to full value.

5. Logging operations would be allowed only when site conditions allow, generally between June 1 and October 31. Logging may be allowed before June 1, if dry conditions exist that would prevent unnecessary damage to the roads and woods. Regardless, no rutting deeper than 6" would be allowed.

6. The permittee (or his representative) would not litter. Disposal of petroleum products would be prohibited. Equipment must not leak more than a few drops per day. Performance bond monies may be used to pay for litter clean-up.

7. Tree-length logging and skidders would be allowed. Unnecessary damage to the residual stand would not be tolerated. The penalty for excessive skinning or other damage to residual trees would be assessed at $5 per inch DBH.

8. Each portion of the sale area must be completed before moving to other portions of the area.

9. The permittee would be responsible for job safety while operating on the refuge.

10. A pre-entry conference with permittee and his logger would be held prior to any work being done on the sale area. The refuge forester retains authority to stop logging operations at any time if road, weather, water, or other unsatisfactory conditions exist.

Justification: This use has been determined compatible provided the above stipulations are implemented. This use would facilitate the primary purpose of the refuge, which is to provide a refuge and breeding grounds for migratory birds and other wildlife. This use would meet the mission of the Refuge System and enhances fish, wildlife, and plant resources on these lands by providing renewable resources for the benefit of the American public. This use would be administered in compliance with 50 CFR 29.1.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date:

Description of Use: Furbearer trapping

Trapping of furbearers by the public for recreational purposes is allowed on portions of the refuge via a special use permit. Species classified as furbearers by the state include: beaver, mink, bobcat, coyote, gray fox, muskrat, nutria, opossum, raccoon, river otter, skunk, and weasel. Raccoon, mink, beaver, and opossum are the primary target species for trapping on White River NWR, based upon reports required from each permittee annually. Trappers are required to maintain detailed records of take as a condition of the special use permit and provide this information to the refuge. Very little trapping actually takes place at the current time due to low fur values for virtually all species. The refuge trapping season would open with the state season (mid- to late-November) and close January 31 of each year. Having the refuge season correspond with surrounding areas would alleviate many administrative and law enforcement problems.

Availability of Resources: Adequate funding and staff currently exist to maintain the furbearer trapping program. This includes annual monitoring of harvest records by the refuge biologist, administration of special use permits by one administrative assistant, and maintaining law enforcement patrols to assure compliance with refuge and state regulations. Personnel costs associated with these items are already in place. Efforts would continue to monitor demographics of trappers, trapping success, and harvest statistics, as well as collecting data on furbearer management issues.

Anticipated Impacts of Use: Conducted under conditions imposed by the refuge special use permit, no adverse long-term impacts are anticipated from furbearer trapping. The animals taken by trappers serve as a positive population control mechanism for problem species such as raccoon and beaver. By the reduction of the beaver population, the negative impact of beavers on the environment would help by protecting several thousand acres of prime bottomland hardwood habitat and other wildlife species. Research has identified nest destruction of ground and understory nesting birds at relatively high levels by species such as raccoons and skunks. Trapping can supplement population control mechanisms already in place at the refuge and assists in keeping furbearer numbers to an acceptable population levels. Due to the time period that most furbearer trapping takes place, there is a potential for disturbance of waterfowl and conflicts with other refuge users, but this impact is not believed to be significant due to the low number of trappers. Trapping of non-target species is possible but stipulations are in place to minimize the negative impacts to a point that is believed to be insignificant.

Determination (check one below):

____ **Use Is Not Compatible**

__X_ **Use Is Compatible with Following Stipulations**

Stipulations Necessary to Ensure Compatibility: Pursuant of Code of Federal Regulations, Title 50, Section 31.16, the following special conditions apply to the trapping of furbearers on White River NWR. State seasons, bag limits, and regulations apply unless exempted by a special use permit.

Refuge trapping season would start with the state season until noon, January 31. Trapping would be conducted in compliance with state wildlife laws and regulations. Trappers must meet all Arkansas state license requirements and obtain a White River NWR special use permit. Trappers shall carry in their possession all required state and federal licenses and permits while on the refuge, and exhibit them to any federal or state agent on request.

The area open for trapping includes the entire North Unit depicted as open for hunting to the general public on the refuge brochure, and does not include any provisions for trapping on or crossing private inholdings or property. Trapping on the South Unit is closed. The use of any form of sight bait (visual attractions) is prohibited. Traps must be checked daily (within every 24 hours) during daylight hours. Trappers may use firearms to dispatch any furbearers caught in non-lethal sets. Every effort would be made to prevent the capture of non-target species and any caught would be immediately released if not seriously injured.

All special use permit holders would maintain daily records of all captures and would submit a written summary of all species captured, whether target or non-target by February 28. If applicable, a negative report would be submitted if no trapping was conducted by February 28. Trapping reports would be brought to the refuge office or sent certified mail with permittee retaining the signed receipt. Failure to comply with this reporting requirement could result in possible refuge citations and suspensions of future trapping privileges. The number of trapping permits would be limited as necessary to protect furbearers and other wildlife resources and to minimize conflicts with other users.

Justification: Furbearer trapping is a longstanding traditional activity in this area. This activity is compatible with the purposes for which the refuge was established, to protect bottomland hardwood forest and provide habitat for waterfowl. Overall, the total furbearer harvest and trapping pressure have declined dramatically over the past few years. Encouraging increased furbearer trapping would provide additional removal of problem species, such as raccoon and beaver, and would assist in reducing overpopulated species to acceptable levels. As described above, this action would not change this use as conducted on this refuge since establishment.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
___X___Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Haying

Haying is the cutting and removal, by baling and transport to an off-refuge location, of grass, either nonnative cool season species, such as fescue, or native warm or cool season species. Haying on the refuge is typically done on portions of the White River levee by a farmer acting under authority of an easement granted to the White River Drainage District for levee maintenance. At the current time, the only haying that occurs on the refuge is on a portion of the White River levee on the southeast end of the refuge and it is done as a means of maintaining the integrity of the levee by preventing large-rooted species (i.e., hardwood trees) from developing and undermining the levee.

Haying can be an effective management tool as part of an overall grassland management plan to improve and maintain grasslands for the benefit of grassland-dependent bird species. Grasslands need periodic renovation to maintain vigor, diversity, and the structure necessary for bird use. Haying is an effective alternative to burning or grazing, which are two other means that could be used to maintain grassland vigor. Removal of accumulated biomass through haying serves to reduce unwanted woody growth and woody plant invasion. Such removal allows for more vigorous regrowth of desirable species following the haying, although results are neither as dramatic nor positive as with prescribed fire.

Availability of Resources: No additional resources are needed to conduct this use, if the use is conducted by either the White River Drainage District or a cooperative farmer. The refuge is not equipped with the needed equipment to conduct this use internally. The decision to use a cooperative farmer for haying would only follow strategies developed under grassland management discussions. The additional time needed to coordinate issuance and oversight of the needed special use permit or cooperative farming agreement for haying is minor and within existing resources.

Anticipated Impacts of Use: Haying would result in short-term disturbances and long-term benefits to both resident and migratory wildlife, if done under certain time constraints. Short-term impacts would include disturbance and displacement typical of any heavy equipment operation. Cutting and removing of standing grasses would also result in short-term loss of habitat for those species preferring tall grasses for feeding or cover. Long-term benefits would accrue due to the increased vigor of the regrown grasses. Strict time constraints placed on this use would limit anticipated impacts to the relatively minor issues.

In addition to haying's direct impact to ground nesting species, haying creates suitable habitat for brown-headed cowbirds. These cowbirds are attracted to areas that have been hayed (e.g., cowbirds do not inhabit areas where the grass is > 6 inches tall), especially hayed areas in the vicinity of grazing cattle such as along the White River levee. Arkansas State University conducted a preliminary study on brown-headed cowbirds' abundance and use of the White River levee during the summer of 2010. This study indicated that as the summer progressed, short grass and cattle did not seem to impact cowbird abundance, whereas these same conditions provided favorable habitat for them earlier in the summer. Because of this, haying should not occur before August 1. Brown-headed cowbirds are detrimental to migratory songbirds nesting in the adjoining forests. These cowbirds are parasitic, meaning they lay their eggs in the nests of other species at the expense of the species that created the nest. Cowbird eggs typically hatch earlier than the other eggs in the nest, and the cowbird nestlings are larger and ultimately out-compete host nestlings that may hatch. It has been found that cowbird depredation can result in the loss of greater than 50 percent of migratory songbird nests within one mile of suitable cowbird habitat. Therefore, haying portions of the White River levee adjacent to the forest before migratory songbird nesting is complete would produce habitat conditions favored by cowbirds and cause increased nest failure for migratory songbirds. As mentioned above, however, as long as strict time constraints are placed on this use, cowbird depredation would not be a concern.

Determination (check one below):

____ Use Is Not Compatible
_X__ Use Is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Haying would only be allowed after August 1, to minimize disturbance to nesting birds. In most years, birds are off the nest by this date.
- Bales must be removed from the refuge within 90 days of baling.
- If a cooperative farmer is used for haying, a cooperative farming agreement must be signed and all stipulations contained in the agreement must be followed.

Justification: Haying would not interfere with ground-nesting bird production if done within the necessary stipulations. Use of haying as a management tool can be a valuable technique for providing long-term habitat improvements to grassland that would otherwise degrade through natural succession. While haying is a much more time-consuming and costly technique used to maintain grassland conditions than prescribed fire, it is a viable alternative in areas where fire is not an option. Without this tool, the areas such as the White River levee would suffer encroachment of woody species that could compromise the integrity of the levee. Use of these areas by ground-nesting species such as the eastern wild turkey would slowly decline in the absence of haying or other similar management technique.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Hunting

Hunting on White River NWR includes the take of deer, migratory birds, small game, and turkey. Migratory bird hunting includes ducks, geese, coots and woodcock. Small game hunting includes squirrel, rabbit, raccoon, and opossum. Additionally, hunters may take beaver, nutria, muskrat, coyote, and feral hogs during any daytime refuge hunt with weapons legal for that season. Hunting seasons and bag limits are set within the framework of the Arkansas Game and Fish Commission (AGFC) and follow AGFC regulations. There are, however, refuge-specific regulations that supplement and further restrict the AGFC regulations. Refuge-specific regulations are reviewed annually and incorporated into an annual refuge brochure that includes specific hunting regulations. All users of the refuge are required to read the annual refuge brochure and sign the ‘user permit’ on the front cover and carry the signed brochure at all times while on the refuge.

Hunting Access

Designated areas of the refuge may be seasonally closed to hunting in order reduce disturbance to wintering waterfowl or nesting bald eagles. In order to effectively administer hunting on the refuge and to meet legislative mandates related to the acquisition of various tracts of land, the refuge is divided into two hunting zones separated by Arkansas Highway 1. Hunting is allowed on all refuge lands located north of Arkansas Highway 1 (north unit) except for the Cooks Lake Conservation Education Sanctuary and designated in-holdings in which the previous landowners retained hunting rights. Additionally, the Kansas Lake Waterfowl Sanctuary is closed to all access from December 1 to February 28.

On those lands located south of Arkansas Highway 1 (south unit), hunting is permitted on all refuge lands except for the area near the Visitor's Center and the Farm Unit. Waterfowl hunting, however, is only allowed at the Jacks Bay area of the south unit. Additionally, the Dry Lake and Demonstration Areas are closed to all entry after November 1.

Hunting dogs are allowed on the North Unit for waterfowl, small game, and raccoon hunting and on the South Unit for waterfowl (Jacks Bay Area only) and raccoon hunting. Dogs are permitted for raccoon hunting from sunset to sunrise only. Hunter access is by foot, motor vehicle, boat, bicycle, or all-terrain vehicle (ATV). Refuge roads on the South Unit are open to vehicular traffic March 1 through December 15. All other refuge roads are open year-round. A locked gate, road closed sign, or other barrier (i.e. mounded dirt) means the road is closed to all vehicle travel but not to foot travel unless signed otherwise. All licensed vehicles must stay on gravel roads. ATV's must remain on yellow marked trails and are not allowed on gravel roads. Mobility impaired hunters may apply for a special use permit, allowing specialized access by ATV. Public access to hunt areas may be closed at any time necessary to protect refuge resources or visitors.

Availability of Resources: The ability to offer recreational hunting is dependent upon an adequate infrastructure with three key components: (1) staff to administer a hunting program, (2) adequately maintained access roads and trails, and (3) an adequate number of law enforcement officers.

