PREPARED FOR:
U.S. Fish and Wildlife Service

PREPARED BY:
Federal Highway Administration
Eastern Federal Lands Highway Division

December 2005

WHITE RIVER NATIONAL WILDLIFE REFUGE
TRANSPORTATION STUDY

This goose, designed by J.N. "Ding" Darling, has become a symbol of the National Wildlife Refuge System.

The *U.S. Fish and Wildlife Service* is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The Service manages the 95-million acre National Wildlife Refuge System, which encompasses 542 national wildlife refuges, thousands of small wetlands, and other special management areas. It also operates 69 national fish hatcheries, 64 fishery resources offices, and 81 ecological services field stations. The agency enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign governments with their conservation efforts. It also oversees the Federal Assistance program, which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

PREAMBLE

Ivory-billed Woodpecker

On April 28, 2005, sightings of the ivory-billed woodpecker at the nearby Cache River National Wildlife Refuge were made public, propelling a flurry of activity to find this once thought to be extinct bird. Over the past 6 months, ornithologists, state and federal officials, and naturalists from throughout the world have congregated in the "Big Woods" of eastern Arkansas to confirm the existence of this elusive creature. The White River National Wildlife Refuge (WRNWR) has received much attention and focus in conjunction with the ivory-billed. WRNWR has been identified as a more likely habitat of ivory-billed woodpeckers because of its proximity to Cache River, its larger size, and its habitat – which is dominated by hardwood bottomland forest.

It is unclear how this exciting discovery will impact future visitation and operations at WRNWR, and in turn, how the Refuge's transportation infrastructure may need to be modified outside of the recommendations made within this report. It is clear, however, that the ivory-billed will only bring increased attention to our National Wildlife Refuge System and the important role it plays in maintaining and supporting nature and our ecosystem.

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1 Introduction

1.1 Refuge History

White River National Wildlife Refuge (NWR) was established in 1935 for the protection of migratory birds. The Refuge lies in the floodplain of the White River in southeast Arkansas near where it meets the Arkansas and Mississippi Rivers. It is one of the largest remaining bottomland hardwood forests in the Mississippi River Valley. Figure 1-1 depicts the location of White River NWR in southeast Arkansas.

Approximately two-thirds of the bird species found in the State of Arkansas have been identified as inhabitants at White River NWR. Many of these species are neo-tropical migratory songbirds that use the Refuge as a stopping point on their journey to and from Central and South America. Arriving in early autumn and usually peaking in late December, mallards, along with gadwalls, American widgeon, and greenwing teal find their way along that highway in the sky - the Mississippi Flyway. During some years, up to 350,000 birds will winter in these flooded bottomland hardwood forests.

Consisting of approximately 160,000 acres of actively-managed land, White River NWR has one of the largest management programs within the United States' National Wildlife Refuge System. The management programs consist of wildlife, forestry, public use, and facilities. All of these functions are interrelated. With over 95 percent of the Refuge covered in forest, the success of achieving most Refuge objectives hinges on the effectiveness of forested habitat management. Forest thinning is employed to restore, or in some cases, enhance optimum conditions for the range of wildlife species that naturally occur within the Refuge. Water levels are managed in some areas with levees and other water control structures. Wildlife populations are monitored through various surveys throughout the year. Population levels are managed with periodic trapping and relocation programs for some species, such as bear, as well as Refuge-sponsored public hunts.

Gravel road in the South Unit near Honey Locust Bayou.

The primary public use of the White River NWR includes mostly wildlife-dependent recreational activities such as hunting, fishing, wildlife observation and photography, and environmental education.

1.2 U.S. Fish and Wildlife Service Mission and Goals

The National Wildlife Refuge System is administered by the U.S. Fish and Wildlife Service (FWS). Its mission is to:

> "*Work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.*[1]"

The goals of the FWS are aimed at fulfilling this mission. Primary FWS goals are to:

- Sustain fish and wildlife populations including migratory birds, endangered species, anadromous fish, and marine animals.
- Conserve a network of lands and waters, including the National Wildlife Refuge System.
- Provide the public an opportunity to understand and participate in the conservation and use of fish and wildlife resources.

1.3 National Wildlife Refuge System Mission and Goals

The Mission of the National Wildlife Refuge System is to:

> "*Administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, plant resources and their habitats within the United States for the benefit of present and future generations of Americans*[2]."

The primary goals of the National Wildlife Refuge System are to:

- Preserve, restore, and enhance threatened and endangered species in their natural ecosystems.
- Perpetuate the migratory bird resource.
- Preserve a natural diversity and abundance of fish and wildlife ecology.
- Provide the public an understanding and appreciation of fish and wildlife ecology.
- Provide visitors with wildlife-dependent recreation.

Legislative history recognizes the importance of providing for wildlife-oriented recreation for people on National Wildlife Refuges. The Refuge Recreation Act of 1962 (16 USC 460k-460k-4) provides guidance for the FWS to provide wildlife-oriented recreational opportunities for the public if they are deemed compatible with the primary purpose of the Refuge. Funds must also be available for the development, operation, and maintenance of recreational programs. In the National Wildlife Refuge System Improvement Act

1 US Fish and Wildlife Service website: www.fws.gov.

2 National Wildlife Refuge System Improvement Act, 1997.

of 1997, six wildlife-dependent recreational uses are recognized as priority public uses of refuge lands. These include the following:

- Hunting
- Fishing
- Environmental Education
- Environmental Interpretation
- Wildlife Observation & Photography

1.4 Purpose of the Transportation Study

The purpose of this Transportation Study is to identify the core transportation network and appropriate levels of maintenance for public roads within White River NWR. The Transportation Study has been prepared by Eastern Federal Lands Highway Division (EFLHD) to examine reasonable alternatives for the core transportation network within the Refuge, develops the preferred alternative, and identifies short- and long-range transportation plans, capital, and maintenance for future programming. The Federal Lands Highway (FLH) Program of the Federal Highway Administration (FHWA) administers highway programs in cooperation with Federal Land managing agencies. EFLHD provides transportation engineering services for planning, design, construction, and rehabilitation of the highways and bridges on or providing access to federally owned lands. This Study will be used to develop the transportation component of a future Comprehensive Conservation Plan (CCP) for the Refuge.

The entrances and highways/roads providing access to the Refuge are evaluated as part of the Study. The Study evaluates the Refuge's existing internal transportation network and develops transportation alternatives within the Refuge while taking into account the mobility, operation, safety, and other aspects considered essential by the FWS and consistent with its values and mission.

White River NWR Visitor Center sign, located on Great River Road National Scenic Byway.

Within the Refuge, the Study identifies the roads that are necessary for public use (accessible by normal passenger vehicles) with appropriate levels of maintenance, roads that should be closed to public use, roads that are not categorized as public roads but are open to the public for recreational activities (i.e., hunting and fishing), roads that are open to All Terrain Vehicle (ATV) users, and roads that are to be used only for maintenance and management purposes. The Study also identifies transportation improvement projects for the five, ten, and twenty year plans within the Refuge with associated preliminary capital needs and expenses. In developing short- and long-range transportation plans, the Study takes into consideration the following factors:

- The FWS mission;
- Consistency with regional goals and policies;
- Cost;
- Environmental sensitivity of the area; and
- Community or agency endorsement.

1.5 Study Area

White River NWR is located in Arkansas, Desha, Monroe, and Phillips Counties, Arkansas. The Refuge is generally bounded by U.S. Highway 79 to the north and the Arkansas and Mississippi Rivers to the south. The Refuge can be accessed via several state highways and county roads and highways located along the eastern and western Refuge borders. The defined study area for the Transportation Study is illustrated in Figure 1-2. The study area includes the entire Refuge, major roads that connect to and from the Refuge to nearby communities, regional highways, interstate highways, and adjacent land uses in the four surrounding counties.

The Refuge is divided into a North Unit and a South Unit, separated by State Highway 1, which is a part of the Great River Road National Scenic Byway. Because the Refuge resides mostly in floodplain, many Refuge roads are not accessible during the flooding season. The Refuge has over 77 miles of gravel roads, 70 miles of dirt roads, 358 miles of All Terrain Vehicle (ATV) trails, numerous levees, culverts, spillways, and other facilities that all require periodic maintenance for reliable and safe use.

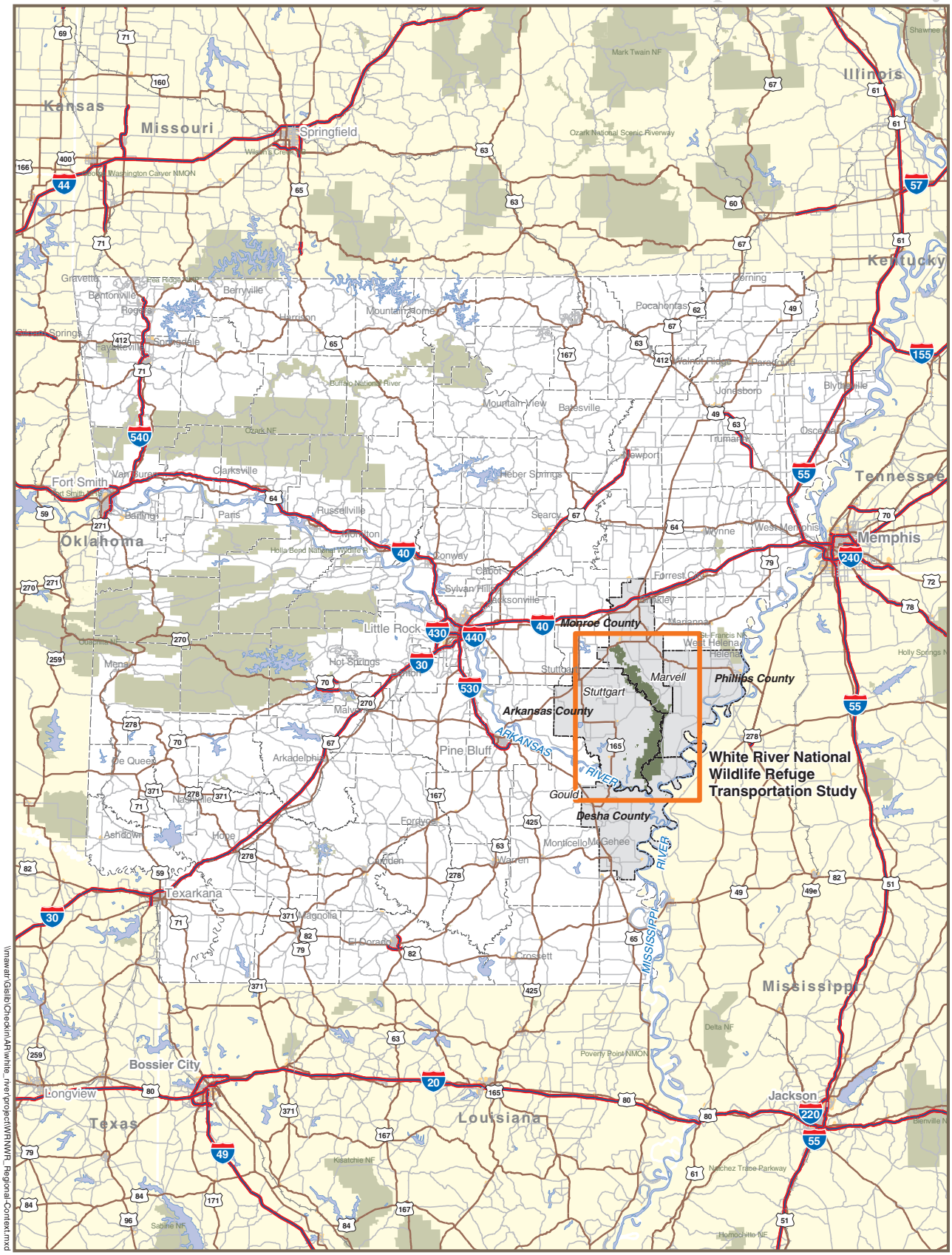
1.6 Study Schedule

Preparation of the Transportation Study began in June 2004 and was expected to take approximately 12 months to complete. A detailed schedule of study tasks and public meetings are identified in Figure 1-3 as originally expected. The data collection phase of the project and summary of existing conditions was completed in the fall of 2004. The development and analysis of alternatives was completed during the fall of 2005, with a final report being produced in fall 2005.

Additionally, the project team has developed and is executing a public involvement plan for the project. The purpose of the plan is to provide guidance and direction for internal and external communications and public involvement activities associated with the development of the Transportation Study. The public involvement process provides many opportunities during key project milestones for affected individuals and groups, organizations, and agencies to voice concerns and ideas. The public involvement plan for the project includes the development and issuance of newsletters, and news releases, and the hosting of public meetings and stakeholder meetings at key stages during the conduct of the project. The Study also includes the development and hosting of an interactive project website via the internet, with connecting links via the following agency websites:

- White River website (www.whiteriver.fws.gov)
- FWS website (www.fws.gov)
- Federal Highway Administration's (FHWA) Eastern Federal Lands Highway Division (EFLHD) website (www.efl.fhwa.dot.gov)

White River National Wildlife Refuge Transportation Study



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Limited Access Highway
US Highway
State Highway / Road

Study Area
White River National Wildlife Refuge

0 20 40 60 Miles

Figure 1-1
Refuge Location Map

White River National Wildlife Refuge
Transportation Study

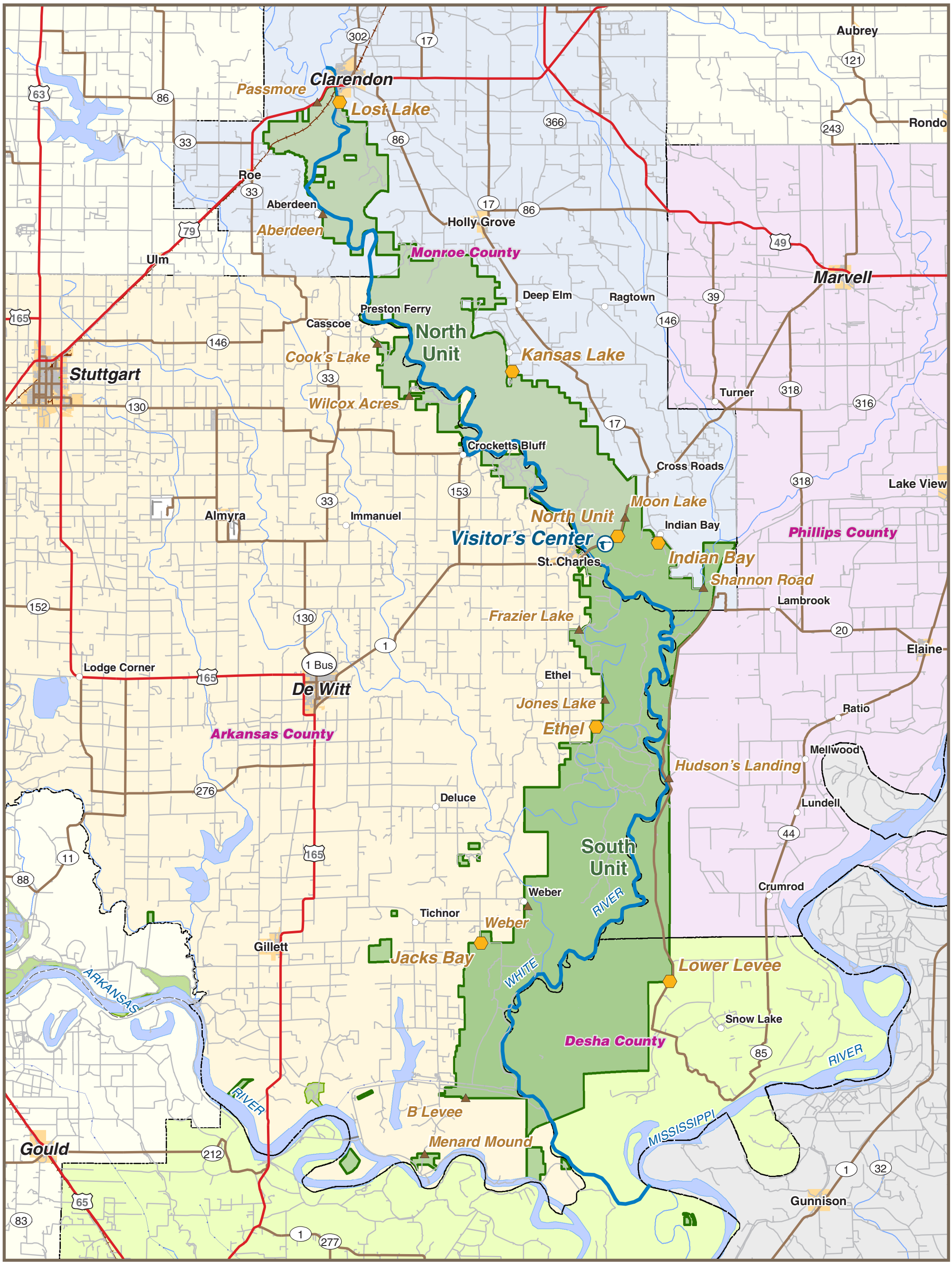

Figure 1-2

Project Study Area

White River National Wildlife Refuge Transportation Study

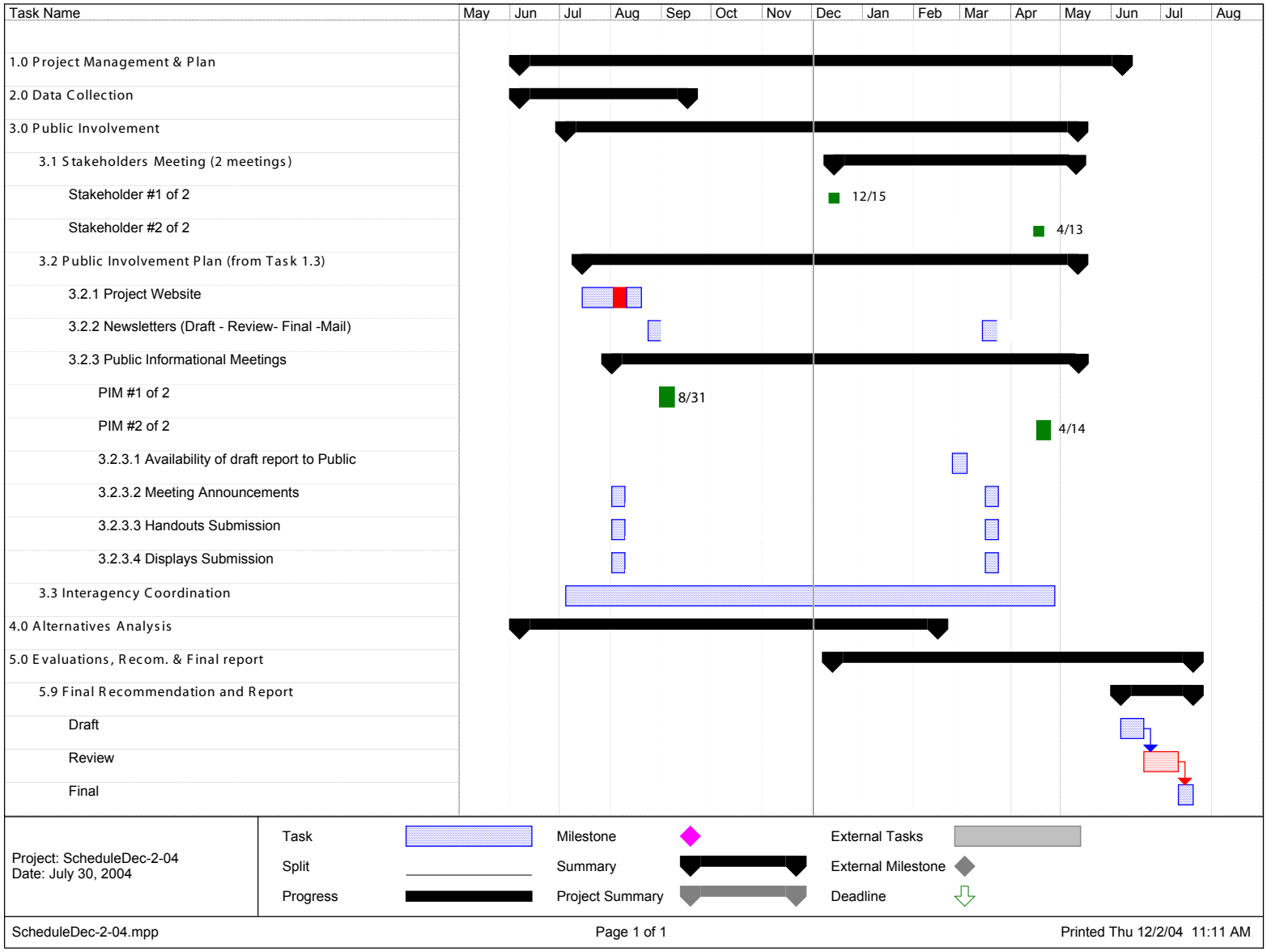

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Figure 1-3

Study Schedule

2

Existing Conditions

2.1 Overview

This chapter describes existing conditions at White River NWR. The first section of this chapter describes the geographic location of the Refuge, its public entrances, a visitation summary and monthly profile, and a calendar of major annual Refuge events.

The second section of this chapter presents regional transportation conditions in the surrounding area. This section includes discussion and illustration of regional roadways, average traffic volumes for those roads, a regional accident summary compiled by the Arkansas State Police, and a summary and discussion of planned transportation improvement projects in the area that have been listed on the Arkansas State Highway and Transportation Department (AHTD) State Transportation Implementation Plan (STIP).

The third section describes the Refuge's existing transportation system. This section includes a description of the Refuge's vehicle access system, including area vehicle traffic volume count information, ATV trails, walking and hiking trails, and water access. This section also describes supporting infrastructure, such as campgrounds, informational kiosks, signage, gates, and boat ramps. Refuge management and operations are also described, including staffing levels, and operations and maintenance funding are documented. Finally, private in-holdings within the Refuge and Refuge-owned out-parcels are illustrated and described.

Example of low water vehicle crossing.

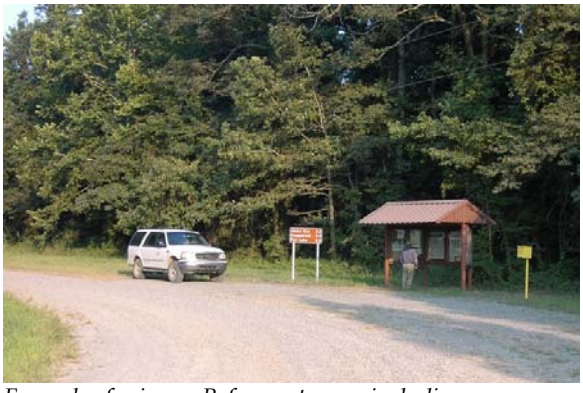
The final section of this chapter identifies and highlights major transportation issues and challenges for the Refuge in the future. These issues are discussed and addressed in greater detail in Chapter 4, Analysis of Alternatives.

2.2 Refuge Description

The White River National Wildlife Refuge is one of over 500 refuges that are actively managed and maintained by the U.S. Fish and Wildlife Service. Located in the floodplains of the White River before its confluence with the Arkansas and Mississippi Rivers, this Refuge encompasses approximately 160,000 acres of bottomland hardwood forest, lakes, streams, and the River itself. These lands consist of public and privately-owned and maintained property.

2.2.1 Regional Location

The Refuge is located along the White River south of Interstate 40 in the southeastern part of Arkansas just west of the Mississippi River.



Example of primary Refuge entrance, including informational kiosk, directional signage, and brochure box.