(1) Administrative staff

Managing the refuge's hunt program begins in April as preparation for the upcoming quota hunt mail out begins. An average of 15,600 deer quota hunt information letters, complete with application procedures, season dates and bar-coded labels, are prepared and mailed out annually. The application process begins in June with the muzzleloader submissions and continues into July with the modern gun applicants. Successful applicants are randomly chosen for each hunt. Based on 2009 hunt application information, the total number of successful applicants was 2699 for the muzzleloader hunt and 3600 for the modern gun. A notification card is returned to each applicant with information as to their success/non-success in the drawing. In 2009, White River received a total of 2846 muzzleloader applications and 4883 modern gun applications. The quota deer hunt permit process lasts into mid-November.

One administrative assistant devotes a minimum of 35% of her normal tour of duty hours (plus an additional 15 to 20 hours per week during peak periods) to processing and issuing special use permits for hunting and fishing, quota hunt permits and responding to over 70% of the thousands of telephone and visitor inquiries. She is assisted by a STEP employee who works approximately 20 hours per week on hunt-related duties and other visitor services responsibilities. In addition to the administrative assistant and STEP; the park ranger, project leader, deputy project leader, forester and biologist support the hunting program by answering telephones during busy times and greeting

and assisting hunters. The refuge biologist, equipment operators, temporary employees and others as available, operate deer check stations on different parts of the Refuge for three days in November.

(2) Adequately maintained roads and trails

Refuge staff spends a large portion of their time on road maintenance (e.g. grading, mowing, spraying and trail marking) in late summer because this is often the only time when conditions are dry enough. There are 95 miles of gravel roads on the Refuge and 527 miles of interior roads that are maintained for timber harvest operations and 407 miles of these interior roads are untilized as ATV trails for wildlife dependent activities. Roads and trails consume only a small portion of the vast acreages of White River NWR in an open condition, however the acreages consumed by roads and trails is significant when considered in and of itself, with approximately 4,000 acres in a road (48-70 foot cleared width) or trail (16-70 foot cleared width) condition. Particularly in the conditions of White River NWR, where seasonal flooding of the bottoms (90% of the Refuge) is common, roads and trails demand regular and sometimes intensive maintenance. Trails maintained for timber harvest, however, are to be maintained by loggers after a timber harvest although this may only be a few trails in any given year. The condition of roads and trails are very obvious to the public and once these roads and trails exist, the Refuge is under demand to keep up with their maintenance, while less obvious needs related to habitat management tend not to receive the same insistent demands from the public for attention.

(3) Adequate number of law enforcement officers

White River NWR is protected by 2 full-time law enforcement officers and 1 dual-function officer. In addition, personnel from the AGFC and various sheriffs' departments assist refuge officers when needed. Law enforcement officers are responsible for patrolling the Refuge and conduct surveillance, check hunter permits, respond to hunter emergencies, enforce laws and regulations, ensure public safety, and protect refuge resources. In any given year, officers may handle 120 incidents or violations each year, including incidents associated with suspicious person's reports, weapons violations, and natural resource violations. During the 6-months of hunting season, full-time law enforcement officers devote 100 percent of their scheduled shifts plus an additional 12 hours of overtime per week during peak hunt periods and the dual-function law enforcement officer devotes 33 percent of his scheduled shift to law enforcement. Full-time law enforcement officers often devote more than 400 hours of overtime in a given year.

Anticipated Impacts of Use:

Short-term impacts

White River NWR has been open to some form of hunting since 1956 with no documented disturbance to refuge habitats or noticeable impacts on the abundance of species hunted or other associated wildlife. Hunting pressure noticeably impacts localized populations of individual animals and their daily routines; however no noticeable effect on populations has been documented. Because of an overwhelming interest in hunting on the Refuge, restrictions have been set within the Refuge hunting program to make hunting on the Refuge safe and to prevent over-harvesting of a species and these restrictions have been closely monitored for effectiveness.

Long-term impacts

To date, there is no indication of adverse biological impacts associated with the Refuge's hunting program. Should, however, adverse impacts be identified, the Refuge has the ability to restrict or eliminate actions that are adversely impacting the resource. However, adverse impacts on most wildlife species are unlikely because of the fact that wildlife populations and habitat conditions are closely monitored by Refuge staff.

ATV impacts

In order to disperse hunters and access remote areas of the Refuge, users have historically utilized ATVs throughout the area. White River NWR has 407 miles of ATV trails that have resulted in a 'web' of trails to almost every lake on the Refuge. This use has resulted in degraded trails that function as waterways characterized by eroding soil that likely increase sedimentation. Hunters often veer off ATV trails into the forest on trails that are highly degraded causing an increase in soil erosion, disruption or diversion of water flow and may cause destruction to plant root systems. This use has resulted in severe rutting in the lowest areas of the refuge. As a part of the comprehensive conservation planning process, ATV trail access will be evaluated to determine which trails are causing the most damage and may not be necessary to access areas that can be reasonably accessed by other methods (e.g. boat, foot travel, and vehicle).

Determination (check one below):

____ Use Is Not Compatible
_X__ Use Is Compatible with Following Stipulations:

Stipulations Necessary to Ensure Compatibility: Hunting is permitted in accordance with AGFC regulations and licensing requirements. Hunting seasons, bag limits and additional refuge-specific regulations that may further restrict AGFC regulations are proposed and established annually as agreed upon during the annual hunt coordination with AGFC personnel. All hunters are required to possess a signed Refuge hunting permit, which explains hunt and refuge-specific regulations, while participating in Refuge hunts. Law enforcement patrols are frequently conducted throughout hunting seasons to ensure compliance with refuge laws and regulations. ATV use and access will be monitored and may be modified to ensure compliance with Executive Orders 11644 and 11989, which states that "the use of off-road-vehicle use on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands." Public access to hunting areas may be closed at any time necessary to protect refuge resources or visitors.

General Refuge-specific regulations pertaining to hunting include, but are not limited to:

- ATV's are allowed only for consumptive activities (i.e., hunting and fishing).
- ATV's may not be left unattended overnight on the refuge.
- State bag limits apply for all hunts unless indicated otherwise in annual Refuge brochure.
- Annual refuge brochure must be in possession and signed by ALL refuge users.
- Hunting, taking, possessing, or attempting to take wildlife with an unauthorized guide, guide service, outfitter, club or organization providing assistance, service or equipment is prohibited.
- Hunting may be closed at manager's discretion any time deemed necessary to protect refuge resources or visitors.

Refuge-specific regulations that pertain specifically to waterfowl hunting include, but are not limited to:

- Duck hunting is permitted until noon.
- Retriever dogs are permitted.
- Only portable blinds are permitted.
- Waterfowl hunters may enter the refuge no earlier than 4 am.
- Boats, blinds, blind material, and decoys must be removed from the refuge by 1 pm each day.
- Hunting is allowed 7 days a week on the North Unit; however, waterfowl hunting is only allowed on every Tuesday, Thursday, Saturday and Sunday at Jacks Bay on South Unit.
- Only approved non-toxic shot may be possessed or used.
- Cutting of holes or other manipulation of vegetation (i.e. cutting bushes, mowing, weed-eating) or hunting from manipulated areas is prohibited.

Refuge-specific regulations that pertain to small game hunting include, but are not limited to:

- Squirrel hunting on South Unit is closed after November 30.
- Squirrel and rabbit hunting dogs are only allowed on the North Unit beginning December 15.
- Dogs are permitted for raccoon hunting from sunset to sunrise only.
- Beaver, nutria, coyote, muskrat and feral hogs may be taken incident to any daytime refuge hunt with weapons legal for that hunt until the daily limit of game is taken.

Refuge-specific regulations that pertain to big game hunting include, but are not limited to:

- For all deer harvested on the refuge, the hunter will immediately (prior to moving the animal) complete the hunting license kill information. All deer taken on the South Unit must be recorded as zone 660 and deer taken on the North Unit must be recorded as zone 661.
- Portable tree stands must have the owner's name and address affixed in a conspicuous manner. Stands may be erected seven days prior to the refuge deer season and must be removed from the refuge within seven days from the last day of deer season.
- All non-quota hunting is closed during quota deer hunts.
- For all refuge quota deer hunts, the limit is one either-sex deer per quota hunt except for the buck-only muzzleloader and gun hunts on the North Unit in which the limit is one buck. State bag limit applies for deer harvested during archery season.
- Harvested deer should be checked at a manned refuge check station during the quota gun deer hunt to allow collection of biological data.

Refuge-specific regulations that pertain to turkey hunting include, but are not limited to:

- Spring turkey hunting season and bag limit on refuge is same as state season.
- Fall turkey hunting is restricted to archery hunting only.

Justification: Recreational hunting (a wildlife-dependent activity) has been identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority public use, provided it is compatible with the purpose for which the refuge was established. The refuge hunt program is an excellent wildlife management and public relations tool that provides quality recreational opportunities for the public while regulating specific animal populations at levels that are sustainable with habitat conditions. Public hunting opportunities around White River NWR are limited to National Wildlife Refuges and AGFC-owned Wildlife Management Areas. Private lands offer hunting opportunities only to those willing and able to purchase hunting rights through leases or ownership. With the high prices associated with private land hunting opportunities, the demand for public hunting in this portion

of Arkansas is increasing, and refuges are expected to meet an increasing part of this demand. This need is apparent at White River NWR, as it was estimated that 225,870 hunting- or fishing-related visits were made to White River NWR in 2009.

White River NWR encompasses over 160,000 acres, of which 150,000 acres is bottomland hardwood forest and 10,000 acres is composed of lakes, streams, and other bodies of water. The Refuge is bisected by 92 miles of the White River and up to 90% of the Refuge may be seasonally inundated. Unpredictable habitat conditions along with the large size of the refuge make access difficult. ATV use allows hunters to hunt in areas that would be impossible to hunt by vehicle, boat or foot. Considering the topography of the area and its remoteness, the need for limited use of ATVs by certain refuge users is apparent This serves to distribute hunters more evenly across the landscape, facilitates transport of deer stands and harvested deer and helps to proportionally distribute hunting pressure so that no one portion of the refuge is harvested heavier than others.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date:

Description of Use: Nuisance Animal Control

Feral hogs and beaver are the species upon which management activities would be directed. Current refuge beaver populations are large enough to adversely impact bottomland hardwood and wetland impoundment ecosystem functions by both ponding water in places with susceptible vegetation (i.e., hardwood trees) and preventing water removal on areas with structures that allow de-watering. Therefore, refuge staff would attempt to reduce beaver populations to acceptable levels through both the hiring of temporary beaver trappers during the summer and the incidental shooting of beaver by staff during winter and spring floods. These methods would be used to reduce beaver populations in “problem” areas on the refuge where beavers are overpopulated and causing habitat degradation. In addition to staff removing beavers from the fefuge, special use permits would be issued to the public interested in trapping furbearing species on the refuge. However, furbearer trapping has declined drastically due to low fur prices, and only a few individuals are interested in trapping furbearers on the refuge.

As populations of feral hogs are identified a various locations on the refuge, the staff would utilize trapping and shooting to control hogs at these locations. According to AGFC regulations, it is illegal to trap and move live hogs. In addition to refuge staff removing feral hogs, the public is allowed and encouraged to harvest hogs during any hunting season provided hunters are using a weapon and ammunition that is permitted during the concurrent hunting season.

Availability of Resources: No additional resources are needed to conduct this use at the current time. As time allows during winter and spring floods, nuisance beaver control through incidental shooting would be utilized during routine patrols and field work. Current staffing includes a temporary beaver trapper whose position is contingent on annual budget allotments. This position is necessary to effectively control nuisance beaver populations on the refuge. The opportunistic trapping and shooting of wild hogss can also be accomplished through current staffing, as the traps are available and can be used each year so that the majority of the time invested is in baiting and checking the traps.

Anticipated Impacts of Use: Targeted removal of beaver and feral hogs from portions of the refuge would reduce the negative impacts caused by these species. Control of beaver populations would help ensure the protection of important bottomland hardwood forests and minimize beaver problems associated with the operation of over 30 water control structures on the refuge. The removal of feral hogs on the refuge would reduce competing hog use of annual hard mast crops, increase the success of ground nesting birds, and reduce the destruction of native vegetation used by trust wildlife species. As with all trapping programs, there would likely be non-target species trapped and trappers would be required to report the incidental take of other species. A negligible impact on other wildlife species is expected in both the short and long term.