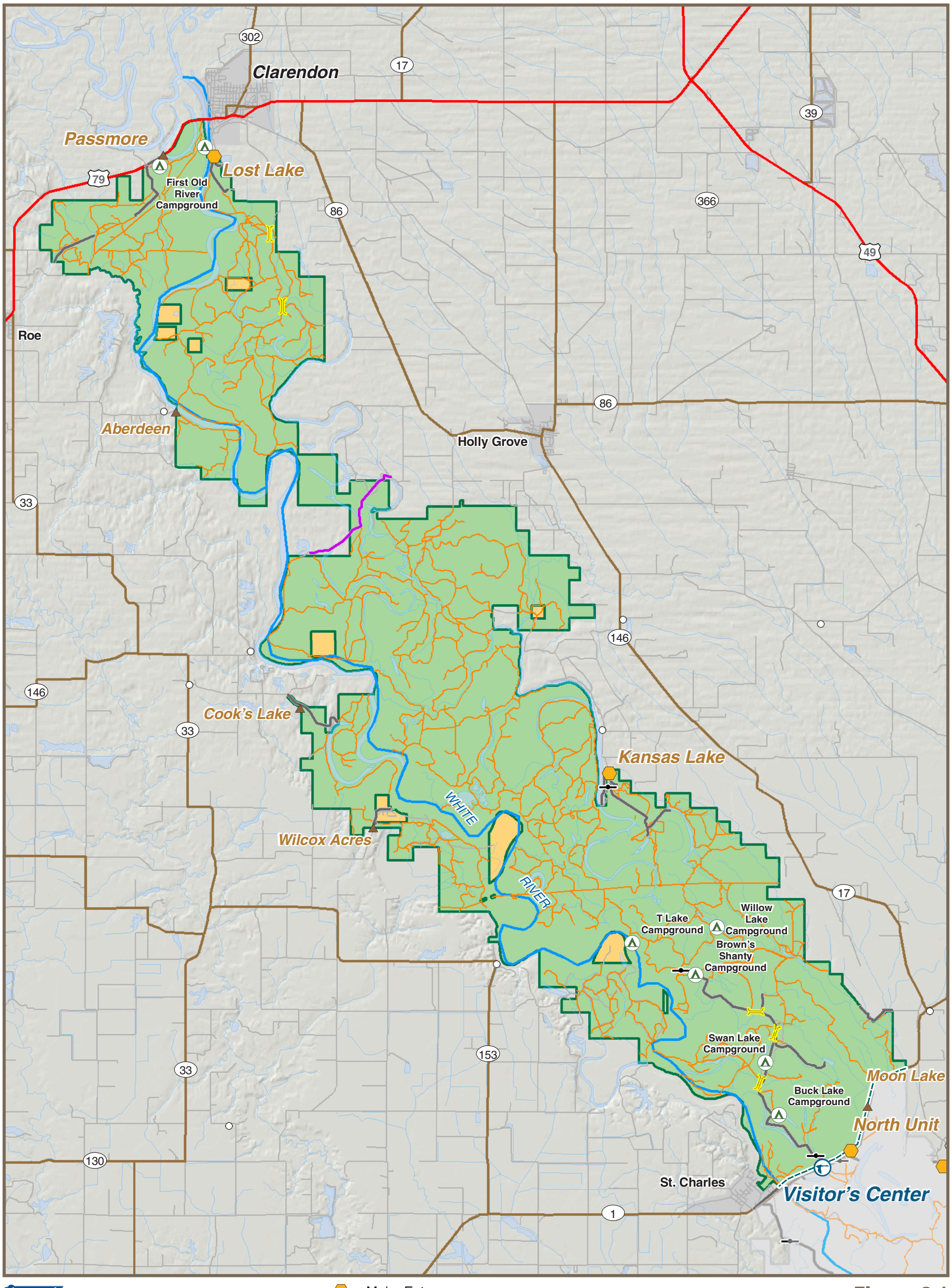
The Refuge extends into parts of four Arkansas counties including Arkansas, Desha, Monroe, and Phillips counties.

The Refuge is physically separated by Arkansas State Highway 1, which traverses the White River in St. Charles, Arkansas. Refuge lands located north of Highway 1 constitute the North Unit. Lands located south of Highway 1 make up the South Unit. The South Unit was established as the original White River NWR in 1935. The North Unit was secured by FWS through a land trade with Potlatch, Inc. in 1992. Prior to its incorporation within the Refuge, the North Unit was utilized for private logging operations. Figures 2-1 and 2-2 illustrate the boundaries of the North and South Units of the White River NWR.

2.2.2 Visitation Summary and Profile

Estimated visitation to the Refuge exceeded 150,000 annual visits in 2003. The Refuge is most active during the various hunting seasons in the fall between the months of September and December. According to surveys conducted by Refuge staff, over 98 percent of all visits are hunting- or fishing-related. Visitor counts, by month, are illustrated in Figure 2-3.

White River National Wildlife Refuge
Transportation Study



Source: White River National Wildlife Refuge, Summer 2004

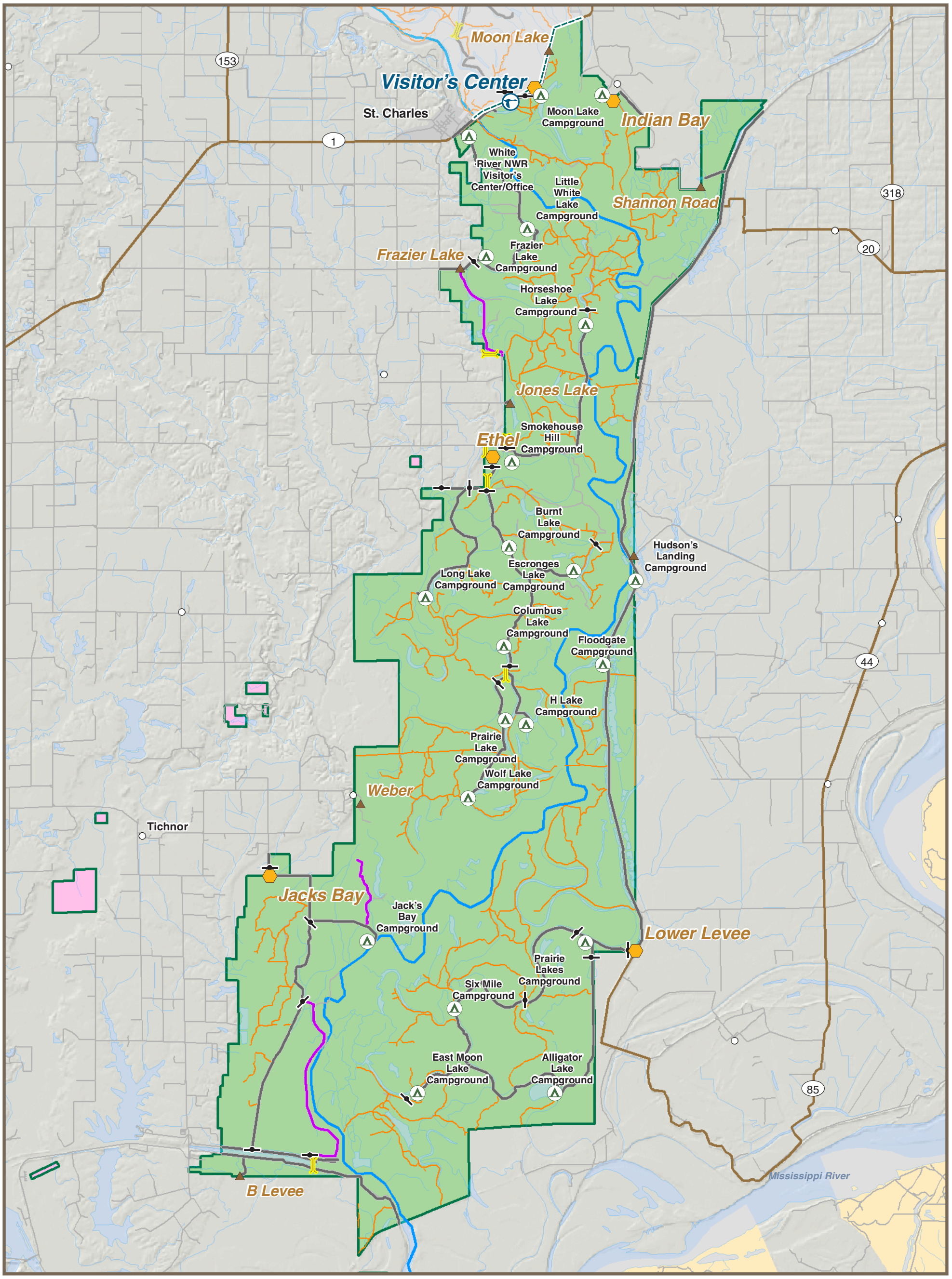
0 1 2 3 Miles

- Major Entrance
- Lesser Entrance
- Visitor's Center
- Campgrounds
- Gate
- Bridge
- ATV / Dirt Roads
- Gravel Roads
- Management Roads (not open to public)
- In-Holdings
- Outparcels
- Refuge

Figure 2-1

Refuge Map
North Unit

White River National Wildlife Refuge
Transportation Study



Source: White River National Wildlife Refuge, Summer 2004

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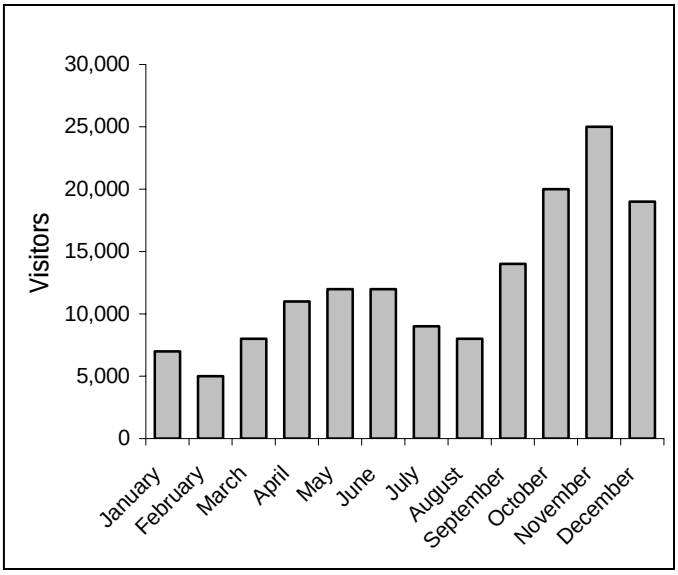
- Gravel Roads
- Management Roads (not open to public)
- In-Holdings
- Outparcels
- Refuge

Figure 2-2

Refuge Map
South Unit

Figure 2-3 Refuge Visitation by Month



Source: White River NWR; 2003 Visitation Estimate.

2.2.3 Refuge Events Calendar

Most recreational activity on the Refuge relates to hunting and fishing. Hunting is limited to deer, turkey, small game, and waterfowl. Table 2-1 identifies allowable hunting and fishing activities by time of year. Camping, ATV use, and other supporting activities are allowed only when participating in approved wildlife-dependent recreational activities such as hunting and fishing.

Public hunts in the Refuge are managed via the issuance of controlled permits. On an annual basis, the Refuge distributes a hunting schedule and notice to apply for various hunting permits to its established database of users, which totals over 13,000 people.

Table 2-1 Major Refuge Events Calendar

Recreational Activity	North Unit	South Unit
Waterfowl Hunt	Jan., Oct., Dec	Jan, Oct, Dec
Turkey Hunt	April	April
Squirrel/Rabbit	Sept – Dec	Sept – Nov
Deer Hunt	Oct – Jan	Oct – Dec
Fishing	All Year	Mar – Nov

Source: White River NWR; Hunting, Fishing and Camping, and ATV Use Brochure, 2004-2005.

Throughout the year, scheduled events occur on the Refuge. Major events include the following:

- **White River National Wildlife Refuge Wildlife Festival**. This is a new event that was initiated in October 2003 and has been established as an annual event with guest speakers, children's activities, special programs, guided walks, and giveaways.
- **Youth Fishing Rodeo**. Youths, less than 12 years of age, are given the opportunity to fish in a stocked pond during the last Saturday of National Fishing and Boating Week in June.
- **Migratory Bird Day**. In May, the Refuge hosts events to celebrate the International Migratory Bird Day.
- **Youth Deer Hunt and Waterfowl Hunt**. During the first week in December, a youth-only deer and waterfowl hunt takes place for youths 15-years and younger.
- **Deer Hunt for the Mobility Impaired**. This event is held during the second week in December.

2.2.4 Entrances to the Refuge

The Refuge Visitor Center and Administrative Offices, located along Arkansas Highway 1 in St. Charles just west of the Highway 1 White River Bridge, serves as the primary Refuge entrance point. In total, the Refuge maintains 21 public entrances, including both major and lesser entrances. There are eight major entrances and 13 lesser entrances into White River NWR as listed in Table 2-2 and illustrated on Figures 2-1 and 2-2.

Over the past few years, the Refuge has installed way finding signage at all of its public entrances along adjacent state and county highways and roads. Primary entrances have been fitted with informational kiosks that show detailed maps and have an ample supply of free Refuge brochures. Primary entrances also have internal Refuge directional signage that trail-blaze to nearby lakes, campgrounds, and other important points of interest within the environs of that particular entrance point.

Entrances in the South Unit are open to vehicular traffic from March 1 through December 15. All other Refuge entrances are open year-round, with the exception of the Kansas Lake area in the North Unit. The Kansas Lake area is closed between December 1 and February 28. During the winter, high water may cause some of the roads and trails to be closed to vehicular travel.

Table 2-2 Refuge Public Entrances

Entrance Name	Accessible Via
Major Entrances	
North Unit (n)	Highway 1
Kansas Lake (n)	Highway 146
Lost Lake (n)	Clarendon
Visitor Center (s)	Highway 1
Ethel (s)	Highway 153
Jack's Bay (s)	Highway 44
Indian Bay (s)	Highway 1
Lower Levee (s)	Snow Lake
Lesser Entrances	
Wilcox Acres (n)	Highway 153
Cook's Lake (n)	Highway 153
Aberdeen (n)	Highway 366
Passmore (n)	Highway 79
Moon Lake (s)	Highway 1
Shannon Road (s)	Highway 318
Hudson's Landing (s)	WR Levee
B Levee (s)	Highway 169
Menard Mound (s)	Highway 165
Lock #2 Bridge (s)	Trusten Holder
Weber (s)	Highway 44
Jones Lake (s)	Highway 17
Frazier Lake (s)	Highway 153

Source: White River NWR.
n = North Unit
s = South Unit

2.3 Regional Transportation Conditions

This section describes the regional transportation infrastructure, traffic conditions, and demand characteristics. Additionally, planned transportation improvements in the area are also discussed.

2.3.1 Regional Roadway Infrastructure

The White River NWR is located approximately 60 miles southeast of Little Rock, the state capital. The City of Memphis, Tennessee is located approximately 80 miles to the northeast. The City of Helena is located approximately 30 miles to the east and Pine Bluff is approximately 60 miles west on US Highway 79.

The Refuge is separated into a North Unit and a South Unit by Arkansas State Highway 1. Highway 1 provides the only vehicle crossing over the White River between the City of Clarendon and its confluence with the Mississippi River 92 miles to the south. This segment of Highway 1 is designated as part of the Great River Road National Scenic Byway by the U.S. Department of Transportation (USDOT).

White River Levee near Lambrook.

From a regional perspective, the Refuge can be accessed via several options that connect to Interstate 40 (I-40) to the north. Motorists traveling from I-40 can access the western side of the Refuge via Highway 165 and Highway 63, with connections to Highways 130, 153, and 17. From the east, the Refuge can be accessed primarily via Highway 49 and connections to Highways 86, 17, and 44. The Refuge is not accessible by motor vehicles from the south and southeast because of natural barriers created by the Arkansas River, Arkansas River Canal, and Mississippi River. An illustration of the regional roadway infrastructure in the study area was presented previously in Figure 1-2.

2.3.2 Regional Traffic Volume Summary

Traffic volumes on area roadways were provided by the Arkansas State Highway and Transportation Department (AHTD). These results are summarized in Table 2-3.

Table 2-3 2003 Regional Traffic Summary

Route/Location	Avg. Annual Daily Traffic (AADT) Volumes
Highway 1 (west of St. Charles)	1,400
Highway 17 (near Lawrenceville)	500
Highway 146 (east of Stuttgart)	630
Highway 33 (north of DeWitt)	370
Highway 44 (north of Mellwood)	820
Highway 79 (west of Clarendon)	4,200
Highway 86 (west of Clarendon)	610
Highway 130 (east of Stuttgart)	1,600
Highway 153 (south of Crocketts Bluff)	300
Highway 165 (west of DeWitt)	2,200
Highway 318 (north of Lambrook)	520

Source: Arkansas State Highway and Transportation Department

As shown in Table 2-3, U.S. Highway 79 connecting Pine Bluff, Arkansas and Memphis, Tennessee carries the most traffic daily in the region, approximately 4,200 vehicles per day. Highway 1 carries approximately 1,400 vehicles daily through the Refuge and over the White River. Figure 2-4 provides average annual daily traffic (AADT) information for major roadway segments located within the project study area.

Directional guide sign for Refuge entrance.

Turning movement counts were taken at the driveway to the Refuge Visitor Center and Administration Offices, which are located approximately a quarter mile west of the Highway 1 White River Bridge. Counts were conducted from 7:00 AM to 9:00 AM, 12:00 PM to 2:00 PM, and 3:00 PM to 5:00 PM in July 2004. A summary of those counts is depicted in Figure 2-5.

2.3.3 Area Transportation Mode Split

Journey-to-work data was obtained from the 2000 U.S. Census and compiled for the four area counties. These data indicate how residents of the area currently commute to work. A summary of the results is shown in Table 2-4.

Table 2-4 Study Area Transportation Mode Split

Mode	Percentage
Automobile	94%
Transit	0%
Walk/Bike	2%
Other	2%
Work at Home	2%
Total	100%

Source: United States Census, Journey to Work Data, 2000.

Area residents are very automobile dependent with approximately 94 percent of all persons in the area commuting to work via automobile. Of those that use automobiles, 17 percent indicate that they carpool regularly. A very small percentage, less than 1 percent, indicates that they use taxis or transit services.

2.3.4 Motor Vehicle Accident Summary

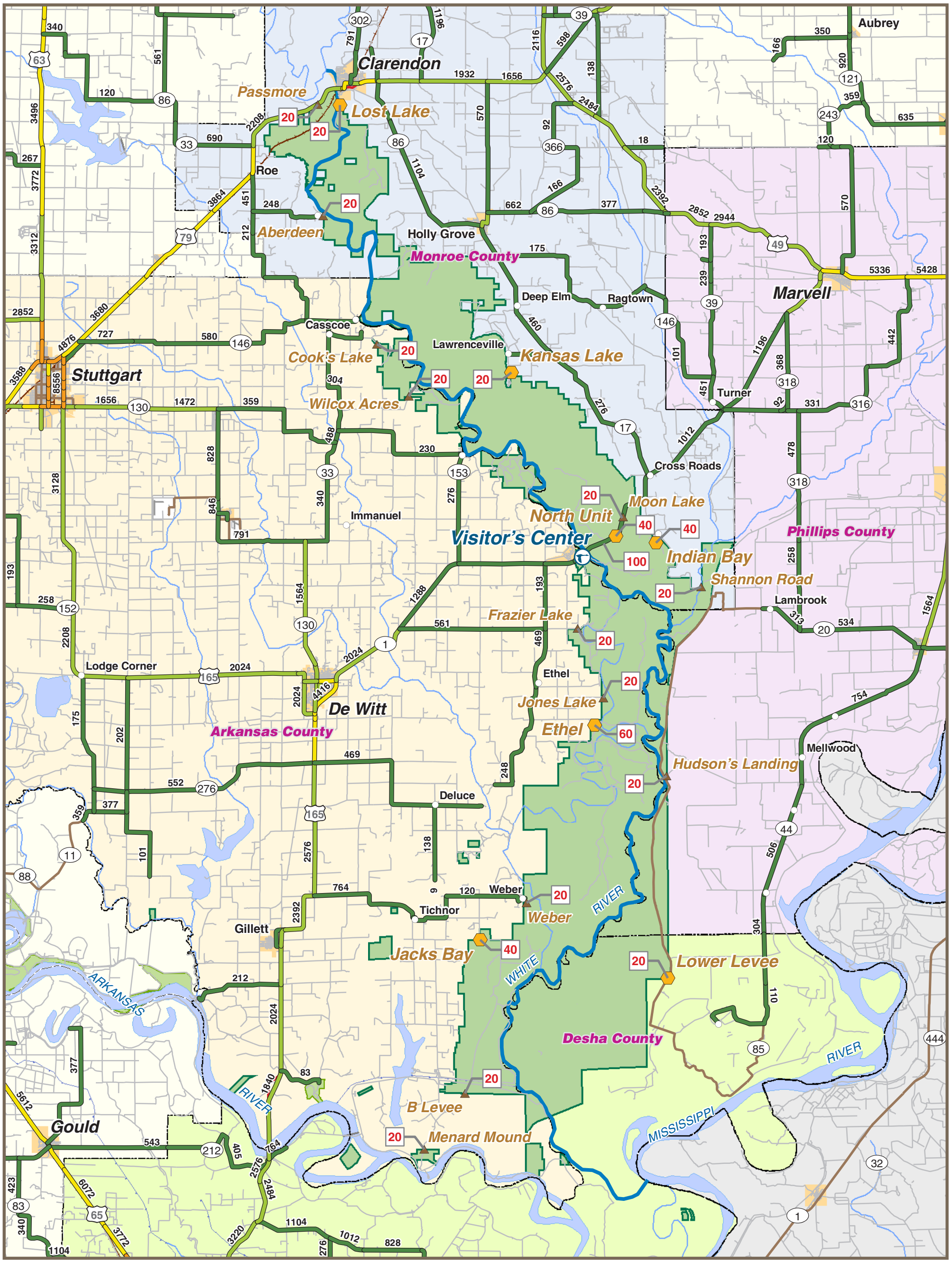
Motor vehicle accidents on State Highways in the State of Arkansas are compiled by the Highway Safety Office of the Arkansas State Police. Total vehicle crashes in the four study area counties are summarized in Table 2-5.

Table 2-5 2002 Motor Vehicle Crash Summary

	Type of Crash			
County	Fatality	Personal Injury	Property Damage	Total
Arkansas	3	91	88	182
Desha	5	143	119	267
Monroe	7	37	35	79
Phillips	7	297	175	479
Total	22	568	417	1,007

Source: Highway Safety Office of the Arkansas State Police

White River National Wildlife Refuge
Transportation Study



Source: Arkansas Department of Transportation

- Major Entrance
- Lesser Entrance
- Visitor's Center
- White River National Wildlife Refuge

2025 Average Annual Daily Traffic

- 10 –1,400
- 1,400 –3,400
- 3,400 –6,300
- 6,300 –16,000
- 16,000 –27,900
- # Refuge Entrance ADT

Figure 2-4

Regional Roadway Network and Average Annual Daily Volumes

In 2002, 1,007 accidents were reported on State Highways in the four study area counties. Nearly half of all accidents reported occurred in the greater Helena area (northeast of the Refuge and outside of the study area). For the same year, nearly 71,000 accidents were reported on all State Highways in Arkansas. Thus, State Highway accidents in the study area counties accounted for approximately 1.4 percent of total Arkansas State Highway accidents.

2.3.5 Planned Area Transportation Improvements Projects

The Arkansas State Highway and Transportation Department (AHTD) has identified several planned roadway projects in the study area. For Federal Fiscal Years 2003 through 2005, AHTD has identified 36 projects in its Statewide Transportation Improvement Program (STIP) that are located either completely, or partially, within the four counties surrounding the project study area. Improvements are proposed to over 36 miles of roadway at a total cost of approximately $94 million. It is expected that federal funding would cover approximately $64 million of these costs. The most notable and relevant project on the list that would have an impact on White River NWR is AHTD's plan to reconstruct Highway 79 between the City of Clarendon and the Township of Roe and along the northern boundary of the Refuge.

A complete listing of the proposed STIP projects, their location, improvement type, and cost estimate are provided within Appendix A.

2.4 Refuge Transportation and Infrastructure Summary

This section includes a description of the Refuge's vehicle access system, including area vehicle traffic volume count information, ATV trails, walking and hiking trails, and water access. Also described is the supporting infrastructure, such as campgrounds, informational kiosks, signage, gates, and boat ramps. Refuge management and operations are overviewed, including staffing levels and operations and maintenance funding. Finally, private in-holdings within the Refuge and Refuge-owned out-parcels are illustrated and described.

2.4.1 Vehicle Access, Circulation, and Parking

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 Table 2-6.

Table 2-6 Refuge Roadways

Roadway	Miles
Gravel Roads	77
Dirt Roads	70
All Terrain Vehicle (ATV) Trails	358

Source: White River NWR.

Figures 2-1 and 2-2 (presented previously) provide a detailed illustration of these access corridors within the Refuge, North and South Units, respectively.

Gravel roads are maintained to provide suitable access by registered passenger vehicles. FWS requires all motorists on roads in National Wildlife Refuges to be licensed motor vehicle operators. Similarly, all vehicles traveling on gravel roads must

be registered as well. The maximum speed for any land vehicle is 35 miles per hour (mph) unless otherwise posted. 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.

Gravel road in the South Unit in Ethel area.

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. The clear zone serves many important purposes, including the following:

- Provides for ample sight distance for oncoming traffic or stopped vehicles.
- Allows for sunlight to permeate through the forest tree canopy, facilitating the drying of roads at the end of the flooding season.
- Allows for vehicles to safely park on the side of the road.
- Allows for moving vehicles to get by approaching oncoming vehicles.
- Reduces potential for vehicle/animal collisions.

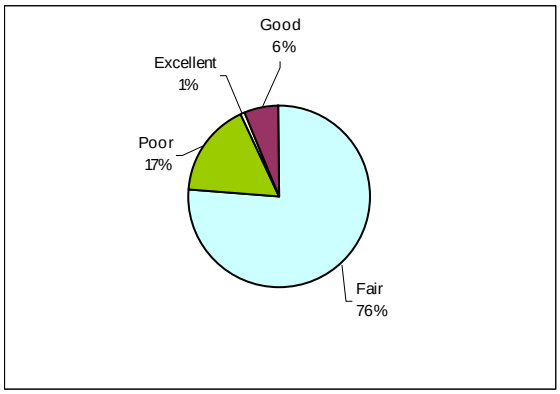
A typical section for Refuge gravel roads (as well as dirt roads and ATV trails) is illustrated in Figure 2-6.

2.4.2 Roadway and Parking Conditions Summary

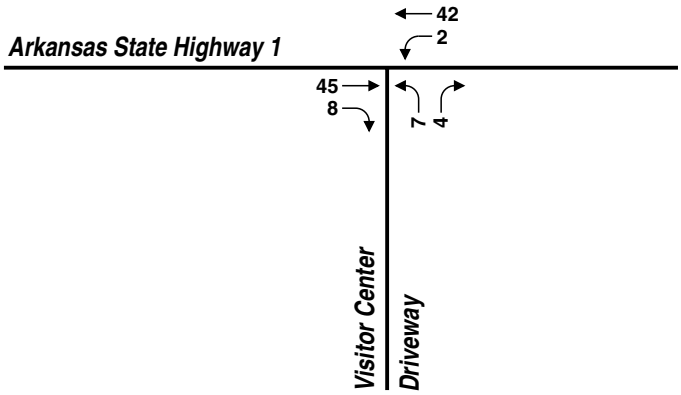
In 2001, the Federal Highway Administration (FHWA) completed a study titled "The Road Inventory of White River National Wildlife Refuge." This study summarized existing roadway and parking conditions at the Refuge to aid in the identification of infrastructure deficiencies and to help identify and prioritize 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. A summary of results for the entire Refuge is provided in Figure 2-7.

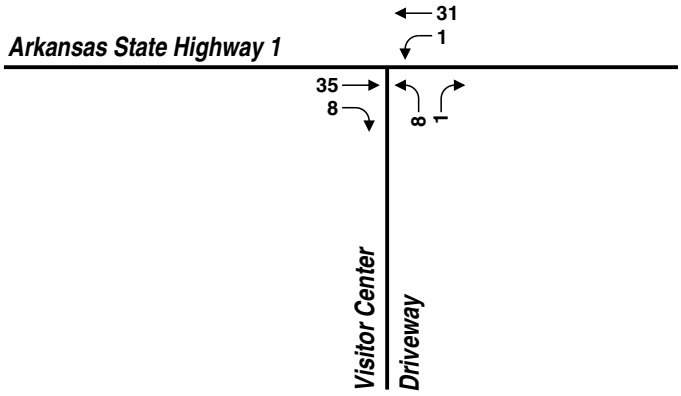
Figure 2-7 Refuge Roadway Conditions Summary



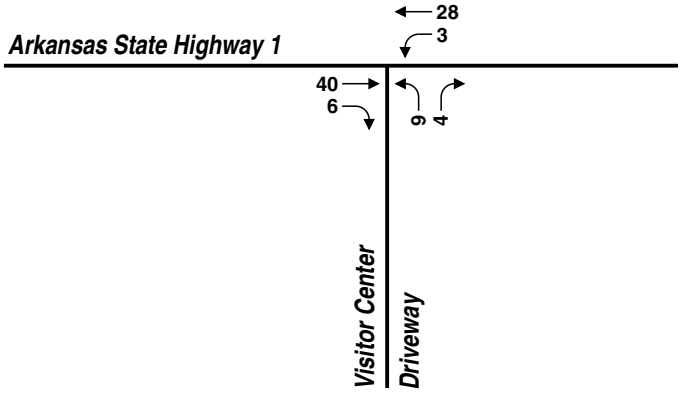
Source: The Road Inventory of White River National Wildlife Refuge, FHWA, 2001.



AM Peak 7:30 AM - 8:30 AM



Mid-Day Peak 12:00 PM - 1:00 PM



PM Peak 4:00 PM - 5:00 PM

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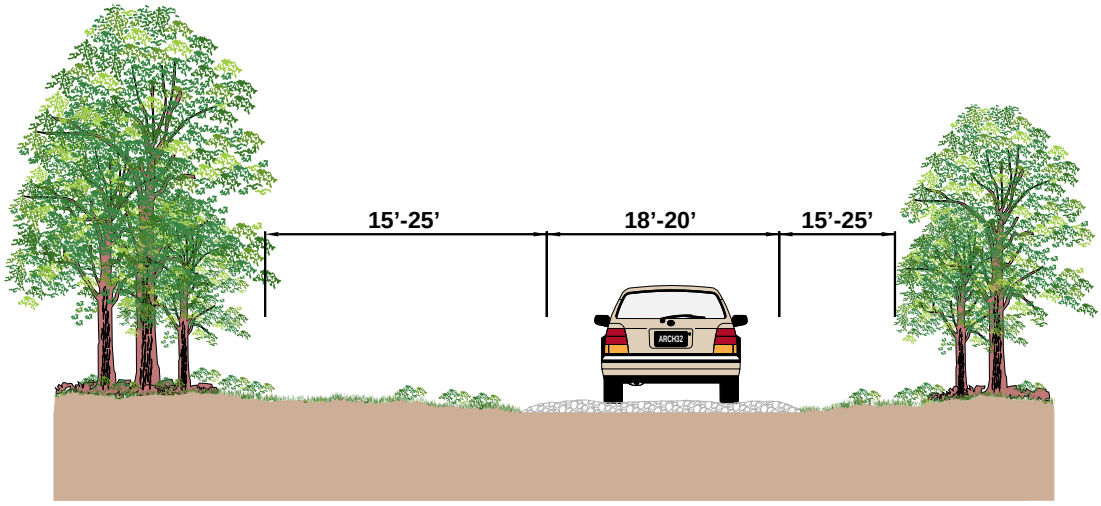
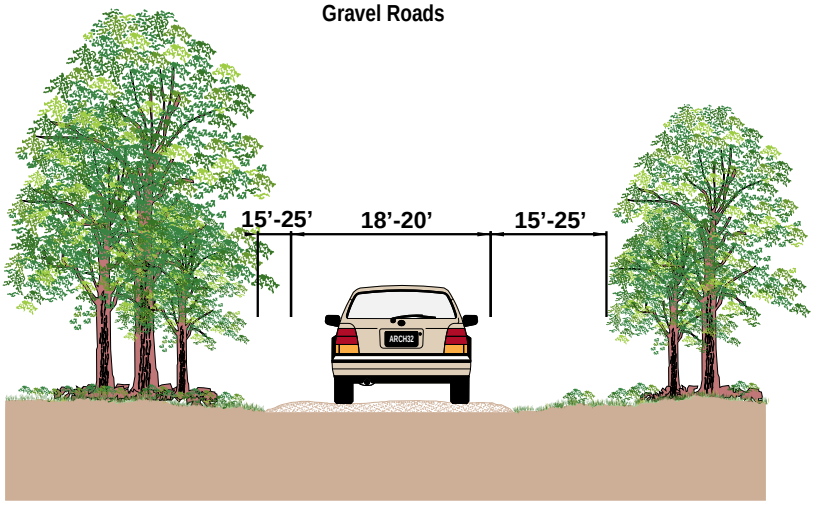
Figure 2-5
Visitor Center Peak Hour Traffic Volumes

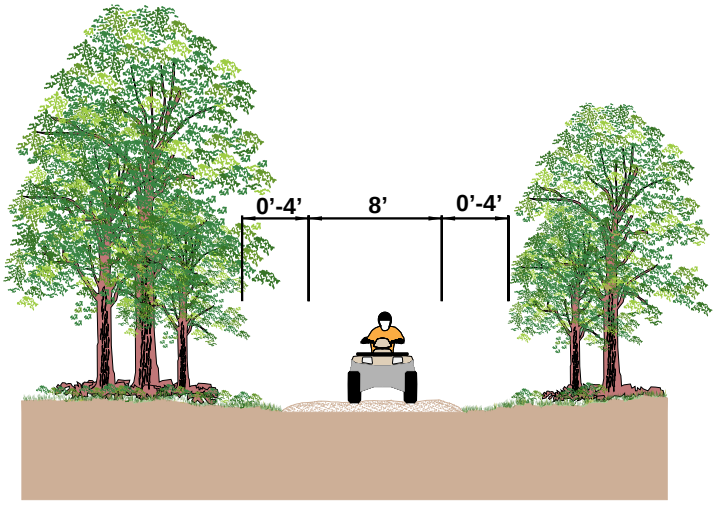
White River National Wildlife Refuge Transportation Study



Gravel Roads



Dirt Roads



ATV Trails

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Figure 2-6
Typical Refuge Road Sections

The majority of surface conditions (75 percent) were determined to have "fair" condition and approximately 20 percent were considered "poor". No surfaces were rated as "failing." The Refuge roadway network consists almost entirely of unpaved routes. Approximately one percent of the roads are paved. Of the unpaved surfaces, 98 percent consist of gravel surfaces. The remaining one 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 roads and ATV trails were not evaluated and rated as part of the study conducted by the FHWA.

Parking areas in the Refuge are either gravel (15 percent) or of native earth (85 percent). In total, FHWA assessed over 2 million square feet of area that could be used for parking Refuge-wide. According to the FHWA's rating structure, all parking areas were determined to be in good, fair, or poor condition. No areas were determined to have a "failing" condition.

2.4.3 Traffic Volumes and Demand Characteristics

White River NWR is located in a very rural setting. Approximately 70,000 people reside in the four counties that surround the Refuge and less than one-third of that total live within 20 miles of the Refuge border. Consequently, average daily traffic volumes on Refuge roads are generally very low. It is estimated that approximately 150,000 people visit the Refuge annually. Based on surveys conducted at various wildlife refuges and national parks, it is estimated that the average vehicle occupancy for vehicles entering these types of destinations ranges between 1.4 and 2.6 persons per vehicle. Using the most conservative vehicle occupancy rate (VOR) from that range, it is estimated that approximately 300 vehicles access White River NWR on an average day, for a total of 600 total vehicle trips (assuming each vehicle enters and exits the Refuge on a given day). Table 2-7 provides an estimate of average daily vehicle activity at the Refuge's 21 public entrances to its North and South Units.

Table 2-7 Public Entrance Average Daily Vehicle Trip Estimates

Entrance Name	ADT Estimate	
	Average Month	Peak Month
Major Entrances		
North Unit (n)	40 vpd	83 vpd
Kansas Lake (n)	20 vpd	42 vpd
Lost Lake (n)	20 vpd	42 vpd
Visitor Center (s)	100 vpd	208 vpd
Ethel (s)	60 vpd	124 vpd
Jack's Bay (s)	40 vpd	83 vpd
Indian Bay (s)	40 vpd	83 vpd
Lower Levee (s)	20 vpd	42 vpd
Lesser Entrances		
Wilcox Acres (n)	20 vpd	41 vpd
Cook's Lake (n)	20 vpd	41 vpd
Aberdeen (n)	20 vpd	41 vpd
Passmore (n)	20 vpd	42 vpd
Moon Lake (s)	20 vpd	42 vpd
Shannon Road (s)	20 vpd	42 vpd
Hudson's Landing (s)	20 vpd	42 vpd
B Levee (s)	20 vpd	42 vpd
Menard Mound (s)	20 vpd	42 vpd
Lock #2 Bridge (s)	20 vpd	42 vpd
Weber (s)	20 vpd	42 vpd
Jones Lake (s)	20 vpd	42 vpd
Frazier Lake (s)	20 vpd	42 vpd
Total	600 vpd	1,250 vpd

Source: White River NWR; 2003 Traffic Estimates.
ADT = average daily traffic
vpd = vehicles per day
n = North Unit
s = South Unit
Peak Month = November

2.4.4 Bridges

Many bridges, spillways, and other facilities are maintained that provide for vehicle access across water barriers on the Refuge. The number and location of bridges and other actively maintained water crossings within the Refuge are presented in Figures 2-1 and 2-2 for the North and South Units respectively. In total, there are 11 bridges that are actively managed and maintained by the Refuge, with five in the North Unit and six in the South Unit.

In late 2003, FWS 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. A summary of bridge conditions at the Refuge, including recommended maintenance and replacement costs, are presented in Table 2-8.

Table 2-8 Bridge Inventory and Conditions Summary

Condition Category	Total # of Bridges	Maintenance Cost	Replacement Cost
Excellent	0	$0.00	$0.00
Very Good	4	$3,900	$0.00
Good	4	$12,300	$0.00
Satisfactory	3	$34,200	$0.00
Fair	0	$0.00	$0.00
Poor	0	$0.00	$0.00
Serious	0	$0.00	$0.00
Critical	0	$0.00	$0.00
Imminent Failure	0	$0.00	$0.00
Failed	0	$0.00	$0.00
Total	11	$50,400	$0.00

Source: White River NWR Bridge Inventory and Appraisal Report, October 2003.

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. The report also recommended that an updated inventory and conditions assessment be conducted in two years (2005).

2.4.5 All Terrain Vehicles and ATV Trails

The Refuge maintains over 70 miles of dirt roads and 358 miles of ATV trails. These trails were identified previously in Figures 2-1 and 2-2. The ATV trail system is an important component of both operations and maintenance functions, as well as for providing access to the public to participate in wildlife-dependent recreational activities.

ATVs are allowed on the Refuge only to support these approved wildlife-dependent activities. In addition, ATVs are not permitted to be used on the Refuge gravel road system. ATVs are allowed only on open dirt roads and ATV trails. FWS defines an ATV as a vehicle with a maximum tire pressure of 15 pounds per square inch (psi) and a maximum dry weight of 1,550 pounds (lbs). All non-licensed motor vehicles that do not meet these criteria are not permitted on the Refuge.

A typical dirt road on the Refuge is a single lane with a width of approximately 18 to 20 feet. A clear zone is maintained on either side of the dirt road that has been observed to vary between 15 and 25 feet. ATV trails are narrower than the dirt roads. They are generally 8 feet wide and have minimal clear zones. A typical section for Refuge dirt roads and ATV trails was illustrated previously in Figure 2-6.

2.4.6 Walking, Hiking, and Bicycling

White River NWR has many walking and hiking opportunities. Walkers and hikers may use the existing system of gravel roads, dirt roads, and ATV trails. These users may also use other roads and trails that are periodically and/or permanently closed to vehicle and ATV access, unless otherwise posted. Most notably, the Refuge has developed a one-mile interpretive hiking trail that loops around its new Visitor Center in St. Charles. Portions of the trail are paved and handicapped accessible.

All-terrain vehicle outfitted for wildlife-dependent activities.

This system of gravel roads, dirt roads, and ATV trails are also open to bicycle access as long as those cyclists' intent is to fulfill one of the six identified wildlife-dependent recreational uses allowed on the Refuge as defined previously in Section 1.3, National Wildlife System Mission and Goals. However, Refuge staff have indicated that the use of bicycles within the Refuge is minimal, due primarily to the remote location of the Refuge and its road system and the proximity to a very rural and dispersed population that surrounds the Refuge property. Demographic characteristics of the area are described and summarized in detail in Chapter 3, Regional Demographic, Socioeconomic, and Environmental Conditions.

2.4.7 Water Transportation Access

The Refuge's primary water access resource is the White River. However, the Refuge also features over 300 lakes, bayous, oxbows, and other water bodies. Nearly every water body is land accessible during dry periods via the existing system of gravel roads, dirt roads, and ATV trails. Most lakes have primitive boat ramps, which are essentially gaps

between trees that the Refuge keeps clear, or in some cases, packs with gravel or rip-rap material. There are literally hundreds of these types of "ramps" on the Refuge. The Refuge also has several concrete boat ramps. These are mostly ramps that provide for water access directly into the White River, larger lakes, and bayous. During the flooding season, all of these ramps become inundated with water. During these times, the existing road system essentially becomes a water access system. The boat ramps to this complex system is basically where dry land along each roadway meets the edge of the flood zone.

2.4.8 Forest Management Activities

The dirt road and ATV trail system exists to accomplish the following:

- Maintain the Refuge's "Wildlife First" mission; and
- Allow for the public to utilize the Refuge for approved wildlife-dependent activities.

Forest management, including occasional forest thinning, is just one part of public land management that is practiced on lands such as White River NWR to ensure the protection and enhancement of wildlife in the area. At White River NWR, the Refuge has been zoned into various forestry compartments, as shown in Figure 2-8. Each compartment is visited periodically and evaluated for habitat conditions on an approximate 15-year cycle. The existing road and trail system is an important component of the infrastructure system required to conduct these and other important refuge management activities.

2.4.9 Refuge Recreational Infrastructure

Figures 2-1 and 2-2 provide an illustration of Refuge Campgrounds, gates, bridges, kiosks, and other important infrastructure features in the North and South Units. The Refuge maintains 25 primitive campgrounds. Camping is permitted year-round in the North Unit (except for Kansas Lake) and on the South Unit at Jack's Bay, Moon Lake, Hudson's Landing, and the Floodgate campgrounds. All other campgrounds on the South Unit are open from March 1 through December 15, except until December 31 for Prairie Lakes and Smokehouse Hill campgrounds. Downed wood may be gathered and used at campsites. Campers are required to remove all of their trash from the Refuge.

2.4.10 Refuge Visitor Center and Office

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 Great River Road, a National Scenic Byway that follows the Mississippi River through 10 states that border the River.

The new White River NWR Visitor Center was opened in St. Charles, Arkansas in October 2003.

The new 10,000 square foot facility will allow the Refuge to showcase the White River, the ecological and wildlife diversity within the Refuge, and the

White River National Wildlife Refuge Transportation Study

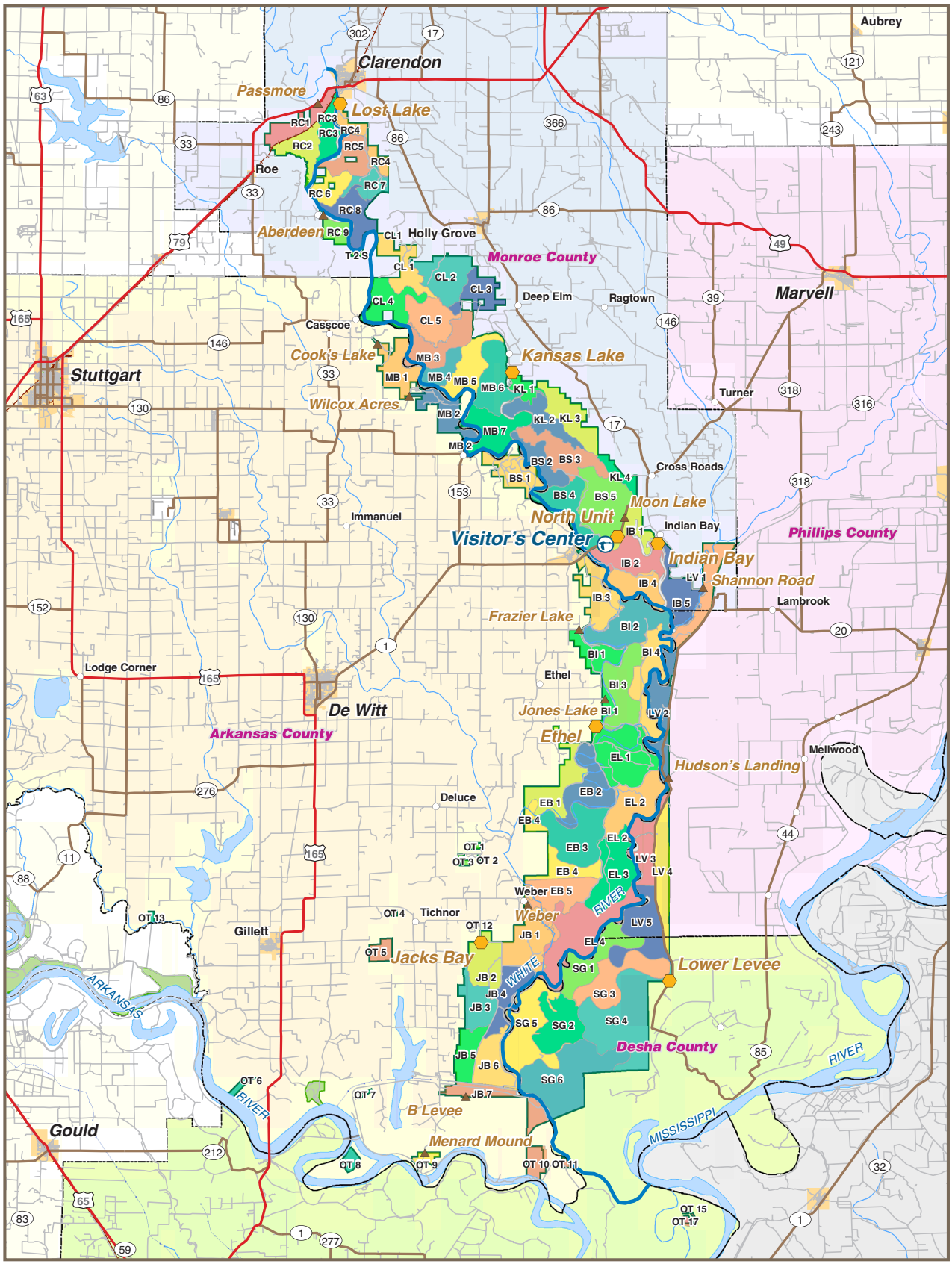


Figure 2-8

Forestry Compartments Profile

history of southeast Arkansas. This center 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 Center.

2.4.11 Refuge Management and Operations

White River NWR is currently maintained by a staff of 13 professionals, including 12 permanent employees and some supporting seasonal employees. The current annual budget for the Refuge exceeds $1.05 million. Over the past five years, annual budget appropriations and staffing levels have increased at a rate of approximately 3.2 percent per year (on average). Table 2-9 summarizes Refuge budget and staffing levels for the past five years.

Table 2-9 Historical Refuge Staffing and Funding Levels

Year	Annual Budget	Permanent Staff
2004	$1,054,100	12
2003	$1,030,400	14
2002	$1,033,200	14
2001	$916,800	14
2000	$929,900	13

Source: White River NWR.

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, as described in the following sections:

Maintenance Management System (MMS)

The Maintenance Management System (MMS) is used to identify and appropriate dollars to justify the funding of Refuge maintenance and construction projects for existing facilities. MMS documents existing facility needs and justifies budget appropriations for maintenance requests, and it serves as a tool for sound facility decision-making. MMS is also used to identify funding needs for staffing salary costs and escalation and facility operations costs. MMS 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.