Determination (check one below):

____ Use Is Not Compatible
_X__ Use Is Compatible with Following Stipulations:

Stipulations Necessary to Ensure Compatibility: As a trapping and nuisance animal removal program is implemented on the refuge, it would be closely monitored to assess the potential adverse effects on other wildlife, as well as the benefits to game and nongame species and their habitats. Any traps that are used would be designed so as to reduce the catch of non-target species. Modifications to the program would be implemented as needed to maintain compatibility. Refuge staff would be required to report the number and location of all traps and wildlife taken. Persons interested in furbearer trapping on the refuge would be required to have a special use permit issued by the refuge and would only be allowed to trap on the North Unit from late-November until January 31, and must adhere to state regulations. The use of dogs by hunters on the refuge to hunt feral hogs would not be allowed.

Justification: A primary purpose for the creation of White River NWR was for the conservation of wetlands and migratory birds. The removal of nuisance animals is a wildlife population management tool used to regulate the populations of harmful wildlife species that are degrading habitat and wildlife for which the refuge was created to conserve. Beavers and feral hogs have been documented to cause negative impacts to bottomland hardwood systems and ground-nesting birds through the degradation and destruction of important wildlife habitats. These negative impacts can be minimized with the control of nuisance animals to an acceptable level. This is often the only measure available to reduce populations because of a lack of natural predators for these species.

Beavers are abundant on the refuge, and in certain situations are fulfilling a purpose of the refuge by providing critical breeding and brood-rearing habitats for wood ducks, woodpeckers, and some neotropical migratory songbirds, as well as providing habitat for fishes. While this may be desirable in some situations, it must be balanced so that important mast-producing bottomland hardwood habitat, that is important for all trust species of White River NWR, is not permanently altered by the creation of permanent water. In 1976-77, the staff estimated that beavers were responsible for the conversion of bottomland hardwood habitat to dead timber beaver ponds at a pace of approximately 400 acres a year. By the mid-1980s, it was estimated that over 4,300 acres of the refuge was composed of beaver ponds and today there is approximately 7,000 acres in dead timber beaver ponds. To prevent

the rapid expansion of dead timber beaver habitats, beaver populations must be controlled at an acceptable level through both trapping and hunting.

Feral hogs are present on the refuge, although they are not evenly distributed throughout the refuge but found in a few distinct areas. This is a consequence of high floodwaters in recent years making much of the refuge habitat inhabitable for feral hogs; however, during dry years it is likely that feral hogs would be more abundant on the refuge, due to the current low numbers on the refuge and lack of competition for resources. Because feral hogs are highly adaptable and are one of the most prolific large mammals, their populations can grow rapidly in good habitat, and this population growth and subsequent dispersal can result in hogs quickly populating new areas. To prevent rapid expansion onto the refuge from surrounding private lands, the staff should be prepared and have the ability to trap and shoot feral hogs found on or near refuge property.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date:

Description of Use: Research and Monitoring

Research and monitoring are used to collect information for the purpose of gaining a better understanding of ecosystem functions and habitat associations that would aid in guiding future refuge management decisions. The refuge supports research from a variety of governmental agencies, research groups, and universities. Projects that enhance the understanding of fish and wildlife management on White River NWR are encouraged and would be given preference. Each research project submitted to the refuge staff would be reviewed and if accepted, an appropriate special use permit would be issued to the researcher.

Availability of Resources: Personnel costs associated with coordinating research and monitoring projects are already in place at this time, as it is the refuge biologist's responsibility to review such projects and the refuge manager's responsibility to coordinate the issuance of annual special use permits that are required to conduct research on the refuge.

Anticipated Impacts of Use: Occasional injuries may occur to wildlife through routine marking activities (banding and tagging) and a small number of animals and plants may be collected for future study. These impacts would be temporary and minimal, however, and the information gained from these studies would potentially lead to improved habitat management of trust resource species.

Determination (check one below):

____ Use Is Not Compatible
_X__ Use Is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: All researchers would be required to obtain and possess a refuge special use permit. All guidelines specified in the permit would be followed when conducting wildlife, fisheries, and flora research within the boundaries of the refuge. These guidelines include, but are not limited to:

- All necessary collection permits must be completed at the permittee's expense. Copies of these permits would be provided to the refuge prior to special use permit issuance.

- At the time of the official permit request a working proposal covering project name, specific study location, problem being addressed along with specific objectives, research methods and materials, product to be produced, primary investigator, cooperators and key field persons, estimated funding amount and source of funding, and start date and completion date would be provided. Only those activities described within the proposal would be covered under this special use permit. A telephone list would be provided by the permittee, including names of key contacts in case of questions or emergencies.

- The permittee would provide detailed maps or plats to the refuge manager clearly showing the proposed project layout, travel/access routes, and work locations. The permittee would also provide details specifying the proposed mode of transportation (vehicle type) and frequency of visits to work sites.

- Field workers and supervisors must understand what is required of them. The permittee would be responsible for all actions conducted while under the authority of this permit.

- Within 30 days of conclusion of the research, a final check to remove all field equipment and supplies would be made. All keys on loan from the refuge would need to be returned. All equipment left after project completion would be considered litter, unless written approval is obtained from the refuge manager. Any equipment and supplies left on the refuge during the time of the study SHOULD NOT deter the scenic value of the area being studied. Any use of visual markers should be clearly presented within the study proposal.

- Permittee would provide one written update and (may be requested) to make up to one formal presentation for the staff or public annually that summarizes the permitted research and its current findings. In addition, permittee would provide a poster of the project and project results for public display in office/visitor center. A final report of peer review quality would be provided to the refuge within 12 months of the completion of field work. Copies of all publications related to the permit would be provided free of charge to the refuge.

Justification: Approved research and monitoring that occurs on refuge habitats could contribute to the understanding of bottomland hardwood forests and related ecosystems. Not only would information gathered be used to guide refuge-specific resource management decisions, but it could also be applied on lands outside of the refuge system within the LMRAV. Allowing this use furthers the mission of the Refuge System by improving our understanding of ecosystem management by ensuring resources are being managed appropriately, for the benefit of future generations.

NEPA Compliance for Refuge Use Decision:

Place an X in appropriate space.
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Description of Use: Wildlife Observation and Photography

Wildlife observation (viewing) and photography are priority public uses at White River NWR, which seek to increase the public's knowledge and understanding of wildlife and their habitats, and to contribute to wildlife conservation. Abundant wildlife and convenient access make White River NWR a destination for visitors hoping to observe and photograph a variety of wildlife and their habitats. Visitors are especially interested in viewing and photographing waterfowl, shorebirds, other migratory birds, including bald eagles, and resident wildlife such as white-tailed deer, eastern wild turkey, and turtles. Much of the refuge is subject to flooding, which may result in parts or all of it being closed for safety reasons. Access is by vehicle, boat, or walking. Vehicles may only be used on designated roads and parking areas, and are not allowed in fields or other areas. There are two developed facilities for this use, one is an observation platform located on the east side of the visitor center, which is open year-round. The other is an observation platform located on a marked trail on Frazier Lake Road overlooking the Demonstration Area, but is only open to the public from March 1 to November 1. The refuge currently has four interpretive trails (Big Cypress, Upland Trail, CCC Levee, and Nuttall Tree Trail) and numerous old logging roads, pipeline rights-of-way, and old abandoned all-terrain vehicle trails that can be utilized for this use as well.

Availability of Resources: Refuge staff and resources are adequate to administer the program at current levels. However, it is anticipated that an increase in these uses would occur over the coming years. In order to provide safe and quality wildlife observation and photography opportunities, additional resources and public use staff would be needed to enhance or develop additional viewing areas and provide improved facilities and programs. White River NWR refuge is open to the public for wildlife observation and photography year-round. While visitation for this use is generally light on the refuge, it poses no conflicts with biological goals and objectives.

Anticipated Impacts of Use: The activities of visitors engaging in wildlife observation and photography may result in some potential disturbance to wildlife. Minimal impacts in the form of trampling small vertebrates or invertebrates, trampling vegetation, and littering may also occur. Significant indirect or cumulative adverse impacts to refuge resources are not expected from these activities. The establishment of specified viewing areas and facilities, such as blinds, boardwalks, and trails would

enhance wildlife observation and photography, as well as manage and minimize associated visitor impacts or conflicts with other uses. Plans to provide such facilities, such as boardwalk behind visitor center, photo blinds at designated points, and designated hiking trails are in progress.

Determination (check one below):

____ Use Is Not Compatible
_X__ Use Is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: The majority of the refuge would be open for public use during daylight hours only, except for areas noted on the annual user permit. Some areas of the refuge may be zoned or restricted to season of use while others areas may be closed to all public use. The general public that uses the refuge are encouraged to read and acknowledge the regulations on the annual user permit to be aware of these areas before entry. Vehicle use would be limited to open, maintained roads. Refuge law enforcement would ensure compliance with regulations and protect refuge resources. Public access to wildlife observation and photography areas or facilities may be closed periodically for appropriate visitor and/or resource protection.

Justification: According to the Improvement Act, wildlife observation and photography are priority public use activities that should be encouraged and expanded where possible. It is through compatible wildlife-dependent public uses such as this that the public becomes aware of and provides support for national wildlife refuges.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date:

Description of Use: Tournament Fishing

Fishing is one of the most popular forms of recreation on White River NWR. Tournament fishing is a popular activity in which anglers compete against each other in an effort to catch the most and/or largest fish within a designated timeframe and fishing location. In most tournaments, entry fees are required and prizes are given to anglers according to the number and size of fish they catch.

Recreational fishing on the refuge is most popular on lakes with improved roads and boat ramps. The ease of access to these lakes leads to a disproportionate amount of fishing pressure and harvest when compared to isolated lakes without improved roads leading to them. In order to reduce interference with recreational fishermen on these lakes and to prevent over-harvesting fish in these lakes, in particular smaller lakes, fishing tournaments would not be allowed on refuge-owned land-locked lakes with boat ramps and improved roads leading to them.

Availability of Resources: Adequate resources required to allow tournament fishing currently exist. This includes evaluating and selecting tournament applications, administration of special use permits

by an administrative assistant, and maintaining law enforcement patrols to assure compliance with refuge and state regulations. Personnel costs associated with these items are already in place.

Anticipated Impacts of Use: Fishing tournaments may have some adverse impacts to wildlife through disturbance. Disturbance to wildlife species may include disturbances to late departing migratory waterfowl, nesting wading birds, and southbound shorebirds. Boating associated with fishing can alter bird distribution or reduce use by waterfowl and other waterbirds, alter feeding behavior, and cause premature departure from an area. These conflicts, however, should be minimal because of the small number and low frequency in which fishing tournaments would be conducted.

Determination (check one below):

____ **Use Is Not Compatible**
_X__ **Use Is Compatible with Following Stipulations**

Stipulations Necessary to Ensure Compatibility: Fishing on both non-navigable and navigable waters must be in compliance with state fishing regulations. The tournament regulations described below pertain to non-navigable waters within the refuge:

- Tournaments would be catch-and-release only.
- Tournaments would not be allowed on refuge-owned land-locked lakes with boat ramps and improved roads (i.e., gravel roads) leading to them.
- Fishing tournaments would be conducted under a special use permit issued by the refuge. Special use permit fees would apply.
- Tournaments would be limited to no more than 2 events per month during the months of March through October. No tournaments would be allowed during waterfowl hunting season (November – January) or during periods of high waterfowl usage (February).
- In order to schedule a fishing tournament, all interested permittee(s) would be required to submit a written proposal outlining the following information: requested tournament dates, number of tournament participants, estimated number of boats to be used during tournaments, names of the organization or club affiliation, a brief narrative explaining how tournament are to be organized (i.e., location of boat ramps to be utilized and weigh-in location), and contact persons.
- No tournaments would be conducted during any quota hunting season on the refuge.
- Tournament participants shall not occupy more than 50 percent of available parking places at any refuge-owned facilities during any given fishing tournament.
- Event elements, such as the collection of fees and the fish weigh-in and award program, would not be held on refuge lands or facilities.

Justification: Well-planned fishing tournaments can promote recreational fishing opportunities on refuges and be a source of conservation information and education for the angler. Time and space limits would be used to avoid conflicts with non-target wildlife species and other refuge users. Techniques such as limiting the amount of parking places that may be filled by tournament fishing vehicles, zoning areas not allowed for tournament fishing, and limiting the number of tournament

events should reduce disturbance to recreational fishers. Biological impacts would be reduced by requiring tournaments to be catch-and-release only.

NEPA Compliance for Refuge Use Decision:

Place an X in appropriate space.
_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date:

Public Review and Comment: These compatibility determinations are part of the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for White River NWR. The availability of the Draft CCP/EA for a 30-day public review and comment period will be announced in the *Federal Register* and in the local media.