Road grader used to maintain the Refuge road and trail system.

Refuge Operations and Needs System (RONS)

The Refuge Operations and Needs System (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 (CCP) for the Refuge. If a CCP does not exist for the given Refuge, projects identified under RONS must comply with approved short- and long-term goals for that Refuge as approved by FWS and the U.S. Department of the Interior.

2.4.12 Private In-Holdings and Refuge Out-Parcels

Portions of the North Unit are privately-owned, and this land is not open to the general public. These private in-holdings are illustrated in Figures 2-1 and 2-2. The private lands consist of private entities offering hunting opportunities, boat ramps, and other recreational services.

Additionally, the Refuge controls many land parcels that are not physically connected to the contiguous Refuge. These Refuge-owned out-parcels are also identified in Figures 2-1 and 2-2.

2.5 Major Refuge Transportation Issues and Challenges

Refuge staff and the project team have identified and prioritized the many transportation issues and challenges that are evaluated and addressed in the following chapters of the Transportation Study. These challenges have been identified based upon a detailed compilation and review of current and historic conditions at White River National Wildlife Refuge and via several briefings, working sessions, and lengthy site observations with key Refuge staff, FWS, and FHWA. In addition, a proactive public involvement process with key stakeholders and the public has also helped to frame and articulate important transportation issues and needs identified by the communities that surround the Refuge.

The following are Refuge transportation issues that have been identified:

Increasing Refuge Staff and Funding

Over the past 12 years, the largest challenge the Refuge has faced has been the task of operating and managing the Refuge with very constrained staffing and funding resources. In 1992, the size of White River National Wildlife Refuge increased from 112,000 acres to over 160,000 acres with FWS's acquisition via land swap of the North Unit from Potlatch, Inc. However, since that time, Refuge funding and staffing have decreased. Currently, the entire Refuge is operated with a staff of 12 permanent employees (or approximately one permanent employee per every 13,000 acres). Justification of increased funding, staffing, and training of staff in key areas such as educational activities and maintenance will be important enhancement considerations during the development of improvement alternatives. The ability to proactively fund improvement projects that support the Refuge's "Wildlife First" mission and foster its ability to promote public use of the Refuge is a critically important challenge.

Transportation Safety Issues

The study has included development of a safety assessment to help understand specific safety deficiencies on or near the Refuge, and appropriate improvement actions to assist in either reducing or eliminating safety concerns. These specific improvements have been based on an evaluation of Refuge conditions during field visits, as well as via

discussion with the Refuge Manager, Refuge staff, and comments received from key stakeholders and the public. These issues are discussed in detail in Chapter 4, Alternatives Analysis.

All Terrain Vehicle Access Issues

The use of ATVs on public lands is an issue that generates a very wide breadth of opinion. There are many who believe that their use is not appropriate on public lands and that they should be banned entirely. There are also many who believe that their use is important to supporting approved wildlife-dependent public uses and that they are a viable alternative to a wider use of larger four-wheel drive vehicles on the Refuge. The role of ATVs and their use at White River NWR is discussed and addressed in later chapters of this report.

Equitable Refuge Vehicle Access

The Refuge and FWS are committed to offering equitable public access to surrounding communities. However, the provision of a Refuge-wide transportation access plan needs to uphold the Refuge's "Wildlife First" mission and must support the various approved wildlife-dependent public use activities that are approved by the Refuge and the FWS.

Wayfinding

Wayfinding is clearly a challenge in traveling both to and within the Refuge. A more comprehensive sign needs assessment and future implementation of certain types of signs will help to improve safety as well as the public's visit experience. Some examples of wayfinding improvements include:

- Advance signage
- Warning signage
- Interpretive signage
- Trial & Mileage markers

Potential Recreational Enhancements

There are many potential opportunities to introduce recreational enhancements to the Refuge (or near the Refuge border) that may be pertinent to furthering the goal to fostering wildlife-dependent activities on the Refuge. Examples include:

- Establishment of some primitive campgrounds in the northern part of the Refuge's North Unit.
- RV provisions (for example near the Visitor Center and/or the Clarendon entrance).
- Canoe/Kayak outfitter.
- Informational tours (tram and/or boat).

The potential of introducing these recreational enhancements is studied further in Chapter 4, Alternatives Analysis.

Forest Management Planning

As described earlier in Chapter 2, Section 2.4.8, the Refuge employs a proactive forest management plan to support its "Wildlife First" mission. A major challenge for the Refuge is to develop and execute an efficient transportation plan for the entire Refuge that will help to support this objective efficiently and in a manner that generates a diminished amount of negative environmental impact. In particular, evaluation of current and historic conditions indicate that large portions of the Refuge's North Unit are not vehicle accessible, and consequently, have not received needed forest management for many years. Development of a transportation plan that supports this objective, but that is also sensitive to the environment and supports responsible use of a very constrained resource base is a very important challenge.

Fostering Relationships with Neighboring Local, State, and Federal Agencies

The Refuge has identified several opportunities to build stronger relationships with neighboring communities and local and state agencies to foster improved and better-balanced public use opportunities for the public both at the Refuge as well within those properties that border or are very close to the Refuge.

Examples include:

- Cook's Lake Educational Center/Arkansas State Game and Fish Commission
- Arkansas Game and Fish Foundation
- Menard Mound/National Park Service
- Arkansas Post National Monument/National Park Service
- Highway 79 Reconstruction/Arkansas State Highway and Transportation Department
- Proposed Clarendon Recreational Vehicle Park/City of Clarendon, Arkansas

Transportation improvements that are considered to help support these opportunities include:

- Implementation of new and/or improved Refuge access points. These could be vehicle access improvements and/or water access improvements.
- Improved parking areas (where appropriate).
- Signage and trailblazing.
- Development of guided tours.

3

Demographic, Socioeconomic, and Environmental Conditions

This section describes regional demographic and socioeconomic conditions in the area and includes an area demographic profile, a summary of socioeconomic and community features, a land use summary, a summary of area cultural resources, and an environmental justice analysis. This section also provides a brief summary of area environmental conditions, including a list of threatened and endangered species known to live within the Refuge, a summary of area air quality conditions, and a delineation of area wetlands and floodplains.

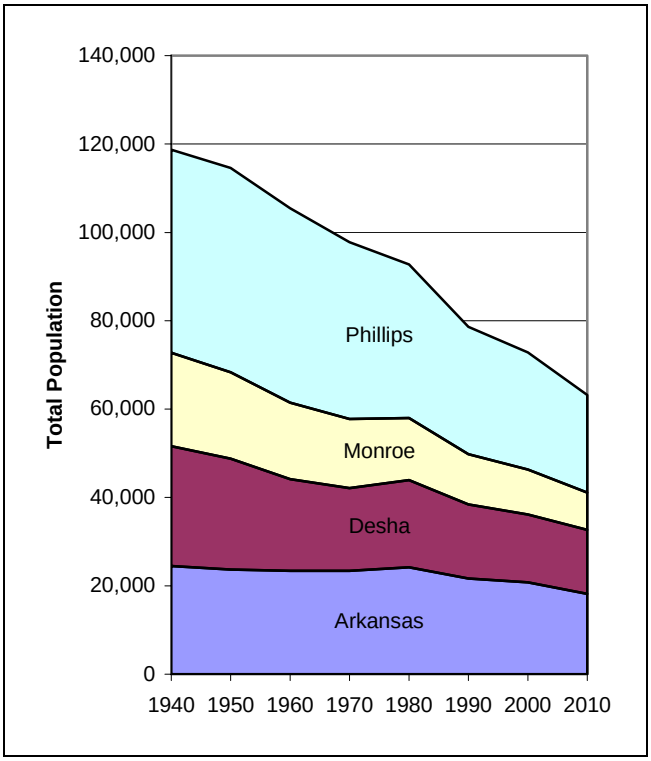
3.1 Regional Demographic and Socioeconomic Conditons

As described previously, the study area includes four counties in southeastern Arkansas: Arkansas County, Monroe County, Phillips County, and Desha County. The Refuge straddles all four of these counties; with the largest area of the refuge bordering Arkansas County. Historic demographic data were obtained from the Arkansas Statistical Abstract for the year 2002 and were compiled by the Census State Data Center at the University of Arkansas at Little Rock. Demographic data presented for the year 2000 were obtained through the U.S. Census Bureau from the 2000 Census. Demographic data and population projections were obtained from the Arkansas Department of Economic Development's County Profiles. Economic and employment data were obtained from the 2000 Census and the Arkansas Department of Economic Development.

3.1.1 Demographic Profile

As shown in Figure 3-1, the population of the four counties has decreased from a high of 118,700 in 1940 to 72,789 persons in 2000. This represents an average annual decline of 0.6 percent per year over the 60-year period (38.7 percent total decline over the entire period).

Figure 3-1 Total Four-County Population



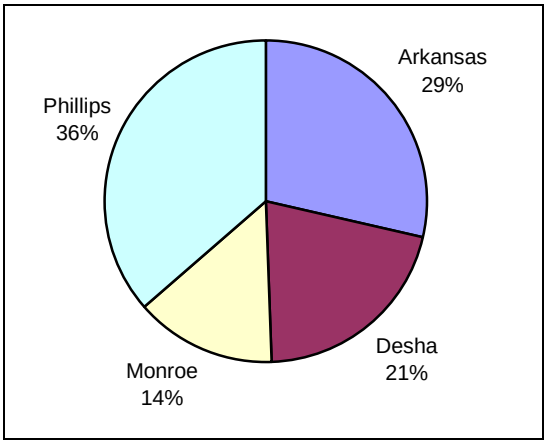
Source: Arkansas Department of Economic Development.

By comparison, the population of southeast Arkansas, which includes these four counties, is projected to continue to decline into the future. This is the only region in Arkansas whose population is projected to decrease in the future. The projected population of the four counties is expected to decline to 63,179 by the year 2010.

Conversely, the total state population experienced an average annual increase of 0.6 percent per year between 1940 and 2000 and 1.4 percent per year between 1990 and 2000.

The breakdown of the 2000 population among the four counties is shown in Figure 3-2. Phillips County has the largest population, representing 36 percent of the total four-county population.

Figure 3-2 Four-County Population

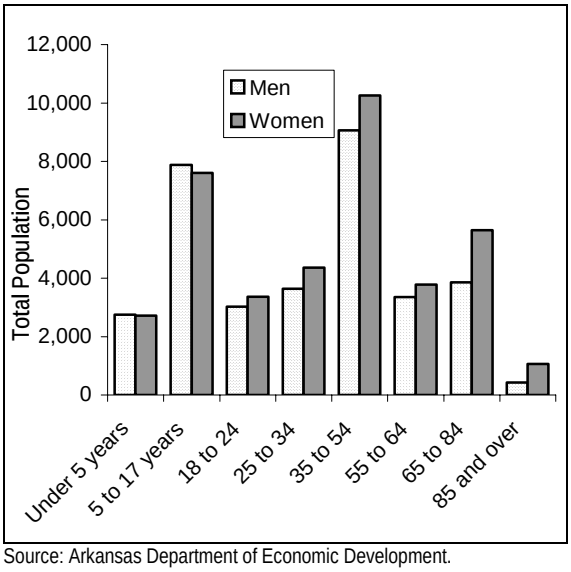


Source: Arkansas Department of Economic Development.

In 1990, the rural population represented 42 percent of the total four-county population. In 2000, the rural population ratio had increased to 44 percent even though the total population had decreased.

The 35-54 year old age cohort is the largest group, representing 27 percent of the population. The 5-17 year old cohort represents 21 percent of the population and the 65-84 year old cohort is the next largest group at 13 percent. Figure 3-3 presents the population strata by sex and age. Women constitute 53 percent of the total four-county population. The male to female ratio is largely consistent (between 49-53 percent) from birth through age 64.

Figure 3-3 Population by Sex and Age



Source: Arkansas Department of Economic Development.

The total study area population (defined by the sum of all census block groups that fall within the study area) in 2000 was 18,135.

3.1.2 Socioeconomic and Community Features

The socioeconomic and community features described in this section include households, migration, education, employment, and income.

Households

According to the 2000 U.S. Census, the four counties had 28,222 total households, with an average household size of 2.58 persons per household. Among the households, 19,836 dwellings or 70 percent were considered "families", and of these, 42 percent were 2-person households, 24 percent 3-person, 19 percent 4-person households, and the remaining 15 percent 5+ person households. Of the 7,691 non-family dwellings, 92 percent were 1-person households.

Migration

In 2000, 61 percent of the population in the four-counties had been living in the same house in 1995. Of the remainder, 68 percent had moved within the same county; 19 percent had moved from a different county in the same state; 13 percent had moved from a different state; and 1 percent were immigrants.

Education

Overall, in the four-counties, 33 percent of the population aged 25 and older has not completed high school (or equivalent). 53 percent have a high school diploma but no college degree, 11 percent have an associates or bachelors degree, and the remaining 3 percent have achieved some advanced educational degree. The education levels between men and women are comparable, with the exception that slightly more men do not complete high school (36 percent men vs. 33 percent women).

Employment

Of the 27,091 workers 16 years and over, 83 percent worked in their county of residence, 12 percent in a different county within Arkansas, and 5 percent in a different state. Of the four counties, Arkansas County has the smallest workforce working out of state (0.5 percent), while Phillips County has the largest (13 percent).

Of the population 16 years and over, 45 percent were not in the labor force[3] in 2000. The percent of women not in the labor force was greater than the percent of men (51 percent of women, 38 percent of men). Of the total population aged 16 years and over in the labor force, 92 percent were employed. Table 3-1 shows the unemployment rates for each

3 People not in the labor force are mainly students, individuals taking care of home or family, retired workers, seasonal workers enumerated in an off-season who were not looking for work, institutionalized people, and people conducting only incidental unpaid family work.

county. The Arkansas State average unemployment rate for 2000 was 6.1 percent.

Table 3-1 Study Area Unemployment Rates

County	Unemployment
Arkansas	6.2%
Desha	8.8%
Monroe	5.3%
Phillips	11.3%
4-County Average	7.9%
State Average	6.2%

Source: 2000 United States Census.

The majority of the employed population 16 years and over works in education, health, and social services. Table 3-2 depicts the top industries in the four counties.

Table 3-2 Employment by Industry

Industry	Percent of Total Population
Education, Health, Social Services	20%
Manufacturing	18%
Wholesale and Retail Trade	15%
Agriculture, Forestry, Fishing, Hunting	10%
Arts, Entertainment, Recreation, Accommodation, Food Service	7%
Public Administration	6%
Construction	6%
Transportation, Utilities	5%
Finance, Insurance, Real Estate	4%
Professional, Scientific, Administrative, Waste Management	3%
Information	1%
Other services (except public administration)	5%
	100%

Source: 2000 United States Census.

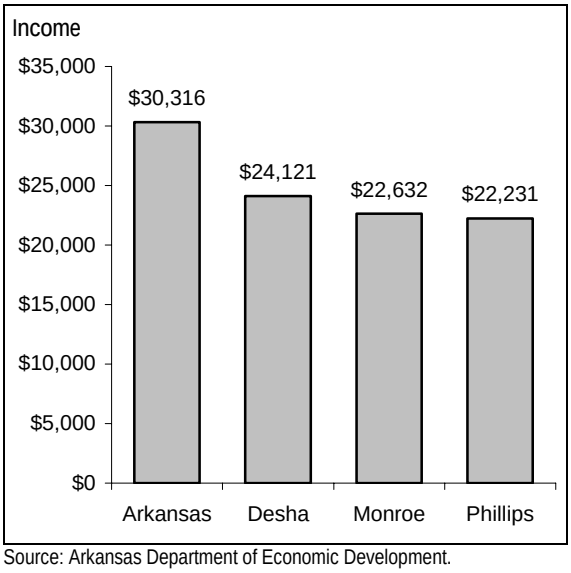
Agricultural production in southeastern Arkansas includes primarily rice, wheat, soybeans, cotton, and aquaculture (including catfish). Manufacturing in southeastern Arkansas, which accounts for 18 percent of employment, includes transportation, aircraft equipment, cosmetics, and furniture. Arkansas County has the highest percentage of manufacturing workers in southeastern Arkansas. The county also has a number of biotechnology research laboratories. Stuttgart is home to a number of research facilities, including Rice Germplasm Evaluation and Enhancement Research Center, the University of Arkansas Rice Research Extension Center, and the Stuttgart Aquaculture Research Center.

Riceland Foods in Stuttgart, Arkansas.

Income

The median household income of the four counties as reported in the 2000 Census was $24,825. Figure 3-4 shows the median household income by county. By comparison, the statewide median household income was $32,182.

Figure 3-4 Median Household Income



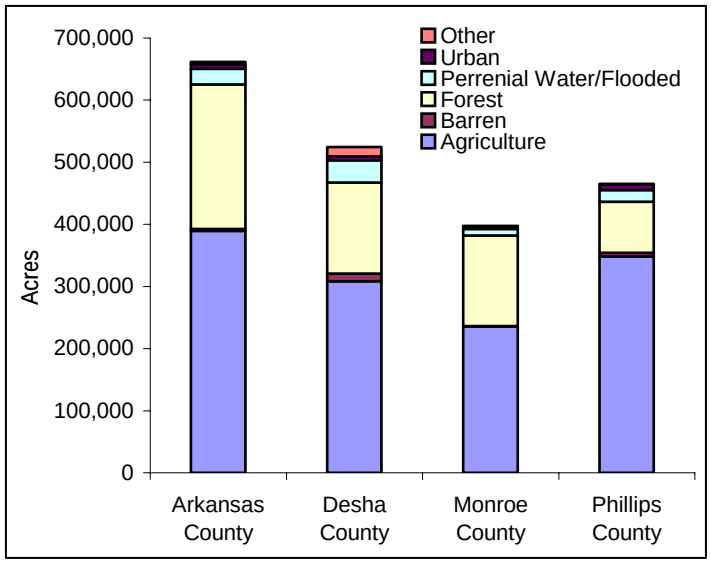
Source: Arkansas Department of Economic Development.

Per capita income as reported in the 2000 Census ranged from $16,401 in Arkansas County to $12,288 in Phillips County. By comparison, the statewide per capita income was $16,904.

3.1.3 Land Use

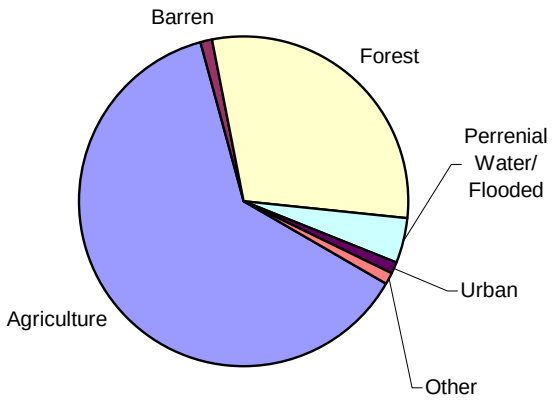
Land use for the four counties was broken down by the following uses: agricultural, forest, urban, barren, perennial water/floods, and other. Land use by county is illustrated in Figure 3-5.

Figure 3-5 Land Use by County (acres)

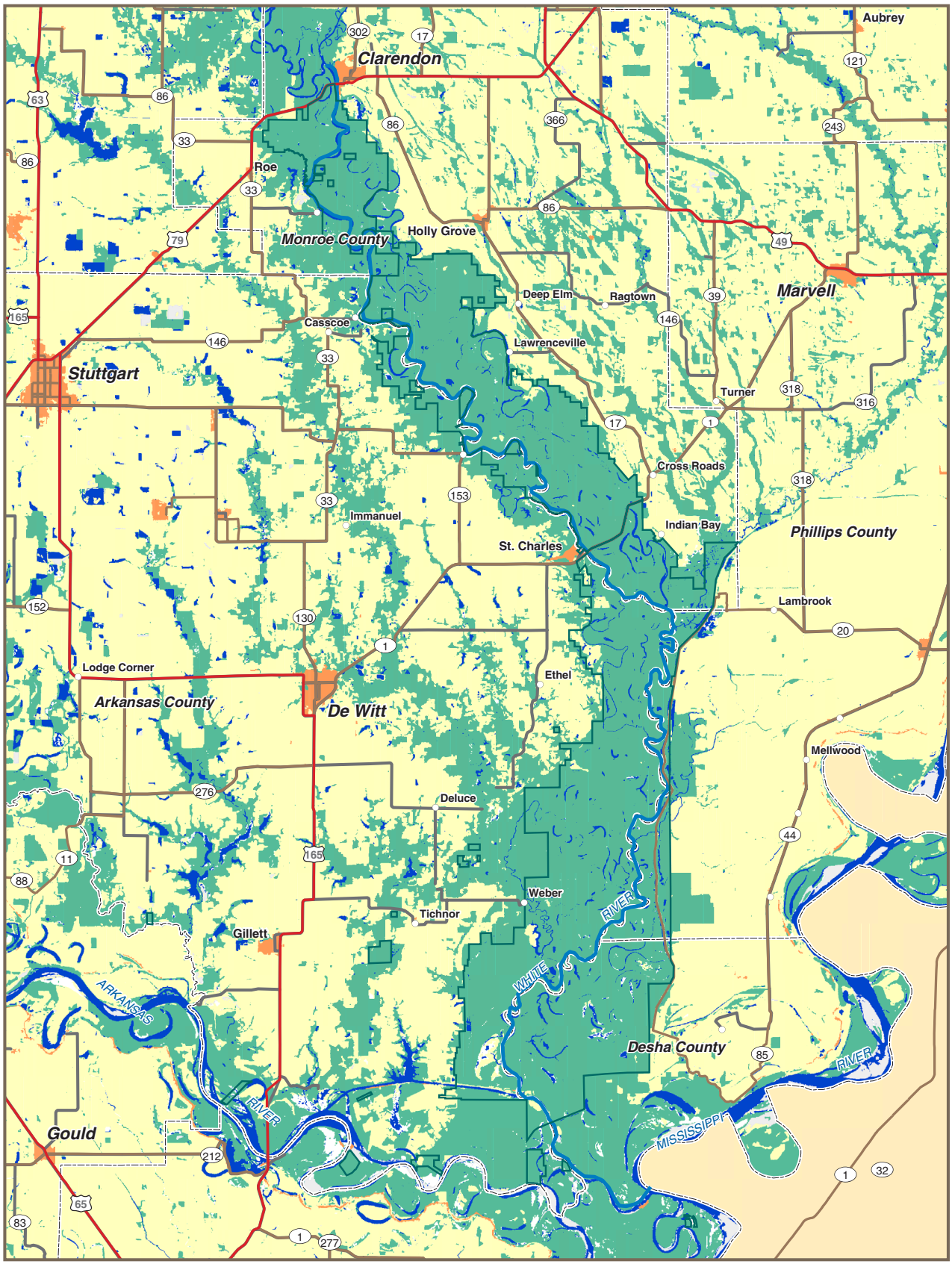


The total land use for the four counties (Figure 3-6) shows that land is predominately used for agriculture (63 percent). 30 percent of the total land is designated as forest. Less than one percent is considered urban. A geographic summary of land use within the study area is shown in Figure 3-7.

Figure 3-6 Land Use by County (ratio)



White River National Wildlife Refuge Transportation Study



Source: Center for Advanced Spatial Technologies, LULC 1999

Agriculture
Barren
Forest
Perrenial Water/Flooded
Urban

0 2 4 6 Miles

Figure 3-7
Land Use

3.1.4 Cultural and Historic Resources

The cultural resources in the study area include museums, national parks, camp or lodging areas, and properties, districts, and sites included in or eligible for inclusion in the National Register of Historic Places. These sites are shown in Figure 3-8. A significant number of these resources are within the boundaries of the South Unit.

Visions of Clarendon Visitor's Center in Clarendon, Arkansas.

There are three educational institutions in the area: Phillips Community College in DeWitt and Stuttgart, Phillips Community College of the University of Arkansas in Helena, and Great Rivers Technical Institute in Desha.

Available tourism statistics for the four counties are shown for 2000 in Table 3-3.