Approval of Compatibility Determinations

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan for White River National Wildlife Refuge. If one of the descriptive uses is considered for compatibility outside of the comprehensive conservation plan, the approval signature becomes part of that determination.

Refuge Manager: _____
(Signature/Date)

Regional Compatibility Coordinator: _____
(Signature/Date)

Refuge Supervisor: _____
(Signature/Date)

Regional Chief, National Wildlife Refuge System, Southeast Region: _____
(Signature/Date)

Appendix G. Intra-Service Section 7 Biological Evaluation

REGION 4
INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

[Note: This form provides the outline of information needed for intra-Service consultation. If additional space is needed, attach additional sheets, or set up this form to accommodate your responses.]

Originating Person: Dennis Sharp
Telephone Number: (870) 282-8200 **E-Mail:** Dennis_Sharp@fws.gov
Date: October 6, 2010

PROJECT NAME (Grant Title/Number):

CCP for the White River National Wildlife Refuge

I. Service Program:

___ **Ecological Services**
___ **Federal Aid**
- ___ **Clean Vessel Act**
- ___ **Coastal Wetlands**
- ___ **Endangered Species Section 6**
- ___ **Partners for Fish and Wildlife**
- ___ **Sport Fish Restoration**
- ___ **Wildlife Restoration**

___ **Fisheries**
_X_ **Refuges/Wildlife**

II. State/Agency:

n/a

III. Station Name:

White River National Wildlife Refuge

IV. Description of Proposed Action (attach additional pages as needed):

The subject action would result in implementation of the Comprehensive Conservation Plan for the White River National Wildlife Refuge in Arkansas, Monroe, Phillips, and Desha Counties, Arkansas. This action would result in enhanced management and administration of the refuge in fulfillment of the establishing purposes for the refuge, which are:

"... As a refuge and breeding ground for migratory birds and other wildlife ....,(Executive Order 71 73,4 September 1935).

".....For use as an inviolate sanctuary, or for any other management purpose, for migratory birds. " 16 U.S.C. 71 5d (Migratory Bird Conservation Act);

"... Shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ...and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon...(Fish and Wildlife Coordination Act)

"...Suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species.." 16 U.S.C., 460k- 1"... the Secretary ...may accept and use ...real. ..property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C., 460k-460k- 4), as mended).
"...conservation, management, and 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.. ." 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act)

Management of the refuge would be guided by the proposed alternative over the next 15 years in the broad areas of Fish and Wildlife Population Management, Habitat Management, Resource Protection, Visitor Services, and Administration. Within these focal areas, detailed goals, objectives, and strategies have been developed to fulfill refuge purposes; comply with laws, regulations, and policies (including the protection of listed species); support regional and national plans and initiatives in conjunction with numerous partners such as Arkansas Game and Fish Commission; and consider public needs and benefits. See the Draft CCP/EA for a detailed description of the proposed alternative.

V. Pertinent Species and Habitat:

A. Include species/habitat occurrence map:

B. Complete the following table:
C.

SPECIES/CRITICAL HABITAT	STATUS[1]
Ivory-billed Woodpecker (*Campephilus principalis*)	E
Interior Least Tern (*Sterna antillarum*)	E
Pink Mucket (*Lampsilus abrupta*)	E
Fat Pocketbook (*Potamilus capax*)	E

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

VI. Location (map attached):

A. Ecoregion Number and Name:
Ecosystem Area I, Ecosystem 27: Mississippi Alluvial Valley

B. County and State:
Arkansas, Monroe, Phillips, and Desha Counties, Arkansas

C. Section, township, and range (or latitude and longitude):
Various holdings in T1N R3W, T1S R4W, T1S R3W, T1S R2W, T2S R3W, T2S R2W, T2S R1W, T3S R2W, T3S R1W, T4S R1W, T4S R1E, T5S R1W, T5S R1E, T6S R4W, T6S R3W, T6S R2W, T6S R1W, T7S R3S, T7S R2W, T7S R1W, T7S R1E, T8S R4W, T8S R3W, T8S R2W, T8S R1W, T9S R1E, all of the 5th Principal Meridian.

D. Distance (miles) and direction to nearest town:
See map. Portions of White River NWR are 0.1-mile south of Clarendon, 15 miles east of Stuttgart, 3 miles north of the Arkansas River, and 11 miles west of Elaine, Arkansas.

E. Species/habitat occurrence:

Ivory-billed Woodpecker (IBWO) - On April 28, 2005, Secretary of Interior Gale Norton announced the rediscovery of the endangered Ivory-billed Woodpecker (*Campephilus principalis*) on adjacent Cache River National Wildlife Refuge. To date, the information available includes several sightings on Cache River NWR and the possible recorded vocalizations on White River NWR. Although no conclusive documentation of IBWO presence on White River NWR currently exists, it may be possible that one or more individual birds (IBWO) are present.

What we know about the Ivory-billed Woodpecker is based on a very limited amount of reference material. In Arkansas Birds; Their Distribution and Abundance, by Douglas James and Joseph C. Neal 1986, the authors stated that the last ivory-billed woodpecker population remaining in Arkansas (near the mouth of the Arkansas River) disappeared between 1900 and 1915. There were also records as late as 1910 from Phillips County and there is one record upstream from the refuge on the White River in Jackson County in 1887.

Other historical accounts state the following: “Almost all of the Ivory-billed Woodpecker records in the Mississippi Delta occur in the first bottoms outside of the backwater and swamp areas.” (The Ivory-billed Woodpecker, James Tanner, 1942, pg. 15). Tanner (1942, pg. 16) stated that the ivory-billed woodpecker tended to use sweet gum-oak forests dominated by sweet gum, Nuttall oak, and green ash. Tanner (1942, pg. 16) also mentioned that the ivory-billed woodpeckers were found in cypress-tupelo swamps in the Mississippi Delta region.

In addition to IBWO, four additional threatened and endangered species are documented within the boundary of White River NWR; the interior least tern, pink mucket mussel, and fat pocketbook mussel.

Interior Least Tern - The Interior Least Tern is sighted occasionally on sand bars within the Lower White River Basin (one to two sightings per year). At this time, no nesting activity has been documented.

Pink Mucket - The pink mucket pearly mussel has a limited distribution with specimens having been found in the White River near Batesville down to near Crocket’s Bluff; one specimen has been collected within the main stem of the Lower White River.

Fat Pocketbook - The fat pocketbook mussel has a limited distribution with only one specimen collected within the main stem of the Lower White River. Historically, however, this species occurred throughout the lower river and may still inhabit suitable habitats.

VII. Determination of Effects:

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

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Ivory-billed Woodpecker (*Campephilus principalis*)	The ivory-billed woodpecker appears to prefer large contiguous forested areas and therefore may be seen in the proposed work area. Proposed management activities such as reforestation, land acquisition, and hydrologic restoration will connect and create large forest blocks and improve the ecosystem. Improvement cuts to forest habitat will be short-term disturbances, but will improve forest structure, composition, productivity, and sustainability of habitat for the long term. Public use, research, and other proposed activities are considered low volume/low impact.
Interior Least Tern (*Sterna antillarum)*	Limited occurrence on White River NWR. Proposed management activities will improve refuge habitat overall; foraging areas and potential nesting sites will not likely be impacted by the proposed actions.
Pink Mucket (*Lampsilus abrupta*)	Limited occurrence on White River NWR. Proposed management activities will improve water quality through sound forest management, reforestation, and hydrologic restoration; public use, research and other proposed activities will likely have no impact to the aquatic habitat.
Fat Pocketbook (*Potamilus capax*)	Limited occurrence on White River NWR. Proposed management activities will improve water quality through sound forest management, reforestation, and hydrologic restoration; public use, research, and other proposed activities will likely have no impact to the aquatic habitat.

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

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Ivory-billed Woodpecker (*Campephilus principalis*)	Surveys to determine potential use of an area by this species are conducted prior to any habitat manipulation. Close coordination with Ecological Services and the Regional Office continues to ensure protection and proper management for this species.
Interior Least Tern *(Sterna antillarum)*	Habitats potentially used by this species are not slated for active management. Ownership and law enforcement are key elements to protection of this species and its habitats.
Pink Mucket *(Lampsilus abrupta)*	State Best Management Practices will be followed for silvicultural operations. Refuge ownership and therefore management and law enforcement will ensure protection of this species and its habitats.
Fat Pocketbook *(Potamilus capax)*	State Best Management Practices will be followed for silvicultural operations. Refuge ownership and therefore management and law enforcement will ensure protection of this species and its habitats.

VIII. Effect Determination and Response Requested:

SPECIES/ CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE	NA	AA	
Ivory-billed Woodpecker (*Campephilus principalis*)		X		Concurrence
Interior Least Tern *(Sterna antillarum)*		X		Concurrence
Pink Mucket *(Lampsilus abrupta)*		X		Concurrence
Fat Pocketbook *(Potamilus capax)*		X		Concurrence

[1]*DETERMINATION/RESPONSE REQUESTED:*

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

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

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

_____ _____

Signature (originating station) **Date**

_____

Title

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence _____ Non-concurrence _____

B. Formal consultation required _____

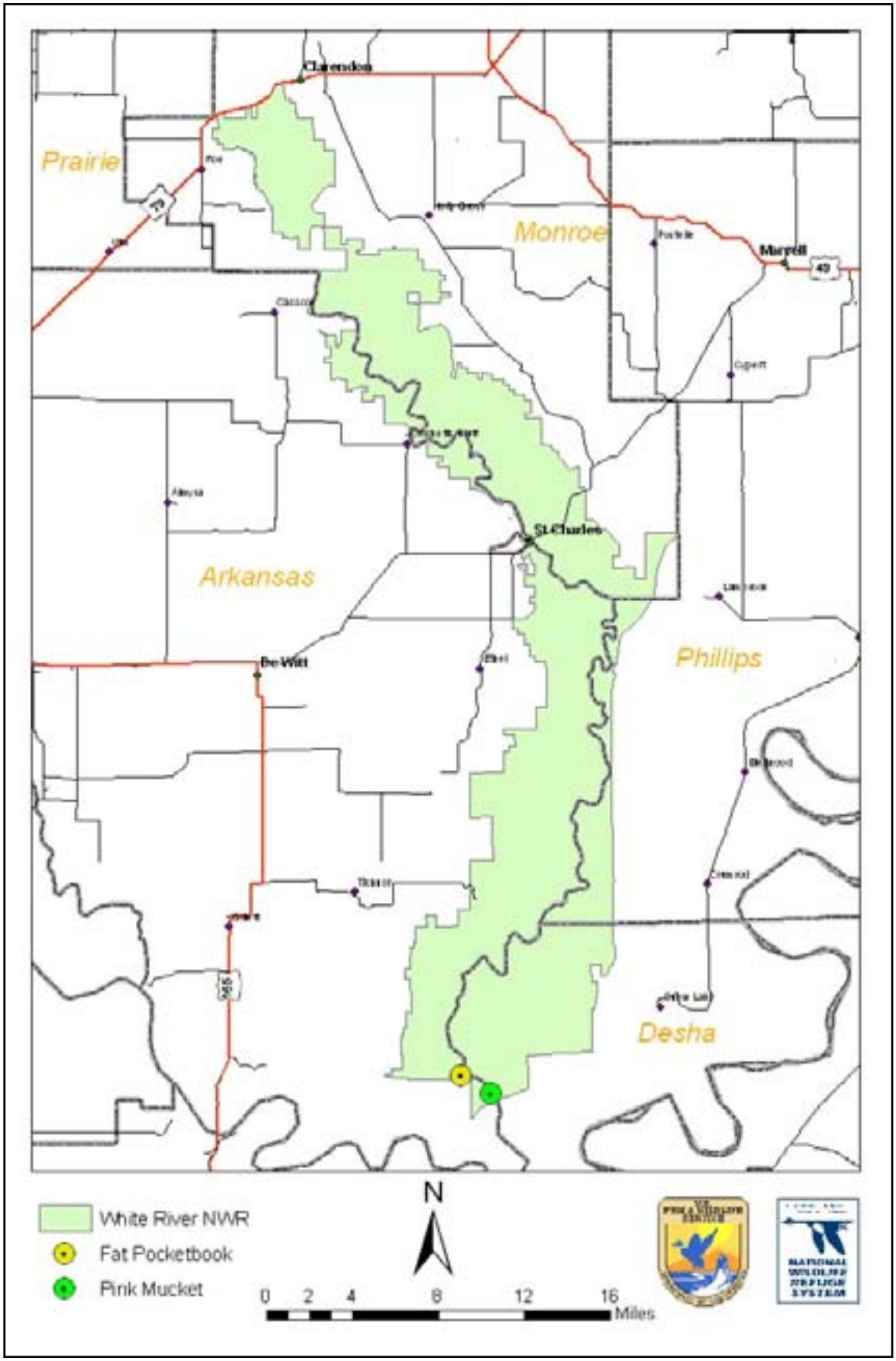
C. Conference required _____

D. Informal conference required _____

D. Remarks (attach additional pages as needed):

_____ _____
signature **date**

_____ _____
title **office**


Clarendon
Prairie
Monroe
Marvell
Arkansas
St Charles
Phillips
De Witt
Desha
White River NWR
Fat Pocketbook
Pink Mucket
N
0 2 4 8 12 16
Miles

Appendix H. Wilderness Review

The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which:

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

The lands within White River NWR were previously reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. A public hearing was held in DeWitt, Arkansas, on May 25, 1972, to consider wilderness designation for White River NWR as was required by the Wilderness Act of 1964. Following the public hearing/comment period only the 975-acre Sugarberry Research Natural Area remained with Research Natural Area (RNA) destination.

Original objectives of the White River Wilderness Study:

- To determine if there are areas on the refuge that fit the Wilderness Act definition of a wilderness.
- To determine if wilderness designated would be compatible with the primary wildlife objectives of the refuge.
- To arrive at objective conclusion concerning the wilderness potential of White River NWR and to make preliminary recommendations based on these conclusions.

In the wilderness proposal, two areas were proposed that were believed to qualify as wilderness areas and in the public hearing they were designated as:

Area A - Scrubgrass Bayou (Sugarberry RNA) - 1,000 acres.
Area B - Parrish Lake, East Moon area - 4,000 acres.

It was believed that by combining these sites, they would meet the required 5,000 minimum acreage required to qualify as a wilderness.

In the public meeting, 78 people attended with a majority not in favor of setting aside any additional acreage because of the restriction to limit motorized equipment for hunting and fishing access.

The following excerpts were read at the meeting and are from Mr. Edward C. Carlson, Regional Director Region 4.

> "we cannot escape, however, the obvious conclusion that White River NWR is not a wilderness area as defined by the Wilderness Act" ……."The Wilderness Study of White River NWR has made clear that previous history of the area as well as management programs currently underway on the refuge and those planned for the future are in conflict with the meaning and intent of "wilderness" as defined by the Act. For these reasons and others included in the statement and the Wilderness Study Report Summary, we shall recommend to the Director, Bureau of Sport Fisheries and Wildlife, that White River NWR does not qualify for wilderness consideration"

During the CCP planning process, all lands within White River NWR were reviewed again to determine their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. No lands in White River NWR were found to meet these criteria. Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this plan.

Appendix I. Refuge Biota

BIRDS

Common Name	Scientific Name	W	Sp	Su	F
Ducks and Geese					
Fulvous Whistling duck	*Dendrocygna bicolor*	N	R	R	R
Black-bellied Whistling Duck	*Dendrocygna autumnalis*	N	R	R	R
Greater White-Fronted Goose	*Anser albifrons*	A	O	N	A
Snow Goose (white morph)	*Chen caerulescens*	A	C	N	C
Snow Goose (blue morph)	*Chen caerulescens*	O	O	N	O
Ross's Goose	*Chen rossii*	C	O	N	C
Cackling Goose	*Branta hutchinsii*	O	O	N	O
Canada Goose	*Branta canadensis*	O	O	O	O
Wood Duck	*Aix sponsa*	C	C	N	C
Gadwall	*Anas strepera*	A	C	N	C
American Wigeon	*Anas americana*	A	C	N	C
American Black Duck	*Anas rubripes*	U	O	N	U
Mallard	*Anas platyrhynchos*	A	A	O	A

Common Name	Scientific Name	W	Sp	Su	F
Blue-winged Teal	*Anas discors*	R	C	O	C
Northern Shoveler	*Anas clypeata*	A	C	N	C
Northern Pintail	*Anas acuta*	C	O	N	U
Green-winged Teal	*Anas crecca*	C	C	N	C
Canvasback	*Aythya valisineria*	O	O	N	O
Redhead	*Aythya Americana*	R	U	N	R
Ring-necked Duck	*Aythya collaris*	A	O	N	A
Greater Scaup	*Aythya marila*	O	O	N	O
Lesser Scaup	*Aythya affinis*	C	O	N	C
Bufflehead	*Bucephala albeola*	O	O	N	O
Common Goldeneye	*Bucephala clangula*	O	O	N	O
Hooded Merganser	*Lophodytes cucullatus*	C	U	U	C
Common Merganser	*Mergus merganser*	O	R	N	R
Red Breasted Merganser	*Mergus serrator*	R	R	N	R
Ruddy Duck	*Oxyura jamaicensis*	R	U	N	R

Common Name	Scientific Name	W	Sp	Su	F
Turkey and Quail					
Wild Turkey	*Melleagris gallopavo*	C	C	C	C
Northern Bobwhite	*Colinus virginianus*	U	U	U	U
Loons					
Common Loon	*Gavia immer*	O	O	N	O
Grebes					
Pied-Billed Grebe	*Podilymbus podiceps*	U	U	N	U
Horned Grebe	*Podilymbus auritus*	U	U	N	U
Eared Grebe	*Podiceps nigricollis*	U	U	N	U
Pelican and Anhinga					
American White Pelican	*Pelecanus erthrorhynchos*	C	O	N	O
Double-crested Cormorant	*Phalacrocorax auritus*	O	C	C	C
Anhinga	*Anhinga anhinga*	N	O	O	O
Herons, Bitterns, Egrets, Ibises, Storks, Vultures					
American Bittern	*Botaurus lentiginous*	R	U	U	U
Least Bittern	*Ixobrychus exilis*	N	O	O	O

Common Name	Scientific Name	W	Sp	Su	F
Great Blue Heron	*Butorides striatus*	C	C	C	C
Great Egret	*Ardea alba*	R	A	A	C
Snowy Egret	*Egretta thula*	N	C	C	O
Little Blue Heron	*Florida caerula*	N	C	C	C
Tri-colored Heron	*Egretta tricolor*	N	R	R	R
Cattle Egret	*Bubulcus ibis*	N	C	C	O
Green Heron	*Butorides virecens*	N	A	A	A
Black-crowned Night Heron	*Nycticorax nycticorax*	N	O	O	O
Yellow-crowned Night Heron	*Nyctanassa violacea*	N	U	U	U
White Ibis	*Eudocimus albus*	N	N	U	U
White-Faced Ibis	*Plegadis chihi*	N	U	U	R
Roseate Spoonbill	*Ajaia ajaja*	N	N	R	R
Wood Stork	*Mycteria Americana*	N	N	U	O
Turkey Vulture	*Cathartes aura*	U	U	U	U
Black Vulture	*Coragyps atratus*	U	U	U	U

Common Name	Scientific Name	W	Sp	Su	F
Kites, Hawks, Falcons, Eagles					
Osprey	*Pandion haliaetus*	N	C	R	C
Swallow-tailed Kite	*Elanoides forficatus*	N	0	0	R
Mississippi Kite	*Ictinia mississippiensis*	N	O	C	C
Bald Eagle	*Haliaeetus leucopcephalus*	U	U	U	U
Northern Harrier	*Circus cyaneus*	C	C	N	R
Sharp-shinned Hawk	*Accipiter striatus*	O	O	N	O
Coopers Hawk	*Accipiter cooperii*	U	O	O	O
Red-shouldered Hawk	*Buteo lineatus*	C	C	C	C
Broad-winged Hawk	*Buteo platypterus*	N	C	U	C
Swainson's Hawk	*Buteo swainsonii*	N	O	N	O
Red-tailed Hawk	*Buteo jamaicensis*	C	C	C	C
Rough-legged Hawk	*Buteo lagopus*	O	O	N	O
Golden Eagle	*Aquila chrysaetos*	O	O	N	O
American Kestrel	*Falco sparverius*	C	C	O	C
Merlin	*Falco columbarius*	R	R	N	R

Common Name	Scientific Name	W	Sp	Su	F
Peregrine Falcon	*Falco peregrines*	R	R	N	R
Rails, Cranes					
King Rail	*Rallus elegans*	R	R	R	O
Virginia Rail	*Rallus limicola*	R	R	N	R
Sora	*Porzana Carolina*	U	U	N	U
Purple Gallinule	*Porphyrula martinica*	N	R	O	O
Common Moorhen	*Gallinula chloropus*	N	U	U	R
American Coot	*Fulica Americana*	C	U	R	C
Sandhill Crane	*Grus Canadensis*	N	R	N	O
Shorebirds					
Black Bellied Plover	*Pluvialis squatarola*	R	R	R	R
American Golden Plover	*Pluvialis dominica*	N	R	R	R
Semipalmated Plover	*Charadrius semipalmatus*	N	R	R	R
Killdeer	*Charadrius vociferous*	C	C	C	C
Black-necked Stilt	*Himantopus mexicanus*	N	R	R	R
Greater Yellowlegs	*Tringa melanoleuca*	O	C	C	C

Common Name	Scientific Name	W	Sp	Su	F
Lesser Yellowlegs	*Tringa flavipes*	O	C	O	C
Solitary Sandpiper	*Tringa solitaria*	N	R	R	R
Spotted Sandpiper	*Actitis macularia*	R	U	U	C
Upland Sandpiper	*Bartramia longicauda*	N	R	R	R
Semipalmated Sandpiper	*Calidris pusilla*	N	R	R	R
Western Sandpiper	*Calidris mauri*	R	R	R	R
Least Sandpiper	*Calidris minutilla*	C	C	U	C
Pectoral Sandpiper	*Calidris melantos*	N	U	U	U
Stilt Sandpiper	*Calidris himantopus*	N	R	R	R
Shortbilled Dowitcher	*Limnodromus griseus*	N	R	R	R
American Avocet	*Recurvirostra americana*	N	N	N	R
Longbilled Dowitcher	*Limnodromus scolopaceus*	O	O	R	U
Common Snipe	*Gallinago gallinago*	C	C	O	C
American Woodcock	*Scolopax minor*	U	O	O	O
Wilson's Phalarope	*Phalaropus tricolor*	N	R	R	R

Common Name	Scientific Name	W	Sp	Su	F
Gulls and Terns					
Laughing Gull	*Larus atricilla*	R	N	N	N
Franklins Gull	*Larus pipixcan*	N	N	R	U
Bonaparte's Gull	*Larus Philadelphia*	U	U	N	U
Ring-billed Gull	*Larus delawarensis*	C	C	N	U
Herring Gull	*Larus argentatus*	U	U	N	U
Caspian Tern	*Sterna caspia*	N	R	R	R
Least Tern	*Sterna albifrons*	N	O	O	R
Forester's Tern	*Sterna forsteri*	R	U	R	U
Doves and Cuckoos					
Eurasian Collared-dove	*Streptopelia decaocto*	O	O	O	O
White-winged Dove	*Zenaida asiatica*	R	N	N	R
Mourning Dove	*Zenaida macroura*	A	A	A	A
Inca Dove	*Columbina inca*	N	N	R	N
Common Ground Dove	*Columbina passerine*	N	N	N	R
Rock Dove	*Columba livia*	O	O	O	O

Common Name	Scientific Name	W	Sp	Su	F
Cuckoos					
Black-billed Cuckoo	*Coccyzus erythropthalmus*	N	R	N	R
Yellow-billed Cuckoo	*Coccyzus americanus*	N	C	C	C
Owls					
Barn Owl	*Tyto alba*	U	U	U	U
Eastern Screech Owl	*Otus asio*	C	C	C	C
Great Horned Owl	*Bubo virginianus*	C	C	C	C
Barred Owl	*Strix varia*	C	C	C	C
Long-eared Owl	*Asio otus*	R	R	N	R
Short-eared Owl	*Asio flammeus*	O	R	N	O
Nighthawks					
Common Nighthawk	*Chordeiles minor*	N	U	U	U
Chuck-wills-widow	*Caprimulgus carolinensis*	N	U	U	u
Whip-poor-will	*Caprimulgus vociferous*	N	O	R	O
Swifts, Hummingbirds					
Chimney Swift	*Chaetura pelagica*	N	C	A	A