Table 3-3 Annual Study Area Visitor Statistics

County	Person Trips (2000)
Arkansas	124,000
Desha	95,000
Monroe	122,000
Phillips	94,000

Source: Arkansas Department of Tourism

Arkansas and Monroe Counties host the highest number of visitors annually. In total, the four counties host nearly 500,000 visitors annually.

Historic Structures

Information on historically significant structures within the study area was compiled in consultation with the Arkansas Historic Preservation Program and the FWS. The Arkansas Historic Preservation Program is the State Historic Preservation Office for the State of Arkansas (Arkansas SHPO) and is charged with identifying and evaluating the state's historic and cultural resources.

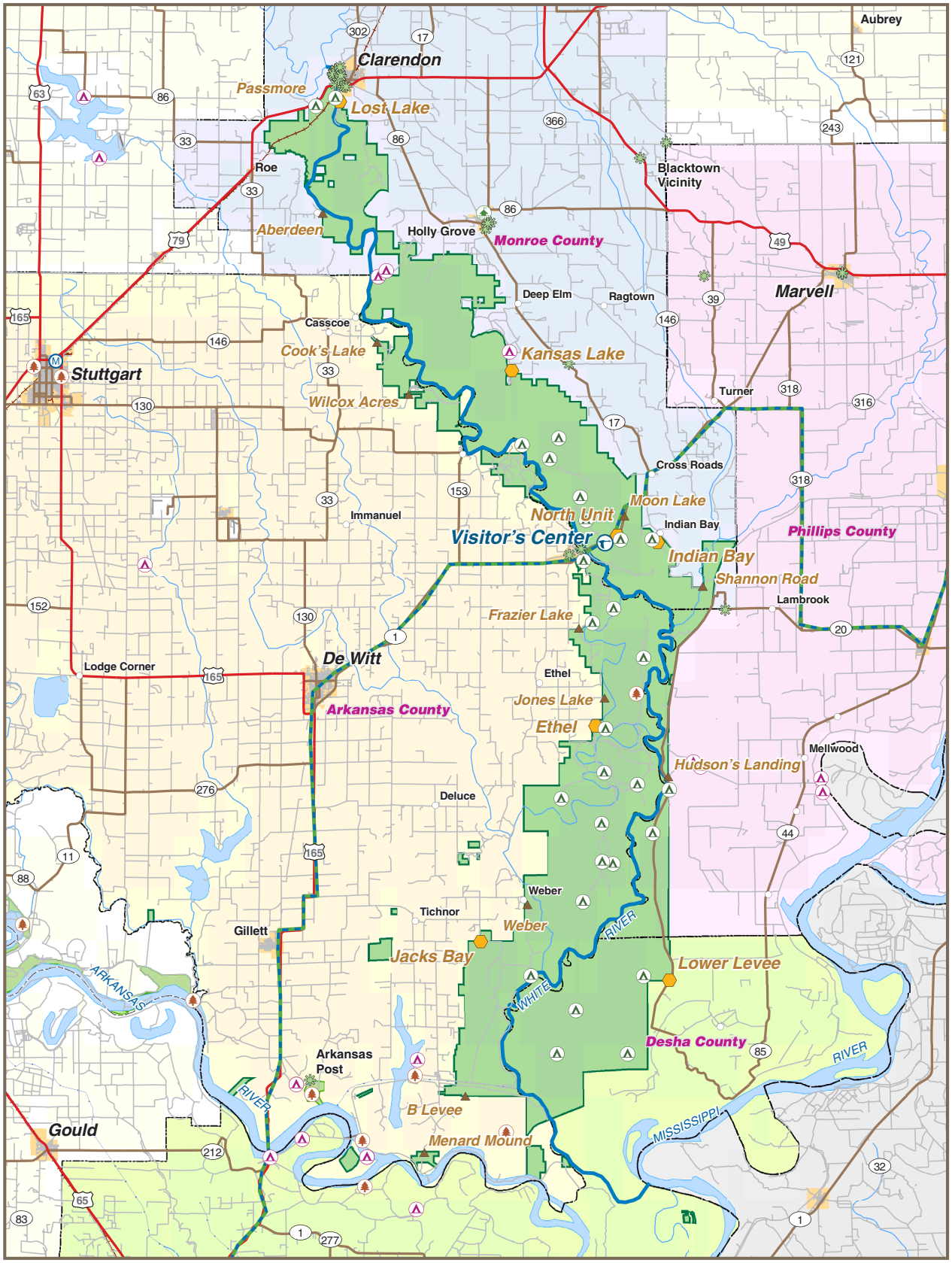
Consultation with the FWS and Arkansas SHPO revealed 25 buildings and one district included in the National Register of Historic Places within the study area. These resources are described in Table 3-4 and located in Figure 3-8.

The Arkansas SHPO also maintains the Arkansas Register of Historic Places, a list of historically significant properties that do not meet the criteria for inclusion in the National Register of Historic Places. Consultation with the Arkansas SHPO revealed no properties listed on the Arkansas Register of Historic Places within the study area.

Archeological Resources

Information on known archeological sites and areas of archeological sensitivity within the study area was compiled in consultation with the Arkansas SHPO, the Arkansas Archeological Survey (AAS), and the FWS. The Arkansas SHPO does not release information on known archeological sites or areas of archeological sensitivity to the public or cultural resource management professionals. FWS will need to consult with the Arkansas SHPO in future stages of the project regarding the presence of archeological sites or areas of archeological sensitivity.

White River National Wildlife Refuge Transportation Study



Source: Center for Advanced Spatial Technologies

0 2 4 6 Miles

- Major Entrance
- Lesser Entrance
- Visitor's Center
- White River National Wildlife Refuge
- Campgrounds (WRNWR)
- Campround or Lodge (AHTD)
- National Register Sites
- Scenic Byway
- Historic Districts
- Parks (GNIS)
- Museums

Figure 3-8
Cultural and Historic Resources

Table 3-4 Properties Included in the National Register of Historic Places

Name	Address	Town
Palmer House	US 49, 4 miles southeast of Blackton	Blackton Vicinity
Anderson Boarding House	201 Main St.	Clarendon
Bank of Clarendon	125 Court St.	Clarendon
Bateman Griffith House	316 Jefferson St.	Clarendon
Bondi Brothers Store	104 Madison St.	Clarendon
Bounds Store	105 Second St.	Clarendon
Clarendon Methodist Episcopal Church South	121 Third St.	Clarendon
Cumberland Presbyterian Church	120 Washington	Clarendon
Ellas-McKay House	404 North Walls St.	Clarendon
Ewan Building	124-128 Second St.	Clarendon
Goldman & Son Store	101 Main St.	Clarendon
Highway 79 Bridge	Highway 79	Clarendon
Jefferies Building	122 Madison St.	Clarendon
Jefferies-Crabtree House	300 Jefferson St.	Clarendon
Manning, Lee, & Moore Law Office	109 Court St.	Clarendon
Marston House	429 Main St.	Clarendon
Merchants & Planters Bank	214 Madison St.	Clarendon
Midland Depot	205 Midland St.	Clarendon
Monroe County Courthouse	123 Madison St.	Clarendon
Moore-Jacobs House	500 North Main St.	Clarendon
New South Inn	132-164 Second St.	Clarendon
Orth C. Galloway House	504 Park St.	Clarendon
Abramson House	127 Crescent Heights	Holly Grove
Holly Grove Historic District	Main and Pine Streets	Holly Grove
James A. Walls House	498 J.A. Walls Drive	Holly Grove
Warrens Bridge	CR 141, 1.8 miles west of the end of Highway 20, west of Lambrook	Lambrook

Source: State Historic Preservation Office for the State of Arkansas.

Traditional Cultural Properties

The Arkansas SHPO does not release information on identified traditional cultural properties in the State of Arkansas to the public or cultural resource management professionals. The FWS will need to consult with the Arkansas SHPO in future stages of the project regarding the presence of traditional cultural properties within the study area.

3.1.5 Environment Justice Analysis

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations (EO 12898) require agencies to identify and address potential disproportionate high and adverse impacts on minority, and low income populations. This section describes the existing environmental justice populations within the study area and the four counties.

Minority and low income populations were identified via the analysis of 2000 U.S. Census data. The following definitions were used in the analyses:

- **Minority Populations** – A minority person is defined as an individual who is a member of one of the following population groups: Black or African American; American Indian and Alaska Native; Asian; and Native Hawaiian, Other Pacific Islander, some other race alone, and two or more races.[4]
- **Low Income Populations** – Low income persons are defined as those whose "median household income is below the United States Department of Health and Human Services poverty guidelines."[5] CEQ Guidelines state that low income populations should be identified using the annual statistical poverty thresholds developed by the Bureau of the Census. Data for Poverty by Age (P87) at the Block Group Level from the 2000 U.S. Census was used to identify low income populations.

Linguistic isolation is also a concern in an environmental justice analysis. If a significant proportion of the affected population is linguistically isolated, outreach documents and reports may need to be translated into other languages.

Minority Populations

Minority populations were identified using 2000 U.S. Census block data, the smallest unit for which minority population data are available. All census blocks that fell at least partially within the study area were included to determine the total population.

Minorities constitute 20 percent of the total state population. However, minorities represent 46 percent of the total population of the four counties. African Americans constitute the largest minority group in each county and represent 94 percent of the minority population. Table 3-5 shows the minority populations in each county.

Table 3-5 Minority Population

County	Minority Population	Percent of Total Population
Arkansas	5,147	24.8%
Desha	7,594	49.5%
Monroe	4,166	40.6%
Phillips	16,066	60.8%
Total	33,573	46.1%

Source: 2000 United States Census.

4 *2000 United States Census data*, (http://www.census.gov/main/www/cen2000.html), 2000.

5 *Federal Register, Final DOT 5610.2, Order to Address Environmental Justice in Minority Populations and Low Income Populations,* Volume 62, No. 72.15 United States Department of Transportation, April 1997.

Within the study area, minorities represent 28 percent of the study area population. Figure 3-9 shows the percent of minorities by census block.

Low Income

Low Income populations were identified using 2000 U.S. Census block group data, which are larger than census blocks, but are the smallest unit for which income data are available. All census block groups that fell within or partially within the study area were included to determine the total population.

16 percent of the total state population was defined as low income in the 2000 census. However, the low income population of the four counties surrounding the Refuge is significantly higher than the average for the state. Low income populations represent 27 percent of the total population of the four counties. Table 3-6 shows the low income populations in each county.

Table 3-6 Low Income Population

County	Low Income Population	Percent of Total Population
Arkansas	3,627	17.8%
Desha	4,380	28.9%
Monroe	2,770	27.4%
Phillips	8,543	32.7%
Total	19,320	26.5%

Source: 2000 United States Census.

Within the study area, low income populations represent 23 percent of the population. Figure 3-10 shows the percent of low income populations by census block group.

Linguistic Isolation

Of the 28,222 households in the four counties, 117 households are linguistically isolated (0.4 percent). In these households, all members 14 years or older have at least some difficulty with English. The two predominant language groups[6] were Spanish (75 households) and Asian/Pacific Island languages (26 households).

Figure 3-11 shows the linguistically isolated households.

Summary – Environmental Justice

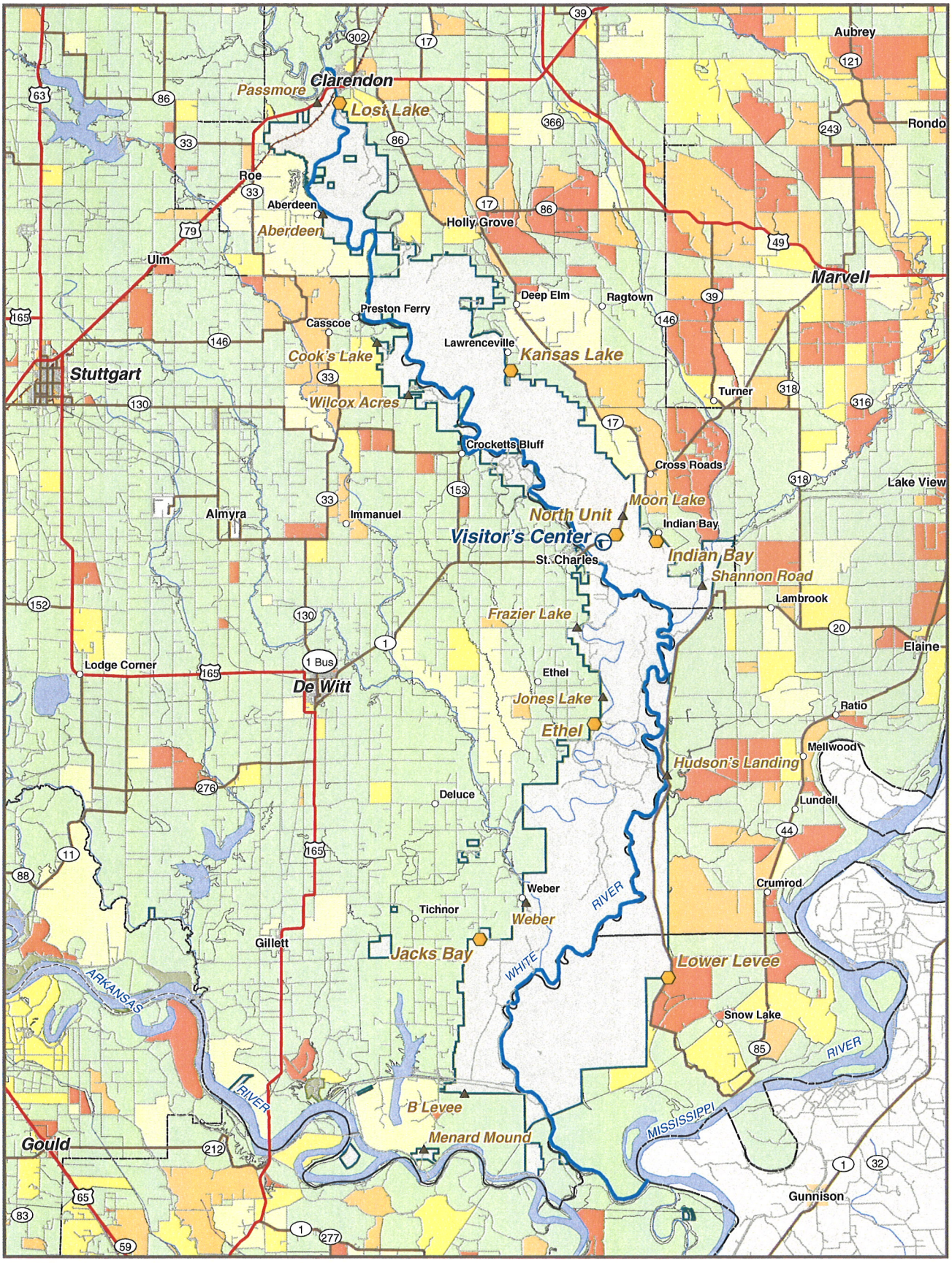
Minorities within the study area constitute a greater proportion of the population (28 percent) than at the state level (20 percent). However, the minority population of the four counties abutting the Refuge is significantly higher (46 percent) and is predominantly African American.

The proportion of low income populations within the study area (23 percent) and four counties (27 percent) are similar, but are larger than the statewide proportion (16 percent). Linguistically isolated households comprise less than 0.5 percent of the households.

Spanish is the most common language among the linguistically isolated households but accounts for less than one quarter of one percent of the total households.

6 The 2000 Census does not identify individual languages (other than Spanish); rather, it identifies language groups and the number of linguistically isolated households under those groups. Asian and Pacific languages include Chinese, Japanese, Korean, Thai, Laotian, Vietnamese, Tagalog, and Pacific Island languages such as Chamorro, Hawaiian, Ilocano, Indonesian, and Samoan.

White River National Wildlife Refuge Transportation Study



Source: US Census Bureau, 2000

0 2 4 6 Miles

- Major Entrance
- Lesser Entrance
- Visitor's Center
- White River National Wildlife Refuge

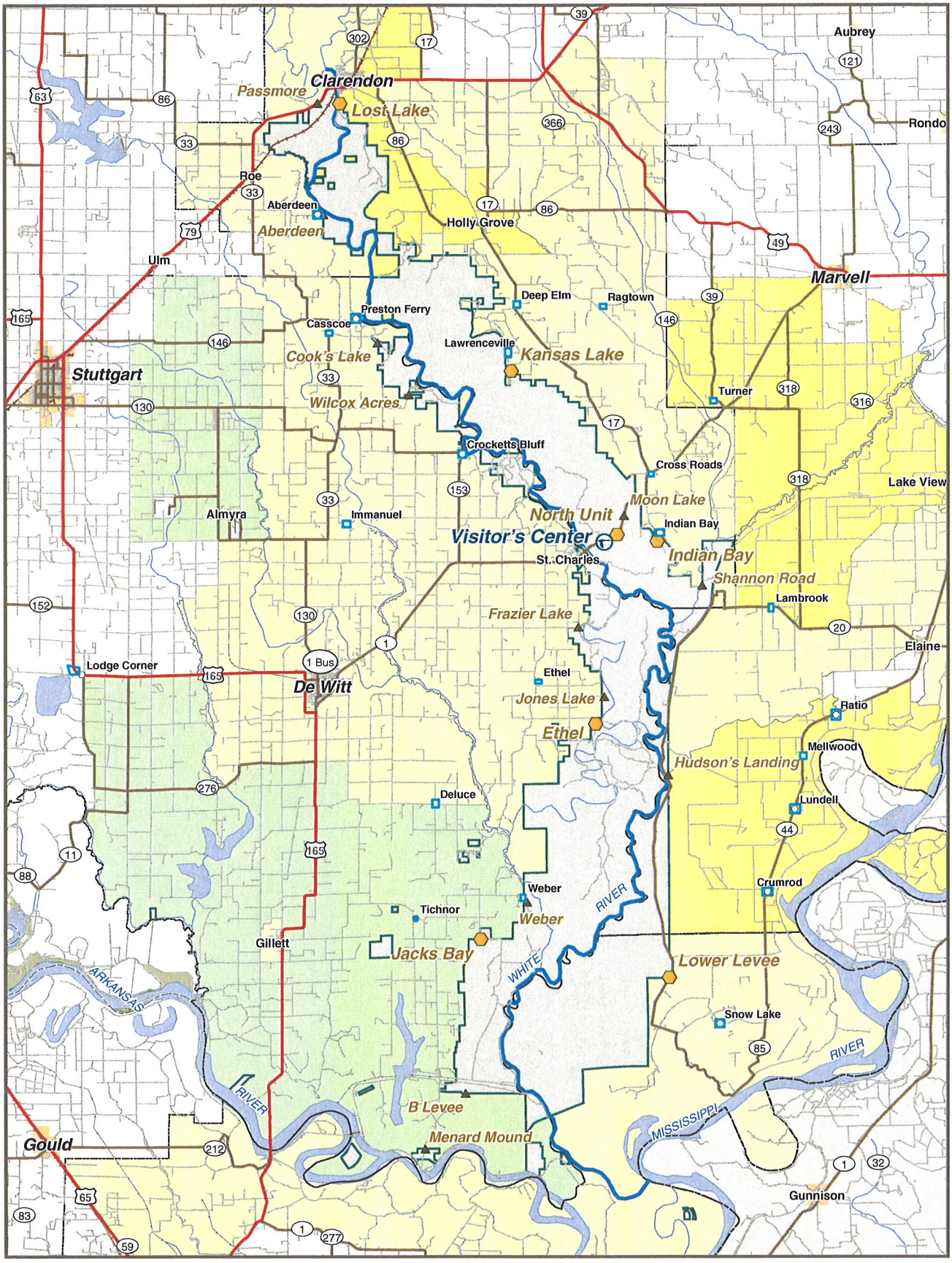
Minority Percentage

- < 10%
- 10% –30%
- 30% –50%
- 50% –80%
- 80% –100%

Figure 3-9

Minority Population

White River National Wildlife Refuge
Transportation Study



Source: US Census Bureau, 2000

0 2 4 6 Miles

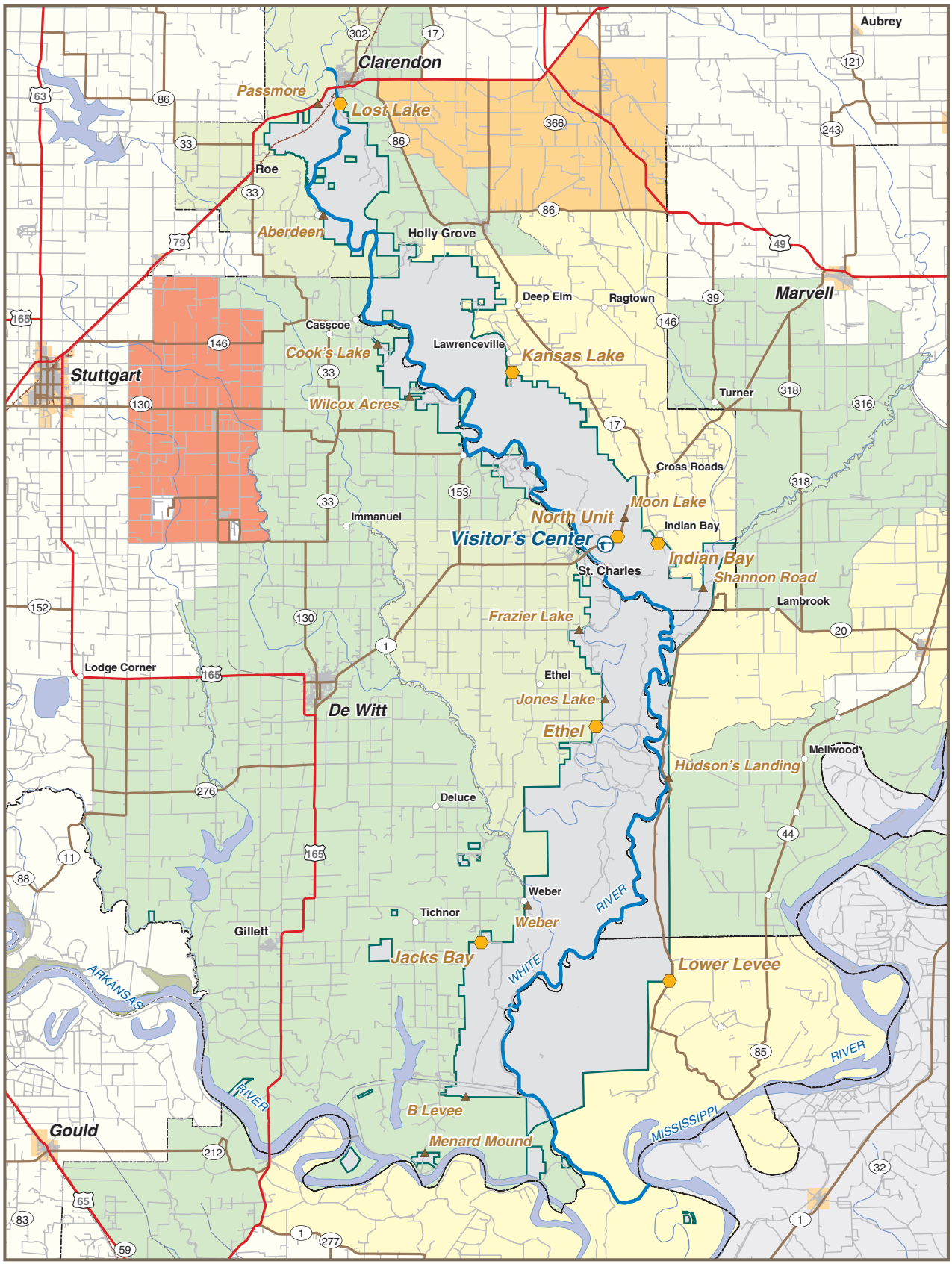
- Major Entrance
- Lesser Entrance
- Visitor's Center
- White River National Wildlife Refuge

Low Income Percentage by Population

- < 10%
- 10% –30%
- 30% –50%
- 50% –80%
- 80% –100%

Figure 3-10
Low Income Households

White River National Wildlife Refuge Transportation Study



Source: US Census Bureau, 2000

0 2 4 6 Miles

- Major Entrance
- Lesser Entrance
- Visitor's Center
- White River National Wildlife Refuge

Linguistically Isolated Households

- 0%
- 1%
- 2%
- 3%
- 4%

Figure 3-11

Linguistically Isolated Households

3.2 Environmental Conditions

This section describes various environmental conditions within the project study area. Included is a list of threatened and endangered species known to live within the Refuge, a summary of area air quality conditions, and a delineation of wetlands and floodplains in the area.