Common Name	Scientific Name	W	Sp	Su	F
Ruby-throated Hummingbird	*Archilochus colubris*	N	N	C	C
Rufous Hummingbird	*Selasphorus rufus*	N	N	N	R
Anna's Hummingbird	*Calypte anna*	N	N	N	R
Woodpeckers					
Red-headed Woodpecker	*Melanerpes erythrocephalus*	C	C	C	C
Red-bellied Woodpecker	*Melanerpes carolinus*	A	A	A	A
Yellow-bellied Sapsucker	*Sphyrapicus varius*	C	N	N	U
Downy Woodpecker	*Picoides pubescens*	C	C	C	C
Hairy Woodpecker	*Picoides villosus*	U	U	U	U
Northern Flicker	*Colaptes auratus*	C	C	C	C
Pileated Woodpecker	*Dryocopus pileatus*	C	C	C	C
Ivory-billed Woodpecker	*Campephilus principalis*	R*	R*	R*	R*
Kingfishers					
Belted Kingfisher	*Megaceryle alcyon*	C	C	C	C
Flycatchers					
Eastern Wood-Pewee	*Contopus virens*	N	C	C	C

Common Name	Scientific Name	W	Sp	Su	F
Yellow-bellied Flycatcher	*Empidonax flaviventris*	N	R	N	R
Acadian Flycatcher	*Empidonax virescens*	N	O	A	O
Alder Flycatcher	*Empidonax alnorum*	N	R	R	R
Willow Flycatcher	*Empidonax traillii*	N	R	N	R
Least Flycatcher	*Empidonax minimus*	N	C	N	O
Eastern Phoebe	*Sayornis phoebe*	C	C	N	O
Great-crested Flycatcher	*Myiarchus crinitus*	N	C	C	O
Eastern Kingbird	*Tyrannus tyrannus*	N	C	U	C
Scissor-tailed Flycatcher	*Tyrannus forficatus*	N	N	O	O
Loggerhead Shrike	*Lanius ludovicianus*	O	O	O	O
White-eyed Vireo	*Vireo griseus*	N	C	A	C
Bell's Vireo	*Vireo bellii*	N	O	O	O
Yellow-throated Vireo	*Vireo flavifrons*	N	U	C	C
Warbling Vireo	*Vireo gilvus*	N	O	R	O
Red-eyed Vireo	*Vireo olivaceous*	N	C	A	C

Common Name	Scientific Name	W	Sp	Su	F
Jays and Crows					
Blue Jay	*Cyanocitta cristata*	C	C	C	C
American Crow	*Corvus brachyrhynchos*	O	O	R	O
Fish Crow	*Corvus ossifragus*	O	U	U	U
Larks					
Horned Lark	*Eremophila alpestris*	A	C	U	C
Swallows and Martins					
Purple Martin	*Progne subis*	N	U	C	O
Tree Swallow	*Tachycineta bicolor*	N	U	C	C
Northern Rough-winged Swallow	*Stelgidopteryx ruficollis*	N	U	C	C
Bank Swallow	*Riparia riparia*	N	U	O	C
Cliff Swallow	*Petrochelidon pyrrhonota*	N	R	R	R
Barn Swallow	*Hirundo rustica*	N	C	C	C
Chickadee and Titmouse					
Carolina Chickadee	*Parus carolinensis*	C	C	C	C
Tufted Titmouse	*Parus bicolor*	C	C	C	C

Common Name	Scientific Name	W	Sp	Su	F
Nuthatches and Creepers					
Red-breasted Nuthatch	*Sitta canadensis*	R	N	N	N
White-breasted Nuthatch	*Sitta carolinensis*	U	U	U	U
Brown Creeper	*Certhia canadensi*	U	O	N	O
Wrens					
Carolina Wren	*Thyrothorus ludovicianus*	A	A	A	A
Bewick's Wren	*Thromanes bewickii*	U	U	N	U
House Wren	*Thyrothorus troglodytes*	O	O	N	O
Winter Wren	*Troglodytes troglodytes*	C	C	N	C
Sedge Wren	*Cistothorus platensis*	R	O	R	O
Marsh Wren	*Cistothourus platensis*	O	O	N	O
Gnatcatchers and Kinglets					
Golden-crowned Kinglet	*Regulus satrapa*	C	C	N	U
Ruby-crowned Kinglet	*Regulus calendula*	C	C	N	C
Blue-gray Gnatcatcher	*Polioptila caerulea*	N	O	A	C

Common Name	Scientific Name	W	Sp	Su	F
Thrushes, Mockingbirds, and Thrashers, Pipits					
Eastern Bluebird	*Sialia sialis*	C	C	C	C
Veery	*Catharus fuscescens*	N	R	N	R
Gray-Cheeked Thrush	*Catharus minimus*	N	N	N	O
Swainson's Thrush	*Catharus ustulatus*	N	U	N	U
Hermit Thrush	*Catharus guttatus*	C	C	N	U
Wood Thrush	*Hylocichla mustelina*	N	U	C	U
American Robin	*Turdus migratorius*	A	C	U	C
Gray Catbird	*Dumetella carolinensis*	R	O	C	O
Northern Mockingbird	*Mimus plyglottos*	C	C	C	C
Brown Thrasher	*Toxostoma rufum*	C	C	C	C
European Starling	*Sturnus vulgaris*	A	A	C	A
American Pipit	*Anthus rubescens*	C	O	N	C
Sprague's Pipit	*Anthus spragueii*	O	O	N	O
Cedar Waxwing	*Bombycilla cedrorum*	C	C	N	O

Common Name	Scientific Name	W	Sp	Su	F
Warblers					
Blue-winged Warbler	*Vermivora pinus*	N	R	N	R
Tennessee Warbler	*Vermivora peregrine*	N	C	N	C
Orange-crowned Warbler	*Vermivora celata*	U	O	N	O
Nashville Warbler	*Vermivora ruficapilla*	N	C	O	C
Northern Parula	*Parula americana*	N	O	C	O
Yellow Warbler	*Dendroica petechia*	N	O	O	O
Chestnut-sided Warbler	*Dendroica pensylvanica*	N	O	N	R
Magnolia Warbler	*Dendroica magnolia*	N	O	N	R
Yellow-rumped Warbler	*Dendroica coronata*	A	C	N	C
Black-throated Green Warbler	*Dendroica virens*	N	O	N	O
Blackburnian Warbler	*Dendroica fusca*	N	R	N	R
Yellow-throated Warbler	*Dendroica dominica*	N	C	C	C
Pine Warbler	*Dendroica pinus*	U	O	O	O
Prairie Warbler	*Dendroica discolor*	N	O	U	O
Palm Warbler	*Dendroica palmmarum*	N	R	N	R

Common Name	Scientific Name	W	Sp	Su	F
Bay-breasted Warbler	*Dendroica castanea*	N	R	N	R
Blackpoll Warbler	*Dendroica striata*	N	R	N	N
Cerulean Warbler	*Dendroica cerulean*	N	U	U	U
Black and White Warbler	*Mniotilta varia*	N	C	O	C
American Redstart	*Setophaga ruticilla*	N	U	O	U
Prothonotary Warbler	*Protonotaria citrea*	N	C	A	O
Worm-eating Warbler	*Helmitheros vermivorus*	N	U	U	U
Swainson's Warbler	*Limnothlypis swainsonii*	N	U	U	O
Ovenbird	*Seiurus aurocapillus*	N	C	R	C
Louisiana Waterthrush	*Seiurus motacilla*	N	U	U	U
Kentucky Warbler	*Oporornis formosus*	N	C	C	U
Connecticut Warbler	*Oporornis agilis*	N	R	N	N
Morning Warbler	*Oporornis Philadelphia*	N	O	N	R
Common Yellowthroat	*Geothlypis trichas*	N	U	U	U
Hooded Warbler	*Wilsonia citrine*	N	C	C	U
Wilson's Warbler	*Wilsonia pusilla*	N	R	N	R

Common Name	Scientific Name	W	Sp	Su	F
Canada Warbler	*Wilsonia canadensis*	N	R	N	R
Yellow-breasted Chat	*Icteria virens*	N	C	C	C
Tanagers					
Summer Tanager	*Piranga rubra*	N	C	C	O
Scarlet Tanager	*Piranga olivacea*	N	O	N	R
Sparrows, Towhee, Buntings					
Eastern Towhee	*Phipilo maculatus*	C	C	C	C
American Tree Sparrow	*Spizella arborea*	R	N	N	N
Chipping Sparrow	*Spizella passerine*	U	C	U	C
Clay-Colored Sparrow	*Spizella pallida*	N	R	N	R
Field Sparrow	*Spizella pusilla*	C	C	U	C
Vesper Sparrow	*Pooecetes gramineus*	U	O	N	U
Lark Sparrow	*Chondestes grammacus*	N	R	R	R
Savannah Sparrow	*Passerculus sandwichenis*	A	C	N	A
Grasshopper Sparrow	*Ammodramus savannarum*	U	U	U	U
Henslow's Sparrow	*Ammodramus henslowii*	N	R	N	R

Common Name	Scientific Name	W	Sp	Su	F
Le Conte's Sparrow	*Ammodramus leconteii*	U	U	N	U
Fox Sparrow	*Passerella iliaca*	U	U	N	U
Song Sparrow	*Melospiza melodia*	A	C	N	A
Lincoln's Sparrow	*Melospiza lincolnii*	C	C	N	C
Swamp Sparrow	*Melospiza Georgiana*	C	C	N	C
White-throated Sparrow	*Zonotrichia albicollis*	A	A	N	A
White Crowned Sparrow	*Zonotrichia leucophrys*	C	C	N	C
Dark-eyed Junco	*Junco hymenalis*	C	C	N	C
Lapland Longspur	*Calcarius lapponicus*	C	O	N	O
Northern Cardinal	*Cardinalis cardinalis*	A	A	A	A
Rose-Breasted Grosbeak	*Pheucticus ludovicianus*	N	U	N	U
Blue Grosbeak	*Guiraca caerulea*	N	O	O	O
Indigo Bunting	*Passerina cyanea*	N	A	A	C
Painted Bunting	*Passerina ciris*	N	O	O	O
Dickcissel	*Spiza Americana*	N	A	A	O

Common Name	Scientific Name	W	Sp	Su	F
Blackbirds, Orioles, Meadowlarks					
Bobolink	*Dolichonyx oryzivorus*	N	U	N	N
Red-winged Blackbird	*Agelaius phoeniceus*	A	A	A	A
Eastern Meadowlark	*Sturnella magna*	C	C	C	C
Western Meadowlark	*Sturnella neglecta*	R	N	N	N
Rusty Blackbird	*Euphagus carolinus*	C	C	N	C
Brewers Blackbird	*Euphagus cyanocephalus*	A	C	N	C
Common Grackle	*Quiscalus quiscula*	A	A	A	A
Brown-headed Cowbird	*Molothrus ater*	A	A	A	A
Orchard Oriole	*Icterus spurious*	N	A	A	C
Baltimore Oriole	*Icterus galbula*	N	C	C	C
Finches, Crossbills					
Purple Finch	*Carpodacus purpureus*	U	U	N	R
House Finch	*Carpodacus mexicanus*	O	O	O	O
Red Crossbill	*Loxia curvirostra*	O	O	N	R
Pine Siskin	*Carduelis pinus*	U	O	N	U

Common Name	Scientific Name	W	Sp	Su	F
American Goldfinch	*Carduelis tristis*	C	C	R	C
House Sparrow					
House Sparrow	*Passer domesticus*	O	O	O	O
Incidentals					
Brown Pelican	*Pelecanus occidentalis*				
Cinnamon Teal	*Anas cyanoptera*				
Yellow Rail	*Coturnicops noveboracensis*				
Black Rail	*Laterallus jamaicensis*				
Northern Goshawk	*Accipiter gentiles*				
Boat-tailed Grackle	*Quiscalus major*				
White-winged Scoter	*Melanitta fusca*				

Spring - March-May
Summer - June-August
Fall - September-November
Winter - December-February

A – Abundant (a common species which is very numerous)
C – Common (certain to be seen in suitable habitat)
U – Uncommon (present but not certain to be seen)
O – Occasional (seen only a few times during a season)
R – Rare (seen at intervals of two to five years)
R- Rare (Reported, but not verified)*
N- Not expected or documented during this season

Common Name	Scientific Name
MAMMALS - known to or likely to occur within White River NWR.	
Didelphidae	
Virginia opossum	*Didelphus virginiana*
Soricidae	
Southeastern shrew	*Sorex longirostris*
Southern short-tailed shrew	*Blarina carolinensis*
Least shrew	*Cryptotis parva*
Talpidae	
Eastern mole	*Scalopus aquaticus*
Vespertilionidae	
Little brown bat	*Myotis lucifugus*
Southeastern bat	*Myotis austroriparius*
Gray bat	*Myotis grisescens*
Indiana bat	*Myotis sodalist*
Silver-haired bat	*Lasioncyteris noctivagans*
Eastern pipistrelle	*Pipistrellus subflavus*
Big brown bat	*Eptesicus fuscus*
Red bat	*Lasiurus borealis*
Seminole bat	*Lasiurus seminolus*
Hoary bat	*Lasiurus cinereus*
Evening bat	*Nycticeius humeralis*
Rafinesque's big-eared bat	*Plecotus rafinesquii*
Dasypodidae	
Nine-banded armadillo	*Dasypus novemcinctus*

Common Name	Scientific Name
Leporidae	
Eastern cottontail	*Sylvilagus floridanus*
Swamp rabbit	*Sylvilagus aquaticus*
Sciuridae	
Eastern chipmunk	*Tamias striatus*
Woodchuck	*Marmota monax*
Gray squirrel	*Sciurus carolinensis*
Fox squirrel	*Sciurus niger*
Southern flying squirrel	*Glaucomys volans*
Geomyidae	
Baird's pocket gopher	*Geomys breviceps*
Castoridae	
Beaver	*Castor canadensis*
Muridae	
Marsh rice rat	*Oryzomys palustris*
Eastern harvest mouse	*Reithrodontomys humulis*
Fulvous harvest mouse	*Reithrodontomys fulvescens*
Deer mouse	*Peromyscus maniculatus*
White-footed mouse	*Peromyscus leucopus*
Cotton mouse	*Peromyscus gossypinus*
Golden mouse	*Ochrotomys nuttalli*
Hispid cotton rat	*Sigmodon hispidus*
Eastern woodrat	*Neotoma floridana*
Prairie vole	*Microtus ochrogaster*
Woodland vole	*Microtus pinetorum*
Muskrat	*Ondatra zibethicus*

Common Name	Scientific Name
Southern bog lemming	*Synaptomys cooperi*
Black rat	*Rattus rattus*
House mouse	*Mus musculus*
Norway rat	*Rattus norvegicus*
Capromyidae	
Nutria	*Myocastor coypus*
Canidae	
Coyote	*Canis latrans*
Red fox	*Vulpes vulpes*
Gray fox	*Urocyon cinereoargenteus*
Ursidae	
Black bear	*Ursus americanus*
Procyonidae	
Raccoon	*Procyon lotor*
Mustelidae	
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
Eastern spotted skunk	*Spilogale putorius*
Striped skunk	*Mephitis mephitis*
River otter	*Lutra Canadensis*
Felidae	
Bobcat	*Felis rufus*
Suidae	
Feral hog	*Sus scrofa*
Cervidae	
White-tailed deer	*Odocoileus virginianus*

Common Name	Scientific Name
AMPHIBIANS &REPTILES - known to or likely to occur within White River NWR.	
AMPHIBIANS	
Ambystomatidae	
Spotted salamander	*Ambystoma maculatum*
Marbled salamander	*Ambystoma opacum*
Mole salamander	*Ambystoma talpoideum*
Small-mouthed salamander	*Ambystoma texanum*
Amphiumidae	
Three-toed amphiuma	*Amphiuma tridactylum*
Plethodontidae	
Western slimy salamander	*Plethodon albagula*
Ozark zigzag salamander	*Plethodon angusticlavus*
Proteidae	
Louisiana waterdog	*Necturus maculosus louisianensis*
Red River waterdog	*Necturus maculosus*
Salamandridae	
Central newt	*Notophthalmus viridescens louisianens*
Sirenidae	
Western lesser siren	*Siren intermedia nettingi*
Bufonidae	
Dwarf American toad	*Bufo americanus charlesmithi*
Fowler's toad	*Bufo fowleri*
Hylidae	
Blanchard's cricket frog	*Acris crepitans blanchardi*
Northern cricket frog	*Acris crepitans crepitans*
Bird-voiced treefrog	*Hyla avivoca*

Common Name	Scientific Name
Gray treefrog	*Hyla chrysoscelis* or *Hyla versicolor*
Green treefrog	*Hyla cinerea*
Northern spring peeper	*Pseudacris crucifer crucifer*
Upland chorus frog	*Pseudacris triseriata feriarum*
Microhylidae	
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*
Pelobatidae	
Eastern spadefoot	*Scaphiopus holbrookii*
Ranidae	
Northern crawfish frog	*Rana areolata circulosa*
American bullfrog	*Rana catesbeiana*
Bronze frog	*Rana clamitans clamitans*
Pickerel frog	*Rana palustris*
Southern leopard frog	*Rana sphenocephala*
Gopher Frog	*Rana capito*
REPTILES	
Alligatoridae	
American alligator	*Alligator mississippiensis*
Chelydridae	
Common snapping turtle	*Chelydra serpentina serpentina*
Alligator snapping turtle	*Macrochelys temmincki*
Emydidae	
Southern painted turtle	*Chrysemys picta dorsalis*
Western chicken turtle	*Deirochelys reticularia miaria*
Common map turtle	*Graptemys geographica*
Ouachita map turtle	*Graptemys ouachitensis ouachitensis*

Common Name	Scientific Name
Mississippi map turtle	*Graptemys pseudogeographica kohnii*
Eastern river cooter	*Pseudemys concinna*
Three-toed box turtle	*Terrapene carolina triunguis*
Ornate box turtle	*Terrapene ornata ornata*
Red-eared slider	*Trachemys scripta elegans*
Kinosternidae	
Mississippi mud turtle	*Kinosternon subrubrum hippocrepis*
Razor-backed musk turtle	*Sternotherus carinatus*
Stinkpot	*Sternotherus odoratus*
Trionychidae	
Midland smooth softshell	*Apalone mutica mutica*
Spiny softshell	*Apalone spiniferus*
Anguidae	
Western slender glass lizard	*Ophisaurus attenuatus attenuatus*
Phrynosomatidae	
Northern fence lizard	*Sceloporus undulates hyacinthinus*
Polychrotidae	
Northern green anole	*Anolis carolinensis carolinensis*
Scincidae	
Southern coal skink	*Eumeces anthracinus pluvialis*
Five-lined skink	*Eumeces fasciatus*
Broadhead skink	*Eumeces laticeps*
Ground skink	*Scincella lateralis*
Teiidae	
Prairie racerunner	*Cnemidophorus sexlineatus viridis*
Six-lined racerunner	*Cnemidophorus sexlineatus sexlineatus*

Common Name	Scientific Name
Colubridae	
Northern scarlet snake	*Cemophora coccinea copei*
Eastern racer	*Coluber constrictor*
Western rat snake	*Elaphe obsolete*
Prairie kingsnake	*Lampropeltis calligaster calligaster*
Speckled kingsnake	*Lampropeltis getulus holbrooki*
Red milk snake	*Lampropeltis triangulum syspila*
Rough green snake	*Opheodrys aestivus*
Mississippi green water snake	*Nerodia cyclopion cyclopion*
Yellowbelly water snake	*Nerodia erythrogaster flavigaster*
Broad-banded water snake	*Nerodia fasciata confluens*
Diamondback water snake	*Nerodia rhombifer rhombifer*
Midland water snake	*Nerodia sipedon pleuralis*
Graham's crayfish snake	*Regina grahamii*
Midland brown snake	*Storeria dekayi wrightorum*
Northern redbelly snake	*Storeria occipitomaculata occipitomacu*
Western ribbon snake	*Thamnophis proximus proximus*
Eastern garter snake	*Thamnophis sirtalis sirtalis*
Rough earth snake	*Virginia striatula*
Western smooth snake	*Virginia valeriae elegans*
Western worm snake	*Carphophis vermis*
Midwest worm snake	*Carphophis amoenus*
Mississippi ringneck snake	*Diadophis punctatus stictogenys*
Western mud snake	*Farancia abacura reinwardti*
Eastern hognose snake	*Heterodon platyrhinos*
Flathead snake	*Tantilla gracilis*

Common Name	Scientific Name
Viperidae	
Southern copperhead	*Agkistrodon contortrix contortrix*
Western cottonmouth	*Agkistrodon piscivorus leucostoma*
Canebrake rattlesnake	*Crotalus horridus atricaudatus*
Western pygmy rattlesnake	*Sistrurus miliarius streckeri*
FISHES – known to or likely to occur within White River NWR.	
Petromyzontidae	
Chestnut lamprey	*Ichthyomyzon castaneus*
American brook lamprey	*Lampetra appendix*
Acipenseridae	
Pallid sturgeon	*Scaphirhynchus albus*
Shovelnose sturgeon	*Scaphirhynchus platorynchus*
Polyodontidae	
Paddlefish	*Polyodon spathula*
Lepisosteidae	
Spotted gar	*Lepisosteus oculatus*
Longnose gar	*Lepisosteus osseus*
Shortnose gar	*Lepisosteus platostomus*
Alligator gar	*Atractosteus spatula*
Amiidae	
Bowfin	*Amia calva*
Anguillidae	
American eel	*Anguilla rostrata*
Clupeidae	
Skipjack herring	*Alosa chrysochloris*
Gizzard shad	*Dorosoma cepedianum*

Common Name	Scientific Name
Threadfin shad	*Dorosoma petenense*
Hiodontidae	
Goldeneye	*Hiodon alosoides*
Mooneye	*Hiodon tergisus*
Esocidae	
Grass pickerel	*Esox americanus*
Chain pickerel	*Esox niger*
Cyprinidae	
Common carp	*Cyprinus carpio*
Grass carp	*Ctenopharyngodon idella*
Silver carp	*Hypophthalmichthys molitrix*
Bighead carp	*Hypophthalmichthys nobilis*
Mississippi silvery minnow	*Hybognathus nuchalis*
Speckled chub	*Macrhybopsis aestivalis*
Silver chub	*Macrhybopsis storeriana*
Pallid shiner	*Hybopsis amnis*
Golden shiner	*Notemigonus crysoleucas*
Emerald shiner	*Notropis atherinoides*
Ghost shiner	*Notropis buchanani*
Taillight shiner	*Notropis maculates*
Weed shiner	*Notropis texanus*
Ironcolor shiner	*Notropis chalybaeus*
Mimic shiner	*Notropis volucellus*
Sabine shiner	*Notropis sabinae*
Pugnose minnow	*Opsopoeodus emiliae*
Ribbon shiner	*Lythrurus fumeus*

Common Name	Scientific Name
Redfin shiner	*Lythrurus umbratilis*
Blacktail shiner	*Cyprinella venusta*
Bullhead minnow	*Pimephales vigilax*
Bluntnose minnow	*Pimephales notatus*
Catostomidae	
Blue sucker	*Cycleptus elongatus*
River carpsucker	*Carpiodes carpio*
Quillback	*Carpiodes cyprinus*
Highfin carpsucker	*Carpiodes velifer*
Smallmouth buffalo	*Ictiobus bubalus*
Black buffalo	*Ictiobus niger*
Bigmouth buffalo	*Ictiobus cyprinellus*
Spotted sucker	*Minytrema melanops*
Shorthead redhorse	*Moxostoma macrolepidotum*
Golden redhorse	*Moxostoma erythrurum*
Lake chubsucker	*Erimyzon sucetta*
Ictaluridae	
Blue catfish	*Ictalurus furcatus*
Channel catfish	*Ictalurus punctatus*
Black bullhead	*Ameiurus melas*
Yellow bullhead	*Ameiurus natalis*
Tadpole madtom	*Noturus gyrinus*
Freckled madtom	*Noturus nocturnus*
Flathead catfish	*Pylodictis olivaris*
Aphredoderidae	
Pirate perch	*Aphredoderus sayanus*

Common Name	Scientific Name
Fundulidae	
Golden topminnow	*Fundulus chrysotus*
Blackstripe topminnow	*Fundulus notatus*
Blackspotted topminnow	*Fundulus olivaceus*
Starhead topminnow	*Fundulus dispar*
Poeciliidae	
Mosquitofish	*Gambusia affinis*
Atherinidae	
Brook silverside	*Labidesthes sicculus*
Inland silverside	*Menidia beryllina*
Moronidae	
White bass	*Morone chrysops*
Yellow bass	*Morone mississippiensis*
Striped bass	*Morone saxatilis*
Centrarchidae	
Flier	*Centrarchus macropterus*
Green sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gulosus*
Orangespotted sunfish	*Lepomis humilis*
Bluegill	*Lepomis macrochirus*
Redear sunfish	*Lepomis microlophus*
Longear sunfish	*Lepomis megalotis*
Dollar sunfish	*Lepomis marginatus*
Redspotted Sunfish	*Lepomis miniatus*
Bantam sunfish	*Lepomis symmetricus*
Largemouth bass	*Micropterus salmoides*