3.2.1 Threatened and Endangered Species

The United States Fish and Wildlife Service hosts the Threatened and Endangered Species Service (TESS), which provides information on federally listed species of plants and animals. A list of known threatened and endangered species within White River NWR is shown in Table 3-7.

Table 3-7 Threatened and Endangered Species List

Species Common Name	Scientific Name	Status
Alligator, American	(*Alligator mississippiensis*)	Threatened (S/A)
Eagle, bald	(*Haliaeetus leucocephalus*)	Threatened
Sturgeon, pallid	(*Scaphirhynchus albus*)	Endangered

S/A Similarity of Appearance (defined in the text below)
Source: USFWS TESS.

In addition to these species provided by TESS, the federal endangered wood stork (*Mycteria americana*) is reported as a fall visitor to the preserve.

S/A in Table 3-7 stands for Similarity of Appearance, defined as a species that may be treated as endangered or threatened if it resembles in appearance a species which has been listed under Section 4 and enforcement personnel would have difficulty distinguishing between the listed and the unlisted species; if the effect of this difficulty is an additional threat to the listed species; and if such treatment of the unlisted species would improve protection for the listed species. A similarity of appearance listing must be promulgated or formalized by rule.

3.2.2 Air Quality

Air quality conditions in the State of Arkansas are monitored and regulated by the Arkansas Department of Environmental Quality (ADEQ). Primary responsibilities of ADEQ include:

- Annual emissions inventory of major sources
- Emission inventories for area, mobile, and biogenic sources
- Ozone forecasting for Central Arkansas
- Projects and workshops related to non-attainment areas
- Permit modeling
- Public education
- Studying effects of air toxics
- Conducting the Statewide Air Quality Monitoring Plan

ADEQ is responsible for air quality monitoring in compliance with the federal Clean Air Act. An important part of the Clean Air Act is the delineation of National Ambient Air Quality Standards (NAAQS). NAAQS are standards that apply to outdoor air throughout the United States that set concentration limits on combustion-related pollutants. Areas that meet the NAAQS are termed "attainment areas". Areas that do not meet the NAAQS are termed "non-attainment areas."

For many years, Arkansas has been one of only a handful of states that consistently meets all federal air quality standards for criteria pollutants. Table 3-8 provides a summary of air quality conditions in the project study area.

Table 3-8 2003 Air Quality Summary

Pollutant Type	Meets NAAQS Attainment Levels
Carbon Monoxide	Yes
Lead	Yes
Nitrogen Dioxide	Yes
Ozone (1 hour)	Yes
Ozone (8 hour)	Yes
Particulate Matter (10 microns)	Yes
Particulate Matter (2.5 microns)	Yes

Source: Arkansas Department of Environmental Quality, 2003 Performance Report.

Note that White River NWR and the four counties surrounding the Refuge are in full attainment of the NAAQS.

3.2.3 Wetlands

White River NWR is situated in Southeastern Arkansas above the confluence of three large rivers, the Mississippi River, the Arkansas River, and the White River (see Figure 1-1). This physiographic region, known as the Mississippi Alluvial Plain (MAP), is illustrated in Figure 3-12. The landscape is the product of repeated workings of the region's major rivers over geologic time. Terrain across the MAP is nearly level, often with local changes in elevation of one foot or less. Exceptions occur where the down cutting action of rivers and streams create steep escarpments or bluffs.

The level terraces behind these bluffs represent former bottomlands, now stranded above normal river flood elevations. Terraces are older and more stable landscapes than the alluvial bottomlands.

West of the Refuge, better drained portions of this terrace form what is known as the Arkansas Grand Prairie. This prairie once supported tall grassland communities and fauna assemblages that included buffalo and antelope, but has mostly been converted to irrigated agricultural resources (principally soybean and rice). A small portion of the Refuge, including the Visitors Center, is located above the active floodplain of the White River in an upland forest which bounds the Grand Prairie.

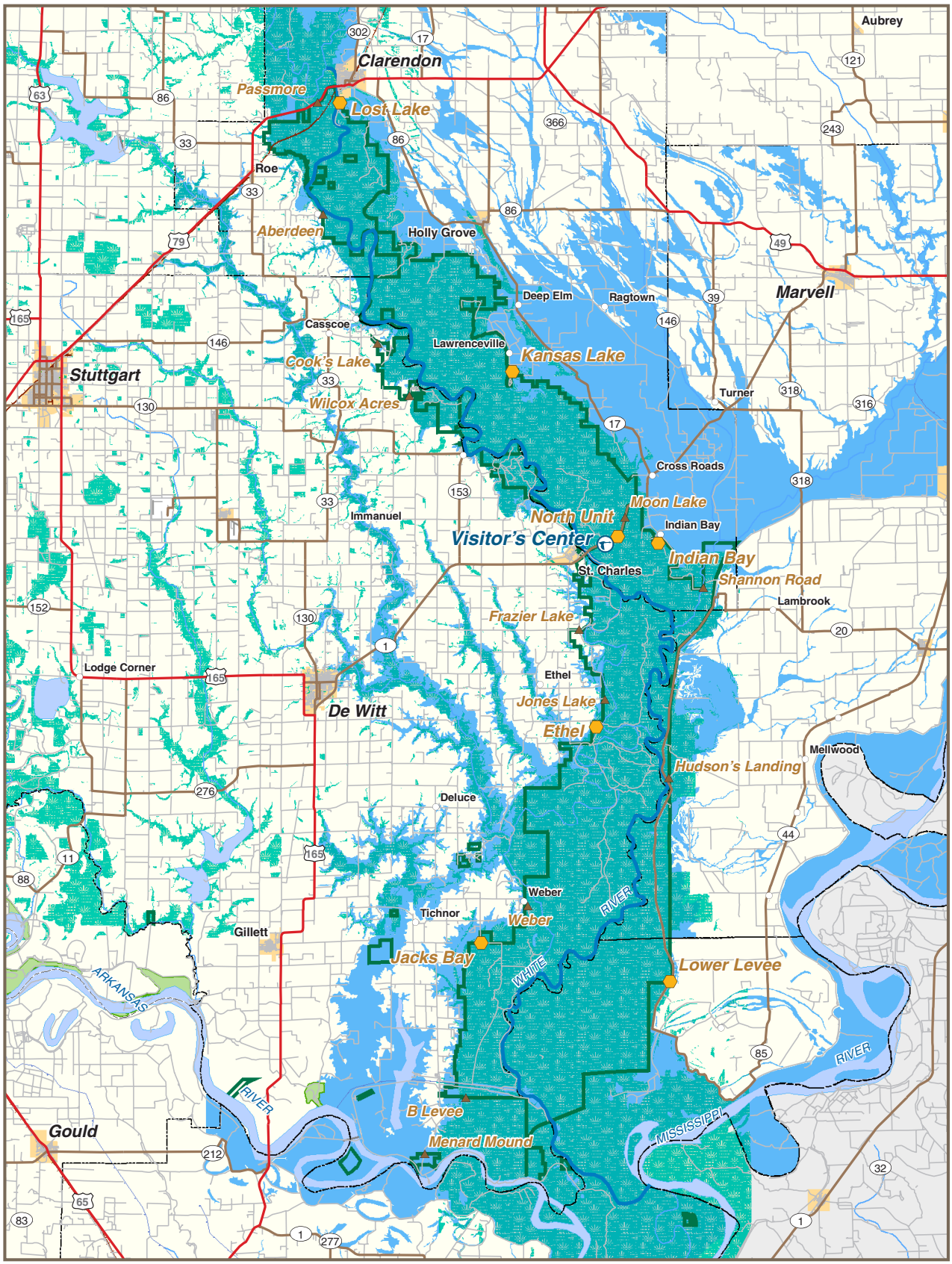
Typical Lake in the South Unit.

Floods along the White River can occur at any time of the year, but winter and spring floods return with regular periodicity. Where not protected by flood control levees, bottomlands are dynamic landscapes, subject to geomorphic processes driven by river floodwaters. Over time, the energy of the river alternative cuts away and redeposits sediment as it repeatedly works across the floodplain to create features that are unique to bottomland systems. These include natural levees, flats, sloughs, meander scrolls, and oxbow lakes (Taylor, Cardamone, and Mitsch, 1990). The Refuge straddles parts of a 95-mile long segment of the White River inside of flood control levees and provides numerous excellent examples of these geomorphic features.

Wetland Types

Most of the 160,000 acre Refuge consists of wetlands classified broadly as bottomland hardwood forest (BHF). This important wetland type is associated with major streams and rivers

White River National Wildlife Refuge Transportation Study



Major Entrance
Lesser Entrance
Visitor's Center

NWI Wetlands
100 Year FEMA Floodzone
White River National Wildlife Refuge

0 2 4 6 Miles

Figure 3-12

Wetlands and Floodplains

throughout the southeastern United States. The lower Mississippi alluvial valley reportedly once contained over 20 million acres of valuable BHF. Much of this former seasonally flooded forest has been isolated from river floodwaters by levees and has been converted to agricultural production. Less than 20 percent of the original forest remains.

Important open water habitats within the Refuge include the White River, numerous tributary streams, and more than 300 lakes which remain each year after flood waters recede.

Cypress trees at Cooks Lake.

Flooding within the Refuge is also affected by extreme flood levels in the Mississippi River and Arkansas River that can cause tail water conditions which back water into the White River and the Refuge. Riparian geomorphic processes are most active close to the principal and secondary channels of the White River; however, the hydrology of bottomland forests far from the river are driven by floodwaters.

Classification of Wetlands

Wetland habitats within bottomland portions of the Refuge vary markedly according to elevation and physiographic position. The hydrogeomorphic (HGM) approach to classifying and evaluating wetlands was developed with the recognition that differences in terrain and water movement can cause wetlands in close proximity to support different vegetation cover types and provide different wetland functions and values. Important regional subclasses that occur in the Refuge include: Riverine Overbank, Riverine Backwater, Connected Depressions, and Connected Fringe. These are considered below.

The Riverine Overbank subclass is characterized by repeated periodic inundation by floodwater from the White River. These floodwaters flow in the same direction of the river with moderate to high velocities. Regionally, the area BHF in this subclass has dwindled as flood control levees have greatly restricted the area subject to direct overbank flooding. The substrate in this subclass consists of recent alluvium which ranges from silty clays in low lying point bar deposits to coarser silty textures on higher elevated natural levees. Common tree species associated with this subclass include sugarberry, green ash, pecan, and a variety of oaks.

The Riverine Backwater subclass is similar to the Overbank subclass, but includes those areas that are primarily flooded by slow moving waters that back into the wetland as the river stage rises. These areas also drain back to the river as flood levels recede. Soils within these backwaters are usually fine textured and slowly permeable. Habitats within this subclass include backswamps as well as drier seasonally wet areas often referred to as flats or bottoms. According to the HGM approach, flats are not inundated by river floodwaters. Common forest species include willow oak, swamp chestnut oak, overcup oak, bitter pecan, and sugarberry.

Connected Depressions include the wetlands and seasonal shallow water habitats that occur within the previous two subclasses. These wetlands are filled by seasonal floodwaters that are then trapped in depressions to form shallow water bodies. These

areas typically drain down at some point during the growing season. Soils are fine textured and slowly permeable. Vegetation within Refuge depressions includes bald cypress, swamp tupelo, water elm, and buttonbush. In addition to naturally impounded depressions, artificially impounded green tree reservoirs and beaver impoundments are also included in this wetland class.

The Connected Fringe subclass includes wetlands that are similar to Depressions, but occur along the edges of permanent waterbodies that maintain an open water zone six feet deep or more in most years. Fringe wetlands occur along the edges of the White River and the greater than 300 lakes within the Refuge. The vegetation fringing lakes and ponds is typically characterized by stands of bald cypress, swamp tupelo, and water hickory. Shrubs such as buttonbush and swamp privet are also common.

Fringe wetlands also occupy recent point bar deposits along the White River. These areas are colonized by black willow when the substrate is fine textured and cottonwood where coarser silts and sands are present. The numerous lakes within the Refuge and the White River are not classified as wetlands but rather as deepwater habitats.

Functions and Values of the Refuge Wetlands and Deepwater Habitats

Wetlands within the Refuge along with other publicly-owned lands in the White River Basin have been jointly designated as "Wetlands of International Importance" under the terms of the Ramsar Convention. The Convention on Wetlands is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. In the United States, there are 19 wetlands that have received this important designation.

The principal function often associated with the Refuge wetlands and deepwater habitats are fish and wildlife habitat. In addition to songbird and waterfowl habitat, each year the flooded bottomlands provide wintering habitat for the largest concentrations of mallards in the U.S. as well as for many other waders and waterfowl. Refuge wetlands also provide habitat for the only remaining population of black bear in the region and nesting habitat for the federally listed bald eagle. The segment of the White River adjacent to the Refuge is thought to provide habitat for the federally listed pallid sturgeon. The unique lake habitats within the Refuge provide important spawning habitat for amphibians, fish, and waterfowl.

The principal wetland value provided by the Refuge wetlands is the harvest of fish and wildlife. World renowned duck hunting in and around the Refuge is the important driving force of the regional economy.

A second principal value is timber harvest associated with the management activities conducted for wildlife habitat enhancement. Approximately 10,000 acres of the Refuge are inventoried and 3,000 acres thinned each year for this purpose. These operations are conducted each year after water levels recede from the forest blocks to be thinned.

The Refuge wetlands are located in floodplain and provide the principal function of flood storage. The value of this storage has increased because much of the historic floodplain has been lost by the construction of artificial levees along the three rivers that converge south of the Refuge. The loss of available floodplain storage causes areas of the refuge to flood more frequently and for longer durations.

3.2.4 Floodplains

The Refuge is part of the White River Basin that occupies more than 1.7 million acres in Arkansas and Missouri. Channel width along the lower reach of the river adjacent to the Refuge is mostly between 400 to 800 feet wide with an average drop of less than 0.4 feet per mile. Nearly the entire Refuge is located within the 100-year return frequency floodplain of the White River (see Figure 3-12) and much of the Refuge is regularly flooded for some part of each year. The high productivity of the seasonally flooded bottomland hardwood forest underpins the food webs critical to the exceptional wildlife value of the Refuge. In addition to this wildlife function, Refuge wetlands also provide important flood storage functions that serve to mitigate flood effects on adjacent properties. Important Refuge infrastructure has been built on the few parts of the Refuge above the floodplain, including the new Visitors Center, the Refuge maintenance and fueling facility, and the Potlatch Conservation Education Center. This regular periodic flooding presents unique challenges for the construction and maintenance of a transportation network through the Refuge.

Average monthly flows and stage height of the White River fluctuate widely each year in response to the annual hydrologic cycle and larger storm events. The Army Corps of Engineers (ACOE) maintains six river gages along the White River within the Refuge. The annual flooding regime provides unique conditions at boat ramps and campgrounds that are underwater during the winter and spring months.[7]

In addition to antecedent weather conditions in the watershed, flows and stage height within the lower reaches of the White River adjacent to the Refuge are affected by other factors. There are five impoundments on the upper White River and dams on the Little Black River and Little Red River which are tributary to the White River. Controlled releases at some of these dams are used to manipulate discharge rates. The eastern half of the White River floodplain in the South Unit of the Refuge has been protected by a flood control levee. This levee joins the system that runs along the western banks of the Mississippi River in Snow Lake. Since flood waters can no longer spread over the protected lands within the levees, the resulting effect is to raise the flood levels within the remaining available floodplain within the Refuge, lengthen the period of inundation, and increase the energy (velocity) of flows within the main stem of the river. Increased flow velocities sustained for longer periods can accelerate river bed and bank scour.

Water levels within the lower White River can also be affected by downstream floodwaters in the Arkansas and Mississippi Rivers. Elevated levels in these rivers can cause water to "stack up" within the lower White River.

Flood durations are manipulated within parts of the Refuge to enhance wintering waterfowl habitat. In addition, artificial impoundments are also used to create green tree reservoirs as important waterfowl wintering habitat.

Within the Refuge, road construction can affect flooding characteristics. Roads built in fill sections can impound or divert flows and increase flow velocities at culverts or crossing structures openings.

[7] RiverGages.com

4

Candidate Enhancements & Improvements

4.1 Overview

The overriding objective of the White River National Wildlife Refuge (NWR) Transportation Study is to identify short- and long-range transportation enhancements and improvements to the core transportation network both within and surrounding the Refuge. This chapter describes the process that was employed to identify the broad range of options for the Refuge that satisfy this study objective. Candidate enhancements and improvements were considered for the following major geographic areas of the Refuge with an emphasis on mobility, operation, safety, and other aspects considered essential by the U.S. Fish and Wildlife Service (FWS) and consistent with its values and mission:

- General Refuge-wide Enhancements and Improvements.
- Visitor Center Improvements and Enhancements.
- North Unit Improvements and Enhancements.

Public Involvement Meeting, held at the White River NWR Visitor Center on May 23, 2005.

- South Unit Improvements and Enhancements.

In particular, enhancements were considered and studied that serve to support the operation and maintenance of the Refuge, uphold its "Wildlife First" mission, and foster its ability to promote public use.

The first section of this chapter serves as the "Traffic Safety and Needs" report for the study. This section quantifies both Refuge and area transportation growth trends that are expected in the future. Additionally, this section provides a listing of specific transportation safety issues that have been identified during the conduct of the study, either via Refuge field investigations, meetings with the Refuge Manager and staff, or via input from the public and/or stakeholders. The second section of this chapter provides a detailed listing of the candidate enhancements and improvements that have been initially developed. Each element of this candidate list is described, including the benefits and challenges of implementation, cost considerations, and its origin.

4.2 Traffic Needs and Safety Report

The primary purpose of this section is to define trends in growth in the study area for a period 20 years into the future. The future horizon year for the Transportation Study is 2025. In later sections of this chapter, improvements developed are evaluated against these future traffic volumes to help understand and test their viability, as well as to help prioritize their future implementation (as presented later in Chapter 5).

This section also specifically identifies safety deficiencies that were identified during the Study's evaluation of Existing Conditions. These deficiencies were identified based upon the following:

- Refuge field study and observations.
- Interviews with the Refuge Manager and other key staff.
- Comments received at Public Involvement and Stakeholder meetings.

4.2.1 Growth Projection Analysis

The following section provides an analysis of growth trends in the region as well as on the Refuge. The purpose of this exercise is to define future traffic volumes in the area for the year 2025, which will be utilized to help test future Refuge improvement actions.

Regional Growth

The White River NWR straddles four counties in southeastern Arkansas: Arkansas, Monroe, Phillips, and Desha Counties. As mentioned in earlier chapters, the study area for the Transportation Study includes the entire Refuge and major roads that connect to and from the Refuge entrances to nearby communities, regional highways, interstate highways, and adjacent land uses in these four surrounding counties, as defined previously in Figure 1-2.

The Refuge can be accessed from several different highways from the north and the east. Travelers on I-40 to the north can access the western side of the Refuge via Highways 165 and 63, with connections to Highways 130, 153, and 17. From the east, the Refuge can be accessed primarily via Highway 49 and connections to Highways 86, 17, and 44. The Refuge is not readily accessible by automobile from the south and southeast because of natural barriers created by the Arkansas River, Arkansas River Canal, and the Mississippi River and no nearby vehicular crossings of these rivers.

Average Annual Daily Traffic (AADT) volumes on area roadways in 2003 were previously shown in Table 2-3 and Figure 2-4[1]. In the area immediately surrounding the Refuge, most of the roadways are

[1] Data compiled from the Arkansas State Highway and Transportation Department.

very lightly traveled, handling less than 1,400 vehicles per day.

North Unit, near Brown's Shanty.

The following factors appear to be the primary contributors to these low traffic levels:

- The four counties have a gross population of only about 72,000 people (or about 10 people per square mile). Most of the population lives in the communities of Helena and Stuttgart, which are each over 30 miles away from the Refuge.
- The density of persons living around the Refuge is very sparse. Less than one-third of the population lives within 20 miles of the Refuge border (or only about 0.5 people per square mile).
- There is also very little through traffic within the region because of the natural water barriers created by the White, Arkansas, and Mississippi Rivers. The only river crossings in the entire study area are at Highway 79 in Clarendon (4,200 AADT) and Highway 1 in St. Charles (1,300 AADT).

Traffic volumes increase to the range of 1,400 to 3,400 vehicles per day on the roadways approaching the more densely populated communities of DeWitt, Stuttgart, and Clarendon, with somewhat higher volumes experienced on some of the roadways within these communities themselves. As shown in Figure 2-4, U.S. Highway 79 (in the northwest quadrant) connecting Pine Bluff, Arkansas and Memphis, Tennessee carries the most daily traffic in the region at approximately 4,200 vehicles per day.

In general, the roadways in this area are either two or four-lane highways, or less traveled two-lane and single lane paved and gravel roads. Regional socioeconomic and demographic data and trends for the region are provided below.

Population. The population of the four counties has decreased from a high of 118,700 in 1940 to 72,789 persons in 2000, representing an average annual decline of 0.6 percent per year over the 60-year period (or 38.7 percent over the entire period). The population of these four counties is projected to continue to decline into the future, with a projected population of 63,179 by 2010 (an additional 13 percent decline). While there are no specific population projections for 2025, one can only deduce that the trend of declining population will continue and/or level-out into the future beyond 2010.

Of the population that resides in the four counties, it is expected that the majority will not relocate out of the area. Based on the 2000 US Census, 61 percent of the population in the four counties had been living in the same house in 1995. Twenty-seven percent had moved (but stayed within the same county), seven percent had moved from a different county in Arkansas, five percent had moved from a different state, and less than one percent were immigrants. The fact that 88 percent

of the population is staying in the same county over a five-year period suggests that this area does not serve a transient population and that it will remain relatively stable.

Land use. The land in the four counties is predominantly used for agriculture (63 percent) and 30 percent is forest. Of the remaining seven percent, the majority is perennial water/flooded or barren, with only one percent considered urban. Given the type and proportion of land use, and the natural water barriers that restrict traffic access, dramatic changes in traffic volumes and/or travel patterns within the region are not expected.

Employment. The job market has a considerable influence on the stability of a region. Of the 27,091 workers 16 years and over in the four counties, 83 percent worked in their county of residence, 12 percent in a different county within Arkansas, and five percent in a different state. The majority of the working force were employed in education, health, and social services (20 percent), followed by manufacturing (18 percent); wholesale and retail trade (15 percent); and agriculture, forestry, fishing, and hunting (10 percent). Manufacturing includes transportation, aircraft equipment, cosmetics, and furniture, while agriculture production includes primarily rice, wheat, soybeans, cotton, and aquaculture. As with land use, given the types of jobs and their location within the region, changes in the job market are not expected; thus, travel patterns are expected to remain generally constant.

These data suggest that the population within the study area as well as the larger four-county region will continue to decline over the next 20 years. Subsequently, it can be deduced that travel demand along major roadways in the area and surrounding the Refuge will likely experience no growth between now and 2025, and will likely decline over this period. Conservatively, regional traffic volumes are estimated to experience decreases in the range of 8 to 10 percent total on most facilities based on this review of existing population and socioeconomic conditions and assessment of their long-term trends and projections. Regional traffic volumes within the Study area for the year 2025 are illustrated in Figure 4-1.

Refuge Growth

The White River NWR consists of approximately 160,000 acres of actively-managed lands, and it has one of the largest management programs within the National Wildlife Refuge System. The Refuge is divided into a North Unit and a South Unit, separated by Arkansas State Highway 1. Within the Refuge itself, there are over 77 miles of gravel roads, 70 miles of dirt roads, and 358 miles of All Terrain Vehicle (ATV) trails. Nearly all roads and trails on the Refuge are inaccessible during the flooding season. Many Refuge roads and trails are closed to the public between December and June (or for about 7 months).

All recreational activities on the Refuge relate to what are termed wildlife-dependent activities (as defined previously in Chapter 2). These activities are predominately hunting and fishing, but also include wildlife photography, interpretation, and education activities. Throughout the year, scheduled events occur on the Refuge. It is estimated that there were over 150,000 visits to the Refuge in 2003, over 98 percent of which were either hunting and fishing-related, mostly during the various hunting seasons in the fall between September and December.

The Refuge is accessible to the public via 21 public entrances, eight major (3 in North Unit, 5 in South Unit) and 13 lesser entrances (4 in North Unit, 9 in South Unit). Entrances to the South Unit are open to vehicular traffic from March 1 through December 15. All other Refuge entrances are open year-

White River National Wildlife Refuge Transportation Study

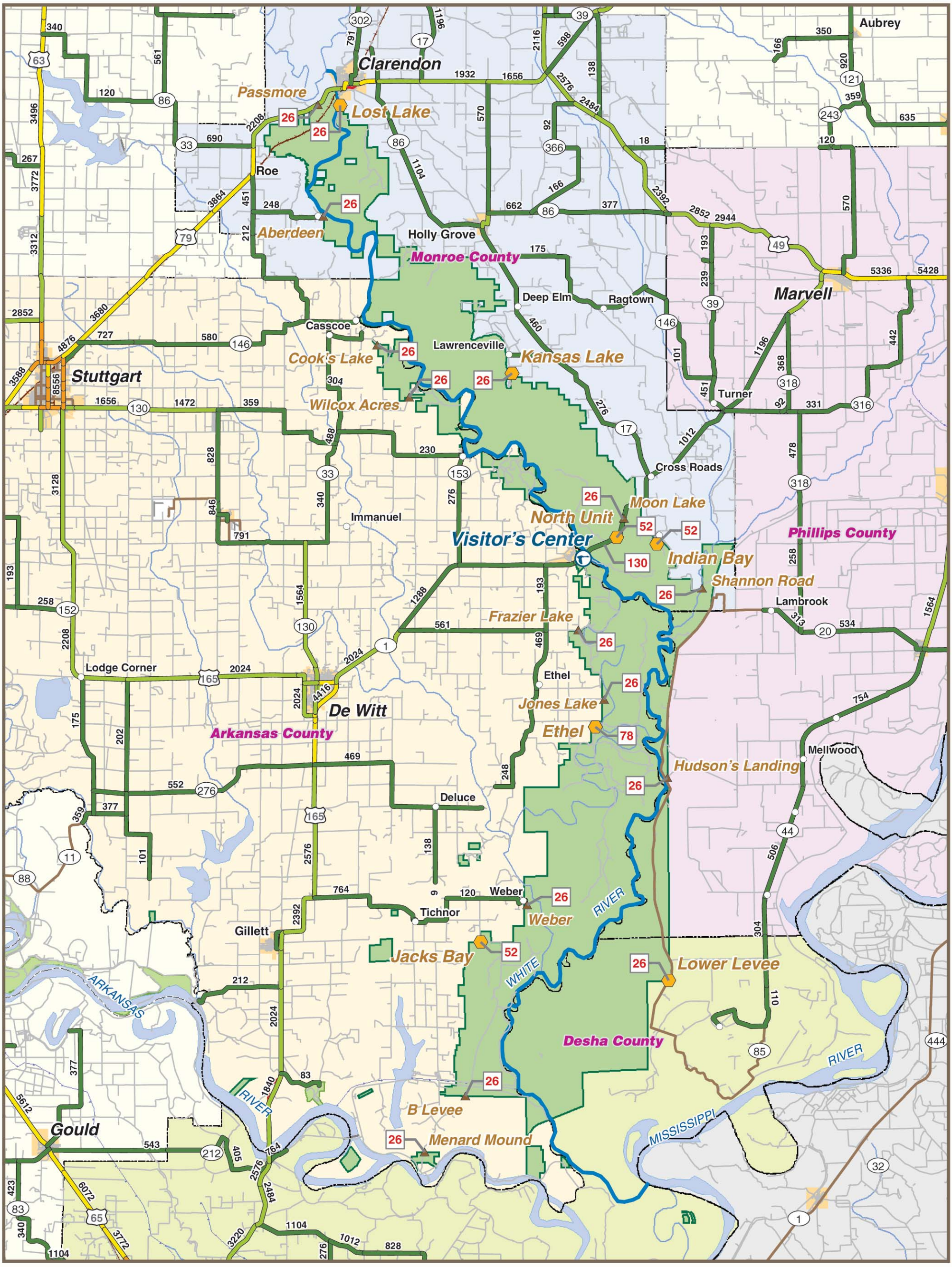


Figure 4-1
Regional Roadway Network and Average Annual Daily Volumes

round, with the exception of the Kansas Lake area in the North Unit, which is closed between December 1 and February 28. During the winter, high water may cause some of the roads and trails to be closed to vehicular travel (as mentioned previously).

In October 2003, the Refuge opened its new Visitor Center and Administrative Offices, located approximately a quarter mile west of the Arkansas State Highway 1 White River Bridge in St. Charles.

As mentioned in the previous section, regional traffic is expected to decline over the next 25 years, primarily attributable to expected declines in regional population. However, it is expected that the Refuge's visitation will likely experience modest growth in the coming years. This growth, even in light of expected regional traffic decline, is based upon the following assumptions:

- The opening of the Visitor Center on State Highway 1, and recent completion of its Education Room, Media Center, and Interpretive Exhibits;

The new Visitor Center is the centerpiece of White River NWR.

- Future opening of an (handicapped accessible) Interpretive Trail;
- Highway 1 designation as a National Scenic Byway;
- Plans to increase wildlife educational opportunities with area schools, both at the Visitor Center and the Arkansas Game and Fish's Cook's Lake Education Center (North Unit);
- Expected regional growth in Ecotourism activities;
- General increase in US Wildlife Refuge use and visitation, nationally; and
- Long-term population growth in the United States.

Based on these general assumptions, it is expected that visitation to the Refuge will increase over time. However, increases are expected to be modest because of the region's declining population, regional accessibility challenges brought on by natural barriers created by the White, Arkansas, and Mississippi Rivers, and the annual prolonged flooding condition on the Refuge during the winter and spring months. Refuge visitation is expected to increase from 150,000 visits today to possibly 175,000 to 200,000 visits by 2025 (or by 16 to 33 percent). Figure 4-1 provides a summary of future average daily traffic at the Refuge's 21 entrances assuming the higher visitation estimate is reached by 2025.

4.2.2 Safety Assessment

This section specifically identifies safety deficiencies that were identified during the Study's evaluation of Existing Conditions. These deficiencies were identified based upon the following:

- Refuge field study and observations;

- Interviews with the Refuge Manager and other key staff; and
- Comments received at Public Involvement and Stakeholder meetings.

The following are key safety deficiencies that were identified at the Refuge:

Visitor Center Entrance: As mentioned earlier, this location has been estimated to handle traffic levels at 1,300 AADT. Traffic is generally light, and dispersed near the Refuge Visitor Center entrance. However, vehicle speeds are high along this corridor (observed to be 40 - 70 miles per hour). The Visitor Center driveway is located just west of the Highway 1 bridge over the White River. The approaches to the bridge are on steep grades. Many large trucks, RVs, and other heavy vehicles tend to increase their speed as they approach these up slopes so that a reasonable rate of speed can be maintained while crossing the River. This phenomenon, in conjunction with vehicles turning into the Visitor Center driveway, can result in a potentially hazardous traffic safety issue. Our understanding is that the Refuge has proactively pursued the future implementation of an exclusive left-turn lane at the entrance driveway to improve access and safety to the Visitor Center.

Access to Clarendon Entrance: Vehicle access to the Refuge's Clarendon Entrance in the North Unit requires traversing an active railroad. On the roadway approaching the Refuge entrance, the railroad sits atop a high embankment as it approaches its bridge over the White River (several hundred yards to the west). This embankment makes it challenging for larger vehicles, particularly those pulling ATVs and/or boat trailers, to traverse the crossing without "bottoming-out" on the tracks atop the embankment. It is also difficult to identify oncoming traffic or pedestrians while traversing the upslope of the embankment.

Railroad grade crossing near the North Unit's Clarendon entrance is an access and safety impediment.

Access to Cooks Lake: The existing roadway to the Cooks Lake Wildlife Education Center is a two-lane gravel road. It is estimated that the Center is accessed by over 5,000 school children over the course of each school calendar year. It is our understanding that many handicapped and special needs students also actively use this facility. The Refuge sponsors its annual handicapped and youth deer hunts at this location. Gravel roads do not provide the same level of maneuverability and comfort as a paved road and can generate a significant amount of dust during dry periods (resulting in visual impairment to motorists). Paving this road in the future is something that should be considered to help improve traffic safety and handicap accessibility along this corridor.

Access to Ethel Entrance: The existing Ethel access is in a state of disrepair. A portion of the roadway was paved by the county several years ago, but today, appears to be in poor condition, with many ruts, patches, and potholes. Ethel is the most frequently used entrance on the Refuge because of its proximity to populated communities and more extensive, and established, gravel road network. Paving this road in the future should be considered

to help improve traffic safety along this corridor, improve driver maneuverability and comfort, and reduce dusty conditions during dry periods.

Trusten Holder Bridge: In the South Unit, this bridge is just south of the Arkansas River Canal that has been identified as being deficient. A recent Bridge Inventory and Safety Report generated by the U.S. Army Corp of Engineers found the bridge to not meet the minimum criteria of the American Association of State Highway and Transportation Officials (AASHTO). The bridge is only one lane wide and site of a severe 90 degree turn and 20 percent down slope. While not heavily traveled, improvement (or replacement of this bridge) will help to improve motorist safety in this part of the Refuge.

Existing Trusten Holder Bridge on Refuge land leased to Arkansas Fish and Game.

4.3 Enhancements and Improvements Development Process

The development of candidate enhancements and improvements was an iterative process conducted in cooperation with the public, local and regional agencies, and the study team. The process of developing these candidate improvement elements extended over several months, from July 2004 until May 2005. Initially, a detailed existing conditions review was conducted at the Refuge (as described previously in Chapters 2 and 3). This evaluation included the study of the geographic location of the Refuge, its public entrances, and visitation summaries; the transportation conditions in the surrounding area; and the Refuge's existing transportation system, its supporting infrastructure, and management and operations. This information was essential to the alternatives development process as it identified existing strengths and deficiencies in the Refuge's core transportation network, as well as other areas in need of aid or improvement. The information gathered during this assessment, together with the following activities, was used to identify the alternatives for this study:

- Refuge field study and observations;
- Interviews with the Refuge Manager and other key staff;
- Comments received at Public Involvement meetings;
- Comments received at Stakeholder meetings; and
- Alternatives Development Working Session

In particular, information gathered at Public Involvement and Stakeholder meetings held over the past year have helped to frame some of the important issues and challenges relative to the consideration and implementation of transportation improvements. Summary of those activities is provided in the following sections.

4.3.1 Public Involvement Meetings

Two public meetings were hosted to allow the public to interact with the Study team and provide input and comments. The first public meeting was held on August 31, 2004 at the Phillips Community

College DeWitt Campus of the University of Arkansas. The second meeting was held on May 23, 2005 at the White River NWR Visitor's Center.

Both meetings were publicized in several local newspapers and reported on local radio station KWAK in Stuttgart, Arkansas at least one week prior to the meetings. In addition, the stakeholders identified in the Public Involvement Plan were each mailed a letter highlighting the purpose and timing of the Transportation Study and were provided with a Study Newsletter. The newsletter and news release also notified the public and stakeholders of a project website that could be viewed to access project information and submit comments to the study team (www.vhb.com/white-river). This project website went on-line on August 19, 2004.

At the meeting, representatives from the Refuge, the U.S. FWS, FHWA, and the consulting team were available to discuss the study with the public and answer questions. During the initial meeting, a presentation was made to highlight the following:

- The History of White River National Wildlife Refuge
- The Mission of the National Wildlife Refuge System
- The Purpose of the Transportation Study

The second meeting was an open house forum on the following items:

- Progress Update on the Transportation Study; and
- Initial Listing of Candidate Improvements and Enhancements

Attendees were encouraged to fill out comment sheets and were given the choice to submit them in a comment box in the rear of the room or mail them to the Refuge at the address identified on the Comment Form. They also had the choice to submit comments electronically via the project website.

Specific comments that emerged during the public meetings included the following:

- The need to limit additional access in the Refuge. People view the Refuge as a wild place and feel that additional vehicle and All Terrain Vehicle (ATV) access will only further "civilize" it. Some of the public expressed that they would not be upset to see ATVs banned from the Refuge altogether;
- Questions were raised regarding any plans to construct access in the area known as Maddox Bay Island.
- There was some discussion regarding the advantages and disadvantages of various low water crossings versus higher, more permanent structures at key water crossings in the Refuge.
- Questions were raised whether roads constructed for forest management purposes would be taken out of service once those activities were completed.
- A comment was made that the river itself provides over ninety miles of access to the Refuge, including many areas that are not readily vehicle-accessible.
- There was concern that a roadway that was used for hunting purposes for 30 years had been closed-off.
- There were several comments regarding the need for additional boat ramps.
- Additional access needs to be created at the North Unit so that it is not so privatized by the many adjacent hunt clubs.

4.3.2 Stakeholder Meetings

Two stakeholder meetings were held for the NWR Transportation Study. The first stakeholder meeting was held on December 15, 2004 at the White River NWR Visitor's Center in St. Charles, Arkansas. While the second meeting was held on May 23, 2005 after the Public Improvement meeting earlier in the day. Attendees included representatives from the NWR, the FHWA, the U.S. FWS, the consultant team, and several interested stakeholders representing the U.S. Army Corps of Engineers, the White River Levee Drainage Board, and the City of St. Charles, Arkansas and the City of Clarendon, Arkansas.

The purpose of these meetings were to review the progress of the Transportation Study with project stakeholders, to obtain input and comments regarding the Existing Conditions Report, review initial thoughts on proposed alternatives, and outline the next steps and schedule for the remainder of the project.

During these discussions, the following were identified as potential areas of improvement to be included in the study:

- The need for work at the existing Trusten Holder Bridge.
- The lack of regional signing/wayfinding outside of the Refuge.
- The poor condition of existing pavement surface on Route 1. In particular construction of a new left turn lane into the Refuge Visitor Center would provide for increased safety along this highway.
- The Refuge's desire to secure National Scenic Byway funds.
- The Refuge's exploration of trail funding programs.
- Clarendon's desire for improved transportation access and amenities similar to those found on the more established South Unit.
- St. Charles' desire to cultivate additional ecotourism opportunities that showcase the Refuge.

Boat Ramp at Aberdeen Entrance in the North Unit.

4.3.3 Team Working Sessions

Several working sessions have also been conducted over the past year by representatives from the Refuge, the FHWA, and FWS. The purpose of these discussions and brainstorming sessions were to better conceptualize transportation issues and ideas that originated from the public and the Stakeholders as well as to clearly understand specific transportation issues and challenges that the Refuge Manager and Refuge Staff perceive as being important enhancement and improvement considerations.

4.3.4 Summary

Refuge staff and the study team identified and prioritized many transportation issues and challenges during the evaluation of existing

conditions. Based on a detailed compilation and review of current and historic conditions at the Refuge, via several briefings, work sessions, lengthy site observations with key Refuge staff, U.S. FWS, and FHWA, and the public involvement process with key stakeholders and the general public, the following five goals are identified:

- Prepare a transportation plan that maintains equitable Refuge access, upholds the "Wildlife First" mission, and supports the wildlife-dependent activities approved by the U.S. FWS and Refuge.
- Address the controversial issue of ATV access and use within the Refuge.
- Increase funding in order to hire more Refuge staff to better operate and manage the Refuge, develop improvement projects that support the "Wildlife First" mission, and foster the Refuge's ability to promote public use.
- Cultivate relationships with neighboring local, state, and federal agencies by implementing transportation improvements such as new and/or upgraded access points and parking areas, creating signage and trailblazing, and developing guided tours.
- Support a proactive forest management plan while being sensitive to the environment.

Having established these goals and using the input generated from the public process, candidate enhancements and improvements were developed to address the Refuge's transportation issues and challenges. Each of these potential action items are described in detail in the following section.

4.4 Description of Candidate Enhancements and Improvements

Following the enhancements and improvements development process, all cultivated ideas were categorized, duplicates were eliminated (as well as those beyond the scope of the study or that did not meet the study objective), and the remaining ideas were developed into a set of creative, yet viable, improvement actions that were responsive to the study's objective.

First, these improvement actions were categorized by area within the Refuge:

- General Refuge-Wide Enhancement Opportunities;
- Visitor Center Enhancement Opportunities;
- North Unit Enhancement Opportunities; and
- South Unit Enhancement Opportunities.

Second, within each area of the Refuge, alternatives were grouped according to which of the five transportation issues or challenges (Section 2.3) that the alternatives attempted to address (for example, one specific alternative that is a General Refuge-Wide Enhancement Opportunity addresses the Equitable Refuge Access issue).

In all, there were 32 specific actions, or candidate enhancements were identified. Following is a brief description of the purpose of each candidate enhancement and any specific actions or features within that enhancement. The candidate enhancements are organized by area within the Refuge and by transportation issue or challenge. In addition, the source of each candidate enhancement is identified to assist in tracking the origin of the alternative.

4.4.1 General Refuge-Wide Enhancement Opportunities

Equitable Refuge Access

1. Shuttle Bus Access – Provide a Refuge-operated shuttle bus into the Refuge for wildlife interpretation for the public and local community groups.

2. Equestrian Access Provisions – Allow equestrian access on the Refuge as an access alternative.

3. Water Access Provisions – Develop an improved water access plan in order to take advantage of the Refuge's existing extensive water access system.

All Terrain Vehicle Access and Use

4. All Terrain Vehicles (ATV) Access Provisions – The Refuge needs to determine whether ATV access is consistent with the mission and goals of the Refuge and whether their use should continue to be allowed. If access is allowed, policies regarding their use and access restrictions need to be better defined as discussed further in Section 5.

Increase Refuge Staff and Funding

5. Access Enforcement – Monitor public use activities, enforce access rules, and provide active access restriction where necessary. Types of access enforcement being considered are:
   - Increased staffing;
   - Gates;
   - Dirt barriers (or other); or
   - Video surveillance.

6. Staff Training – Provide training to staff for operating and maintaining the Refuge infrastructure and to serve as tour/education guides. Types of training considered:
   - Roadway maintenance and materials management;
   - Guide training; and
   - Education liaison.

Foster Relationships with Neighboring Local, State, and Federal Agencies

7. Improve Wayfinding to Refuge – Post information and advance signage for unfamiliar drivers along highways and critical locations providing access to the Refuge:
   - Define primary highway connections to key Refuge destinations;
   - Select critical locations for advance signage; and
   - Identify opportunities to be better recognized as part of the National Scenic Byways Initiative – Great River Road.

8. Access Information – Using various means available, provide up-to-date information regarding Refuge activities and events to the public. Examples of media considered are:
   - Website;
   - Highway Advisory Radio (HAR);
   - Telephone Recordings; and
   - Map Enhancements.

9. Internal Refuge Signage – Provide on-site information to the public to locate trailheads, areas of interest, and post restrictions utilizing various means such as:
   - Kiosks;
   - Interpretative Signs;
   - Trail Markers;
   - Warning Signage;
   - Regulatory Signs; and
   - Road/Trail Mileage Markers.

10. Parking – Provide appropriate parking areas for public users that complement wildlife conditions such as:
    - Designating parking areas in critical locations;
    - Identifying no parking zones.

11. Ecotourism Enhancement – Foster relationships with private entities that support various ecotourism opportunities.

4.4.2 Visitor Center Enhancement Opportunities

Equitable Refuge Access

12. Entrance Improvements – Improve traffic safety along Route 1 by adding a new left turn lane at Visitor Center Driveway.

Increase Refuge Staff and Funding

13. Guided Tour Routes – Provide tours to allow for wildlife observation, education, and interpretation within the Refuge. Routes considered are:
    - White River (boat tour); and
    - Frazier Lake Wildlife Drive (tram/bus tour).

14. Establish Canoe/Kayak Outfitter – Provide public users the opportunity for wildlife observation along the river by establishing a canoe/kayak rental facility (management in-house or contracted).

Foster Relationships with Neighboring Local, State, and Federal Agencies

15. Trail Network – Expand the interpretative trail network for use by children, elderly, and handicapped, and provide additional interpretative signs along the trails.

16. Scenic Byway Enhancements – Post information and advanced signage for pass-by drivers along scenic highways around the Refuge such as:
    - Advance signage;
    - Monument markers; and
    - Roadside park.

17. Recreational Vehicle (RV) Provisions – Provide longer term RV parking and amenities at the Refuge.

4.4.3 North Unit Enhancement Opportunities

Equitable Refuge Access

18. Route 79 Construction – Provide a new primary entrance to the North Unit, which may allow for closure of other access points.

19. Improve Access at Clarendon Entrance – Alter existing entrance at raised railroad abutment and improve safety and access for large vehicles and trailers.

20. Cook's Lake Educational Center Access – Pave county road to the Center to improve access for school buses and handicap vans.

21. Red Cat Lake Access Improvements – Improve public access by:
    - Developing a dirt road from Lost Lake to Red Cat; and
    - Water Crossing at Lost Lake and East Bayou.

22. Holly Grove Access Improvements – Improve public access from the east.

23. New Aberdeen Boat Ramp – Improve water access to White River by upgrading existing boat ramp.

Foster Relationships with Neighboring Local, State, and Federal Agencies

24. Improve RV Campground new Clarendon Entrance – Provide longer term RV parking and amenities at the Refuge border for travelers.

25. Campgrounds – Provide new equitable campgrounds and amenities on the North Unit that are similar to the South Unit.

Forest Management Plan

26. Maddox Bay Access Improvements – Improve water and land access in order to facilitate Refuge management and operations by constructing:
    - A new dirt road from Brown's Shanty to Cut Bluff to support adequate access for forest management practices; and
    - Water crossing at Maddox Bay Runout.

4.4.4 South Unit Enhancement Opportunities

Equitable Refuge Access

27. Rehabilitate County Road to Ethel Entrance – Resurface connecting county road for better access.

28. Trusten Holder Bridge Replacement – Improve access and safety conditions to the existing deficient bridge.

29. Wallace Bottom Development – As possibly Arkansas' first Post site, this development would enhance the site's historical significance by creating interpretive signage.

30. Boat Ramp Improvements – Improve water access to the Refuge at:
    - Hudson's Landing
    - Indian Bayou

Foster Relationships with Neighboring Local, State, and Federal Agencies

31. Frazier Lake Wildlife Drive – Provide signed interpretive trail and/or drive from Visitor Center to Frazier Lake (to tie into Enhancement #13).
32. Jack's Bay Improvements – Provide parking and signage improvements to support prairie replication project.

Refuge would like to expand its interpretive trail network around the Visitor Center.

4.5 Initial Screening Process

Each of the candidate enhancements described in Section 4.4 were carried through an initial screening process. The enhancements were screened using the following criteria, and the results are shown in Table 4-1. Action items that are location-specific are also depicted graphically in Figures 4-2 and 4-3 on aerial mosaic.