Common Name	Scientific Name
Spotted bass	*Micropterus punctulatus*
White crappie	*Pomoxis annularis*
Black crappie	*Pomoxis nigromaculatus*
Elassomatidae	
Banded pygmy sunfish	*Elassoma zonatum*
Percidae	
Crystal darter	*Crystallaria asprella*
Scaly sand darter	*Ammocrypta vivax*
Western sand darter	*Ammocrypta clara*
Mud darter	*Etheostoma asprigene*
Bluntnose darter	*Etheostoma chlorosomamchlorosomam*
Slough darter	*Etheostoma gracile*
Cypress darter	*Etheostoma proeliare*
Swamp darter	*Etheostoma fusiforme*
Harlequin darter	*Etheostoma histrio*
Goldstripe darter	*Etheostoma parvipinne*
Speckled darter	*Etheostoma stigmaeum*
Logperch	*Percina caprodes*
Blackside darter	*Percina maculate*
Dusky darter	*Percina sciera*
River darter	*Percina shumardi*
Stargazing darter	*Percina uranidea*
Sauger	*Sander canadense*
Walleye	*Sander vitreus*
Sciaenidae	
Freshwater drum	*Aplodinotus grunniens*

Common Name	Scientific Name
MUSSEL SPECIES – known to occur or likely to occur within White River NWR.	
Unionidae	
Bankclimber	*Plectomerus dombeyanus*
Fluted shell	*Lasmigona costata*
Mapleleaf	*Quadrula quadrula*
Monkeyface	*Quadrula metanevra*
Pimpleback	*Quadrula pustulosa*
Rabbitsfoot	*Quadrula cylindrica*
Southern mapleleaf	*Quadrula apiculata*
Wartyback	*Quadrula nodulata*
Pistolgrip	*Tritogonia verrucosa*
Purple wartyback	*Cyclonaias tuberculata*
Rock pocketbook	*Arcidens confragosus*
Threehorn wartyback	*Obliquaria reflexa*
Threeridge	*Amblema plicata*
Washboard	*Megalonaias nervosa*
Western fanshell	*Cyprogenia aberti*
Black sandshell	*Ligumia recta*
Scaleshell	*Leptodea leptodon*
Fragile papershell	*Leptodea fragilis*
Giant floater	*Pyganodon grandis*
Spike	*Elliptio dilatata*
Louisiana fatmucket	*Lampsilis hydiana*
Pink mucket	*Lampsilis abrupt*
Yellow sandshell	*Lampsilis teres*
Plain pocketbook	*Lampsilis cardium*

Common Name	Scientific Name
Butterfly	*Ellipsaria lineolata*
Deertoe	*Truncilla truncata*
Ebonyshell	*Fusconaia ebena*
Wabash pigtoe	*Fusconaia flava*
Fawnsfoot	*Truncilla donaciformis*
Flat floater	*Anodonta suborbiculata*
Hickorynut	*Obovaria olivaria*
Mucket	*Actinonaias ligamentina*
Fat pocketbook	*Potamilus capax*
Pink papershell	*Potamilus ohiensis*
Bleufer	*Potamilus purpuratus*
Pyramid pigtoe	*Pleurobema rubrum*
White heelsplitter	T*asmigona complanata*
Creeper	*Strophitus undulates*
Paper pondshell	*Utterbackia imbecillis*
Pondhorn	*Uniomerus tetralasmus*
Tapered pondhorn	*Uniomerus declivis*
Lilliput	*Toxolasma parvus*
Little spectaclecase	*Villosa lienosa*
Round pigtoe	*Pleurobema sintoxia*
Texas lilliput	*Toxolasma texasensis*
Asian clam	*Corbicula fluminea*
Zebra mussel	*Dreissena polymorpha*
VEGETATIVE SPECIES – known to or likely to occur within White River NWR; this is not a complete inventory.	
Trees	
Box Elder	*Acer negundo*

Common Name	Scientific Name
Red Maple	*Acer rubrum*
Silver Maple	*Acer saccharinum*
Mimosa	*Albizia julibrissin*
River Birch	*Betula nigra*
Bitter Pecan	*Carya aquatica*
Water Hickory	*Carya cordiformis*
Pignut Hickory	*Carya glabra*
Native Sweet Pecan	*Carya illinoenis*
Shellbark Hickory	*Carya laciniosa*
Shagbark Hickory	*Carya ovate*
Mockernut Hickory	*Carya tomentosa*
Southern Catalpa	*Catalpa bignonioides*
Sugarberry	*Celtis laevigata*
Hackberry	*Celtis occidentalis*
Redbud	*Cercis canadensis*
Persimmon	*Diospyros virginiana*
White Ash	*Fraxinus americana*
Green Ash	*Fraxinus pennsylavanica*
Pumpkin Ash	*Fraxinus tomentosa*
Water Locust	*Gleditsia aquatica*
Honey Locust	*Gleditsia triocanthos*
Kentucky Coffeetree	*Gymnocladus dioicus*
American Holly	*Ilex opaca*
Butternut	*Juglans cinerea*
Black Walnut	*Juglans nigra*
Eastern Redcedar	*Juniperus virginiana*

Common Name	Scientific Name
Sweetgum	*Liquidambar styraciflua*
Osage Orange	*Maclura pomifera*
Chinaberry	*Melia azedarach*
White Mulberry	*Morus alba*
Red Mulberry	*Morus rubra*
Water Tupelo	*Nyssa aquatica*
Swamp Tupelo	*Nyssa biflora*
Black Gum	*Nyssa sylvatica*
Paulownia	*Paulownia tomentosa*
Loblolly Pine	*Pinus taeda*
Sycamore	*Platinus occidentalis*
White Poplar	*Populus alba*
Cottonwood	*Populus deltoids*
Swamp Cottonwood	*Populus heterophylla*
Black Cherry	*Prunus serotina*
Sawtooth Oak	*Quercus acutissima*
White Oak	*Quercus alba*
Southern Red Oak	*Quercus falcata*
Cherrybark Oak	*Quercus falcata pagodifolia*
Overcup Oak	*Quercus lyrata*
Bur Oak	*Quercus macrocarpa*
Black Jack Oak	*Quercus marilandica*
Swamp Chestnut Oak	*Quercus michauxii*
Water Oak	*Quercus nigra*
Nuttall Oak	*Quercus nuttallii*
Diamond-leaf Oak	*Quercus obtusa*

Common Name	Scientific Name
Pin Oak	*Quercus palustris*
Willow Oak	*Quercus phellos*
Northern Red Oak	*Quercus rubra*
Shumard Oak	*Quercus shumardii*
Durand Oak	*Quercus sinuate*
Bottomland Post Oak	*Quercus stellata paludosa*
Upland Post Oak	*Quercus stellata stellata*
Black Oak	*Quercus velutina*
Black Locust	*Robinia pseudoacacia*
Black Willow	*Salix nigra*
Sassafras	*Sassafras albidum*
Baldcypress	T*axodium distichum*
Winged Elm	*Ulmus alata*
American Elm	*Ulmus Americana*
Cedar Elm	*Ulmus crassifolia*
Red Elm	*Ulmus rubra*
Shrubs	
Red Buckeye	*Aesculus pavia*
Serviceberry	*Amelanchier arborea*
False Indigo	*Amorpha fruticosa*
Devil's Walking Stick	*Aralia spinosa*
Giant Cane or Switchcane	*Arundinaria gigantica*
Paw Paw	*Asimina triloba*
Baccharis or Groundsel-tree	*Baccharis halimifolia*
Paper Mulberry	*Broussonetia papyrifera*
Gum Bumelia	*Bumelia lanuginosa*

Common Name	Scientific Name
American Beauty Berry	*Callicarpa americana*
Blue Beech or American Hornbeam	*Carpinus caroliniana*
Buttonbush	*Cephalanthus occidentalis*
Rough-leaf Dogwood	*Cornus drummondii*
Flowering Dogwood	*Cornus florida*
Swamp Dogwood	*Cornus foemina*
Mayhaw	*Crataegus aestivalis*
Parsley Hawthorne	*Crataegus marshallii*
Dotted Hawthorne	*Crataegus punctata*
Green Hawthorne	*Crataegus viridis*
American Euonymus	*Euonymus americanus*
Swamp Privet	*Foresteria accumunata*
St. John's-wort	*Hypericum* spp.
Deciduous Holly or Possum Haw	*Ilex deciduas*
Virginia Willow	*Itea virginica*
Florida Corkwood	*Leitneria floridana*
Lespedeza	*Lespedeza bicolor*
Common Privet	*Ligustrum volgare*
Spice Bush	*Lindera benzoin*
Pondberry	*Lindera melissifolia*
Iron Wood or Eastern Hophornbeam	*Ostrya virginiana*
Water Elm	*Planera aquatica*
Plum	*Prunus* spp.
Crab Apple	*Pyrus calleryana*
Carolina Buckthorn	*Rhamnus caroliniana*
Winged Sumac	*Rhus copallina*

Common Name	Scientific Name
Smooth Sumac	*Rhus glabra*
Multiflora Rose	*Rosa multiflora*
Swamp Rose	*Rosa palustris*
Blackberry	*Rubus* spp.
Dewberry	*Rubus flagellaris*
Trailing Blackberry	*Rubus trivialis*
Common Elderberry	*Sambucus canadensis*
Snow-bell	*Styrax Americana*
Sparkleberry	*Vaccinium arboretum*
Rusty Blackhaw	*Viburnum rufidulum*
Arkansas Yucca	*Yucca arkansana*
Herbs	
Yarrow	*Achillea millefolium*
Ragweed	*Ambrosia* spp.
Green Dragon	*Arisaema dracontium*
Aster	*Asteraceae* spp.
Nettle	*Boehmeria cylindrica*
Sunflower Family	Compositae
Horseweed	*Conyza* spp.
Wild Carrot	*Daucus carota*
Fern	Polypodiaceae
Bedstraw	*Galium* spp.
Grass (various spp.)	
Hibiscus	*Hibiscus* spp.
Penny-wort	*Hydrocotyle umbellate*
Spider Lily	*Hymenocallis* spp.

Common Name	Scientific Name
Jewel Weed	*Impatiens* spp.
Duckweed	*Lemna* spp.
Pepper Weed	*Lepidium* spp.
Moss (various spp.)	
Creeping Lady's Sorrel	*Oxalis corniculata*
Arrow Arum	*Peltandra virginica*
Pokeweed	*Phytolacca americana*
Smartweed	*Polygonum* spp.
May Apple	*Podophyllum peltatum*
Buttercup	*Ranunculus* spp.
Curly Dock	*Rumex crispus*
Rush (various spp.)	
Swamp Dock	*Rumex verticillatus*
Lizard Tail	*Saururus cernuus*
Sedge (various spp.)	
Horse Nettle	*Solanum carolinense*
Goldenrod	*Solidago* spp.
Goat's Beard	*Tragopogon dubius*
Venus' Looking Glass	*Triodanis perfoliata*
Cattail	*Typha* spp.
Smooth Vetch	*Vicia dasycarpa*
Violet	*Viola* spp.
Common Vetch	*Vicia sativa*
Vines	
Hog Peanut	*Amphicarpaea bracteata*
Peppervine	*Ampleopsis arborea*

Common Name	Scientific Name
Supple-jack	*Berchemia scandens*
Crossvine	*Bignonia capreolata*
Redvine	*Brunnichia cirrohosa*
Cupseed	*Calycocarpum lyonii*
Trumpet Creeper	*Campsis radicans*
Carolina Moonseed	*Cocculus caroliniana*
Morning Glory	Convolvulaceae
Japanese Honeysuckle	*Lonicera japonica*
Trumpet Honeysuckle	*Lonicera sempervirens*
Climbing Hempweed	*Mikania scandens*
Virginia Creeper	*Parthenocissus quinquefolia*
Passion Flower	*Passiflora incarnate*
Kudzu	*Pueraria lobata*
Greenbrier	*Smilax* spp.
Poison-ivy	*Toxicodendron radicans*
Climbing Dogbane	*Trachelospermum difforme*
Muscadine	*Vitis rotundifolia*
Grape	*Vitis* spp.
Wisteria	*Wisteria sinensis*

Appendix J. Budget Requests

REFUGE OPERATING NEEDS SYSTEM (RONS)

MAINTENANCE MANAGEMENT SYSTEM NEEDS

(TO BE INCLUDED IN FINAL CCP)

Appendix K. List of Preparers

Planning Team

White River National Wildlife Refuge, U.S. Fish and Wildlife Service

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