- Benefits of Implementation
- Challenges of Implementation
- Capital/Implementation Cost
- Long-term Operating Costs
- Maintenance Issues
- Potential Impact to Wildlife Habitat
- Supports Wildlife-Dependent Activities
- Supports Refuge Management Activities
- Supports Public User Mobility
- Provides for Increased Safety/Security
- Overall Feasibility

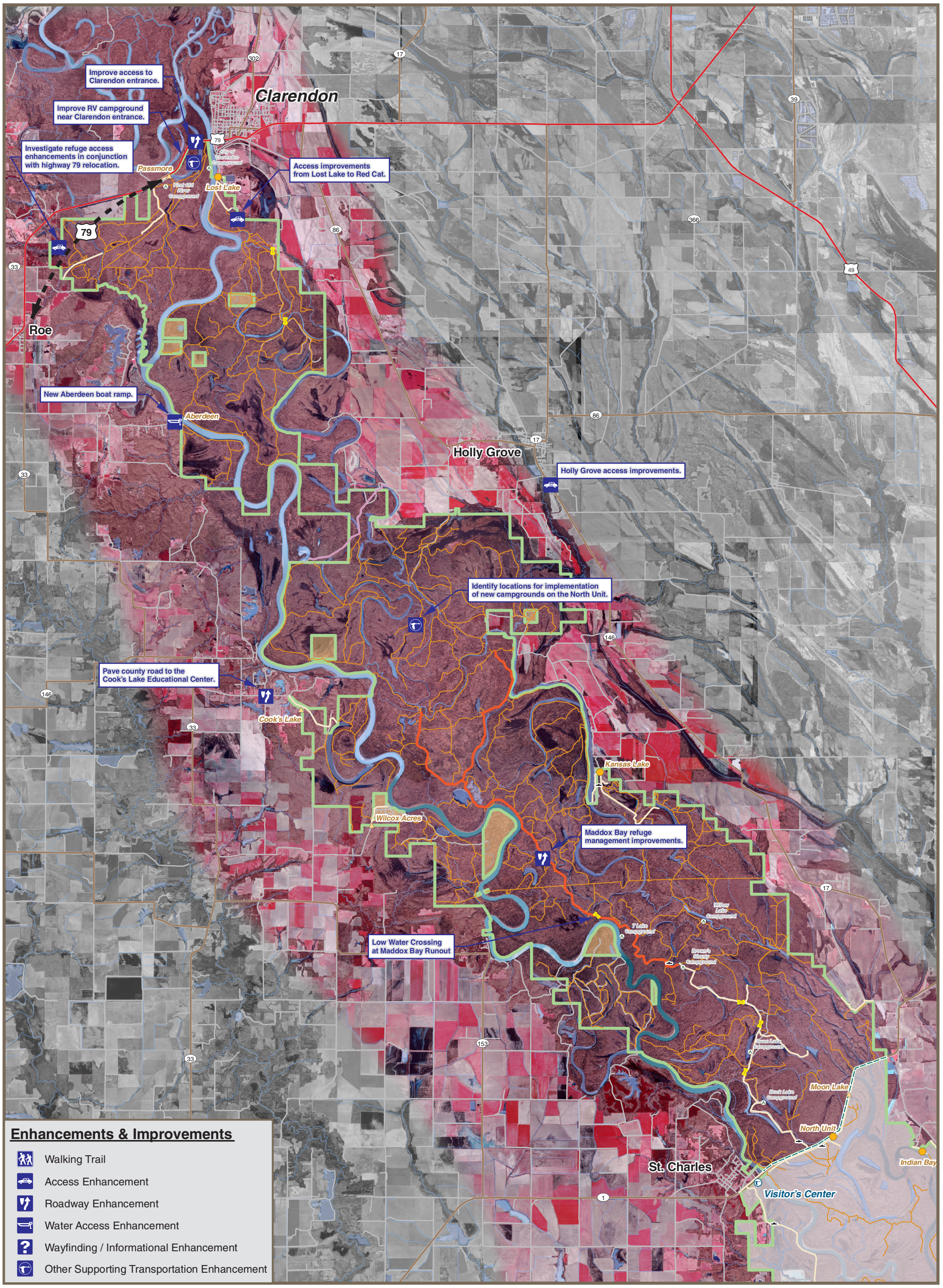
As shown in the table and described in Section 4.4, in some cases, a candidate enhancement included more than one feature or action. For example, for

the Boat Ramp Improvements in the South Unit, there are two locations identified for improvement: 1) Hudson's Landing and 2) Indian Bayou. In all, there were 56 specific actions within the 32 candidate enhancements.

Each of these 56 individual elements were given an initial rating by the 11 criteria as high, medium, or low during the screening process. As these enhancements are further conceptualized, additional measures, both qualitative and quantitative, will be utilized to allow for the prioritization of each element and to eliminate potentially unsuitable options.

This screening process has been developed to frame the pool of options with the next step of prioritizing them into a cohesive implementation and management plan. This process is described in Chapter 5.

White River National Wildlife Refuge
Transportation Study



Source: White River National Wildlife Refuge, Summer 2004

0 1 2 3 Miles

- Major Entrance
- Lesser Entrance
- Visitor's Center
- Campgrounds
- Gate
- Bridge
- ATV / Dirt Roads
- Main Dirt Roads
- Gravel Roads
- Management Roads (not open to public)
- In-Holdings
- Outparcels
- Refuge

Figure 4-2
Refuge Map
North Unit

White River National Wildlife Refuge Transportation Study

White River (boat tour).
Establish canoe/kayak outfitter at White River bridge.
Install new left-turn lane at Visitor Center Driveway on Highway 1.
Visitor's Center
Scenic Byway Enhancements.
St. Charles
Expand interpretive trail network in Striplin Woods.
Frazier Lake Wildlife Drive (tram/bus tour).
Moon Lake
Boat ramp improvements on Indian Bay.
North Unit
Moon Lake Campground
Indian Bay Campground
St. Charles
Visitor's Center
Indian Bay
White River NWR Visitor's Center/Office
Provide signed interpretive trail from Visitor Center to Frazier Lake.
Shannon Road
Little White Lake Campground
Frazier Lake Campground
Frazier Lake
Horseshoe Lake Campground
Jones Lake
Poor road conditions near Ethel. Resurface connecting country road.
Ethel
Smokehouse Hill Campground
Boat ramp improvements at Hudson's Landing.
Burnt Lake Campground
Escatogue Lake Campground
Hudson's Landing
Hudson's Landing Campground
Long Lake Campground
Columbus Lake campground
Floodgate Campground
Prairie Lake Campground
H Lake Campground
Weber
Wolf Lake Campground
Parking and signage improvements to support prairie replication project at Turner Field.
Jacks Bay
Jacks Bay Campground
Lower Levee
Prairie Lake Campground
Six Mile Campground
East Moon Lake Campground
Alligator Lake Campground
B Levee
Replace Trusten Holder bridge.
Mississippi River
Menard Mound
Develop Wallace Bottoms site.
276
165
1
20
44
85

Enhancements & Improvements

- Walking Trail
- Access Enhancement
- Roadway Enhancement
- Water Access Enhancement
- Wayfinding / Informational Enhancement
- Other Supporting Transportation Enhancement

Source: White River National Wildlife Refuge, Summer 2004

0 1 2 3 Miles

- Major Entrance
- Lesser Entrance
- Visitor's Center
- Campgrounds
- Gate
- Bridge
- ATV / Dirt Roads
- Gravel Roads
- Management Roads (not open to public)
- In-Holdings
- Outparcels
- Refuge

Figure 4-3
Refuge Map
South Unit

5

Transportation Improvement and Enhancement Plan

5.1 Overview

As discussed in detail in Chapter 4, the overriding objective of the White River National Wildlife Refuge Transportation Study is to identify and implement short- and long-range transportation enhancements and improvements to the core transportation network both within and surrounding the Refuge. This chapter prioritizes the proposed enhancements discussed in Chapter 4 into three distinct plans:

- Immediate Actions
- Mid-Range Actions, and
- Long-Range Actions.

This plan provides a framework and timeline for implementing these transportation enhancements and improvements within 5, 10, and 20 years, respectively. In addition, a separate section is dedicated to discussing the issue of All Terrain Vehicle (ATV) access management, including the development of a policy describing their use by the public on Refuge property, including prohibitions.

As part of assessing the costs associated with the enhancements, this plan identifies the first year implementation costs and any annualized costs associated with each action (i.e., maintenance costs). It is also important to note that some of the proposed improvements will require increased staffing to support implementation of these respective elements. The improvement plans associated with each of the following sections identify the general underlying cost assumptions such as the number of units needed and/or Full-Time Equivalent (FTEs) of staff to support those actions. In some cases, additional funding may not be necessary since some of the improvements may be made, in kind, through policy changes.

5.2 ATV Access Management Policy

ATVs are one of several possible modes of travel within the White River National Wildlife Refuge. This policy sets forth the criteria for determining which roads and trails will be open to ATV uses.

5.2.1 ATV Use

The US Fish and Wildlife Service defines an ATV as a vehicle with a maximum tire pressure of 15 pounds per square inch and a maximum dry weight of 1,550 pounds. All non-licensed motor vehicles that do not meet these criteria are not permitted on the Refuge. ATV users must have a valid driver's license to operate an ATV on the Refuge's open trail system.

"Yellow Marked" Trail.

The following is a list of general conditions of ATV use:

- ATVs are allowed on the Refuge only to support approved wildlife-dependent activities (hunting, fishing, wildlife observation, and wildlife photography).
- ATVs are not permitted to be used on the Refuge gravel road system.
- ATVs are only allowed on open ATV trails.

5.2.2 ATV & Hiking Trails

Historically, most Refuge property was utilized as private logging lands that were actively harvested during the late 1800's through the 1930's. The Refuge has managed the forest from then through the present. Since the completion of periodic forest management practices, these same roads and trails have been used to support public use of the Refuge, with some roads and trails further improved (i.e., graveled or other) to support public vehicular access. These activities resulted in the creation of most of the current system of gravel roads, dirt roads and trails at the Refuge. The Refuge's primary goal is to continue to provide access for approved wildlife-dependent activities (most notably hunting and fishing). In order to meet its access obligations, the focus is to maintain access to the current network of gravel and dirt roads, and trails.

The Refuge has been zoned into forest management "compartments", with each compartment evaluated on a rolling 15-year cycle. During its periodic evaluation, the Refuge identifies the extent of forest management activities that are required (if any) in a given compartment and will set a plan to rehabilitate existing trails to support those forthcoming activities (as needed).

Most trails that are closed after completion of forest management activities in that area are not opened, nor rehabilitated again until their next 15-year cyclical evaluation. These trails are marked with a red carsonite post, denoting that they are closed to ATV use, but may be used for foot or bicycle travel (a "Red Trail"). Trails that do not directly serve some identified and defined wildlife-dependent activity are closed to all motorized vehicular travel. Generally, ATV and hiking trails are not maintained or rehabilitated by the Refuge on a regular annual or semi-annual schedule due primarily to funding constraints. In order to provide more ATV and hiking trail access, the Refuge is considering implemention of an ATV user fee for the purpose of maintaining those trails by those who utilize them most.

Existing trails are generally rehabilitated the year that actual forest management practices are to take place. Upon completion of those periodic forest management practices, the Refuge determines trails that will remain open and those that will be closed. Trails that provide access to a lake, stream, or bayou are usually permitted to remain open after completion of ongoing forest management activities. These trails are marked with a yellow carsonite post, denoting that they are open to ATV use to support wildlife-dependent activities. (a "Yellow Trail").

"Red Marked" Trail

Trails that are open to ATV use may be subject to closure if it is determined that the natural resources in the area cannot sustain continued motor vehicle use by ATVs. Staff members review the condition of the natural resources for evidence of soil erosion, ATV use outside the defined trail corridor, or other inappropriate use impacts. On a case-by-case basis, the Refuge also periodically reviews the status of other trails that are not necessarily part of an active forest management compartment to understand any known sensitive environmental and/or biological conditions. Most trails that have been closed to ATV use continue to allow access by foot.

5.3 Transportation Improvement and Enhancement Plan

This section prioritizes the proposed enhancements into three distinct plans: Immediate Actions, Mid-Range Actions, and Long-Range Actions. The goal of these action items is to complete them within 5, 10, and 20 years, respectively. Each section summarizes the actions and provides an approximate implementation cost and estimates the annual maintenance costs of each action. All totals are presented in current, 2005 dollar valuation. In the future, adjustments may need to be made to these estimates to account for inflation and other valuation changes. The total implementation cost over the proposed 20-year timeframe is approximately $4.8 million.

Since the rediscovery of the Ivory-billed Woodpecker was announced in April 2005, hundreds of stories have been published about the rediscovery, the evidence, and the ongoing search. Ornithologists and tourists have an increased interest to view the rare bird due to this rediscovery. As more information is available on the whereabouts of this bird within the Refuge, it is expected that it will attract more visitors. It is unclear how this may change the priorities described within this plan.

5.3.1 Immediate Improvement Actions

The Immediate Action plan proposes short-term enhancements and improvements that should be considered within the next 5 years. Many of the improvements in the short-term involve access, parking, and signage. Table 5-1 summarizes the Immediate Improvement Action Plan. The total 1st year implementation costs associated with these enhancements is approximately $3 million. Annual

operating costs have been estimated to total approximately $600,000.

5.3.1.1 Immediate General Refuge-Wide Enhancements

The following general refuge-wide enhancements are considered priorities within the Immediate Action plan:

- Improve Wayfinding to the Refuge
- Provide Access Information
- Construct Parking
- Expand Internal Refuge Signage
- Increase Access Enforcement
- Develop Water Access Provisions
- Develop ATV Access Provisions
- Increase Maintenance of ATV Trails & Roads
- Create Public Use & Provisions
- Enhance Ecotourism

Most enhancements within this section address the need for improved usability and access to the Refuge. They identify and define the primary connections and entrances to the Refuge so that critical locations for signage may be sited. They also address the need for improved access to information about the Refuge. Making information available via website, telephone recordings and maps is of critical importance. Internal Refuge signage and information dissemination in the form of additional kiosks, interpretive signs, trail markers, and warning and regulatory signs are also high on the priority list. This section also enables the Refuge to better define access policies for the use of ATVs, as discussed previously as well as other vehicle and water access. It is estimated that general refuge-wide enhancements would cost approximately $917,000. Annual operating costs are estimated to total approximately $500,000.

5.3.1.2 Immediate Visitor Center Enhancements

The following visitor center enhancements are considered priorities within the short term plan:

- Improve Trail Network
- Improve Entrance
- Enhance the Scenic Byway

These improvements consist of expanding the interpretive trail network and signs within close proximity to the visitor center. These enhancements include installing a new left-turn lane to the visitor center off Highway 1 and constructing advance signage to the entrances. It is estimated that the visitor center enhancements would cost approximately $680,000. Annual operating costs are estimated to total approximately $35,000.

5.3.1.3 Immediate North Unit Enhancements

The following North Unit enhancements are considered priorities within the short term:

- Improve Access to Clarendon Entrance
- Improve Access to Red Cat Lake
- Improve Maddox Bay Refuge Management
- Construct a New Aberdeen Boat Ramp
- Develop a Hazardous Materials & Disaster Response Plan
- Assess Railroad Grade Crossing Safety

Existing access to Maddox Bay Island.

Most of the improvements proposed within the North Unit are associated with the construction or improvement of existing dirt roads or boat ramps. This plan also identifies the need to create a response plan in the case of a hazardous spill or release from the local railroads, barges, pipelines or tankers that pass the Refuge. As part of this plan, an evaluation is proposed of the railroad grade crossings for potential improvements through federal or state funding. It is estimated that North Unit enhancements would cost approximately $1.1 million. Annual operating costs are estimated to total approximately $65,000.

5.3.1.4 Immediate South Unit Enhancements

Enhancing the Frazier Lake Wildlife Drive is the primary South Unit enhancement being considered within the short term. The proposed enhancements are the construction of a new drive from the Visitor Center to Frazier Lake and the placement of interpretive signage along the improved drive. It is estimated that these enhancements would cost approximately $300,000. Annual operating costs are estimated to total approximately $15,000.

5.3.2 Mid-Range Improvement Actions

This plan proposes mid-range enhancements and improvements, which build upon the immediate action items discussed for the first five years. These improvements could occur over the next five to ten years. Again, the focus is on access, parking, and signage. Many of the mid-range enhancements include infrastructure and visitor facility improvements. There are also plans to further improve additional boat ramps. Table 5-2 prioritizes the candidate enhancements within the next 10 years. The total 1st year implementation costs associated with these enhancements is approximately $1.5 million. Annual costs are approximately $410,000.

5.3.2.1 Mid-Range General Refuge-Wide Enhancements

The following general refuge-wide enhancements are considered priorities within the mid-range term:

- Improve Wayfinding to the Refuge
- Build upon existing Access Information
- Construct Parking
- Increase Internal Refuge Signage
- Increase Access Enforcement
- Improve Maintenance of ATV Trails & Roads
- Improve Water Access Provisions
- Increase Public Use & Provisions
- Enhance Ecotourism

Most enhancements in this section continue to build upon the work of the five-year plan. They also concentrate on identifying opportunities to better recognize the Refuge as part of the National Scenic

Cooks Lake Educational Center.

Byways Initiative[1] which may provide additional funding in the future. To build upon disseminating information to the public, the Refuge plans on participating in the Highway Advisory Radio. The plan also recommends securing additional funding for more FTEs in order to better enforce access and conduct maintenance activities at the Refuge. It is estimated that these enhancements would cost approximately $500,000. Annual costs are estimated to total approximately $350,000.

5.3.2.2 Mid-Range Visitor Center Enhancements

The following general refuge-wide enhancements are considered priorities within the mid-term:

- Enhance Scenic Byway
- Support RV Provisions (by others)
- Support Guided Tour Routes (by others)
- Support Canoe/Kayak options (by others)

[1] The National Scenic Byways (NSB) is part of the U.S. Department of Transportation, Federal Highway Administration which recognizes, preserves and enhances selected roads throughout the United States. The U.S. Secretary of Transportation recognizes certain roads based on one or more archeological, cultural, historic, natural, recreational and scenic qualities. This part of the NSB is known as the Great River Road which winds its way along the Mississippi River.

Within the next 10 years, the Refuge plans to construct a roadside pull-off along Highway 1. In order to attract more visitors, the Refuge will explore opportunities to support the implementation of guided boat tours of the White River by other private entities. Tram or bus tours are also being considered along the Frazier Lake Wildlife Drive which would also be implanted by private entities. As an additional opportunity to observe wildlife, the Refuge is considering identifying individuals who would rent canoes and kayaks at the White River Bridge to visitors. It is estimated that these Visitor Center enhancements would cost approximately $50,000. Annual costs are estimated to total approximately $2,000.

5.3.2.3 Mid-Range North Unit Enhancements

The following North Unit enhancements are considered priorities within the mid-range term:

- Reconstruct Highway 79
- Improve Cooks Lake Educational Center Access
- Improve Holly Grove Access
- Construct Additional Campgrounds

With the planned reconstruction of Highway 79 by the Arkansas State Highway and Transportation Department (AHTD), the Refuge has an opportunity to construct a new primary access point from the North. It is expected that a portion of the new access will be funded through mitigation efforts associated with the reconstruction; however the remainder will need to be funded by the Refuge. The Refuge also plans on paving County Road to improve access to Cooks Lake Educational Center. The Refuge is also looking to identify and construct new campground locations on the North Unit. These campgrounds are to complement the existing campgrounds in the South Unit. It is

estimated that these North Unit enhancements would cost approximately $615,000. Annual costs are approximately $34,000

White River NWR Education Center.

5.3.2.4 Mid-Range South Unit Enhancements

The following South Unit enhancements are considered priorities within the mid-range term:

- Jack's Bay Access Road Improvements
- Jack's Bay Improvements (Turner Field)
- Rehabilitate County Road to Ethel entrance
- Improve existing Boat Ramp

The Refuge plans to improve and pave the road into Jack's Bay from Highway 44. Additionally, the Refuge is considering the construction of a parking area, a trail, and associated landscaping at Turner Field. The Refuge also plans to rehabilitate the county road to the Ethel entrance. The road experiences high traffic volumes due to forest management and gravel trucks which have left it in significant disrepair. The final enhancements within the mid-range term are to improve the boat ramps at Hudson's Landing and Indian Bayou. It is estimated that these South Unit enhancements would cost approximately $355,000. Annual costs are estimated to total approximately $23,000.

5.3.3 Long-Term Improvement Actions

The plan proposes long-term enhancements and improvements that anticipate the Refuge's growing needs. It is expected that the need for access enforcement will continue to grow as visibility and use of the Refuge increases. The long-term plan focuses on the management of the anticipated increase in popularity and use of the Refuge. At this time, there are no anticipated enhancements within the North Unit. Table 5-3 prioritizes the candidate enhancements for the long-term. The total cost associated with these enhancements is approximately $335,000. Annual costs are estimated to total approximately $216,000.

5.3.3.1 Long-Term General Refuge-Wide Enhancements

The following general refuge-wide enhancements are considered priorities in the long-term:

- Increase Access Enforcement
- Establish Water Access Provisions
- Support Shuttle Bus Access (by others)
- Public Use & Provisions
- Enhance Ecotourism

With the increased growth and use of the Refuge, additional staffing will be required to continue to maintain the Refuge. Since the Refuge has many sensitive habitats, installing a video surveillance system at these critical areas will improve the Refuge's ability to protect these areas. In anticipation of increased growth, the Refuge is interested in supporting the implementation of a shuttle service to the Refuge from surrounding communities by private entities. This is a proactive

attempt to increase the use of the natural resource but manage the expected increase in vehicular traffic simultaneously.

Ongoing staff training will also become critical. Staff may be trained as tour guides at the Refuge. A staff person may be hired as an education liaison for visitors and surrounding schools.

According to the Refuge's interim policy, only limited equestrian access is permitted (raccoon hunting) within the boundaries of the Refuge at this time. Similar to the ATVs, the Refuge realizes the need to evaluate the demands and environmental impacts associated with equestrian access. Such access will be evaluated as part of the Comprehensive Conservation Plan (CCP) at which time a more permanent policy will be developed.

It is estimated that these General Refuge enhancements would cost approximately $245,000. Annual costs are estimated to total approximately $211,000.

5.3.3.2 Long-Term Visitor Center Enhancements

The following Visitor Center enhancements are considered priorities within the longer-term:

- Enhance the Scenic Byway
- Support Guided Tour Routes (by others)

The Refuge is planning on constructing a second roadside park in the long term. The total cost associated with these enhancements is approximately $40,000. Annual costs are estimated to total approximately $2,000.

5.3.3.3 Long-Term South Unit Enhancements

The Refuge is looking to develop an enhanced historical interpretation station for the first Arkansas Post site (Wallace Bottoms). At this time, it is unclear what types of improvements will be necessary. However, the Refuge anticipates that research will be needed to confirm that this is the first Arkansas Post site and research what types of interpretive amenities would be appropriate. It is estimated that these South Unit enhancements would cost approximately $50,000. Annual costs are estimated to total approximately $3,000.

Alligator Gar caught on White River in August 2004.

White River National Wildlife Refuge Transportation Study

Table 5-1

Transportation Improvement and Enhancement Plan

Immediate Actions

Candidate Enhancement	Description	Enhancement Costs* 1st Year	Enhancement Costs* Annual	Benefits of Implementation	General Underlying Cost Assumptions
Improve Wayfinding to Refuge	Identify primary highway connections to key refuge destinations.	$15,000	$0,000	Provides Information to unfamiliar drivers.	Cost is for the planning component.
	Select critical locations for advance signage.	$90,000	$4,500	Provides Information to unfamiliar drivers.	Signage = 200 units @ $450 (source AHTD bids).
Access Information	Website	$5,000	$5,000	Most effective means to reach widest group of NWR users.	Website using in-house staff & USFWS staff to update. Cost is for minimal additional equipment or software needs.
	Telephone Recordings	$1,000	-	Effective means to reach users planning to travel to the Refuge.	Update messages daily to keep info relevant. Cost is for minimal equipment or software needs.
	Map Enhancements	$30,000	$5,000	Serve as important internal Refuge wayfinding device.	Create a GIS map - possibly an aerial mosaic to assist woodpecker tourists and researchers.
Parking	Designate Parking areas in critical locations.	$33,000	$1,650	Maintains wildlife conditions in ecologically sensitive areas.	Gravel pull-off parking = 15 units @ $2,200 Use in-house staff to define parking, make signage and trim trees.
	Identify no parking zones.	$8,000	$400	Help to quickly identify no parking locations.	Signage = 20 units @ $400 To be used mostly at ATV trail heads to stop parking.
Internal Refuge Signage	Kiosks	$60,000	$3,000	Provides easily accessible on-site information to public users.	Kiosk = 2 units @ $30,000 & Print Media. Use in-house staff to build kiosk. Small parking areas will be required.
	Interpretive signs	$8,000	$400	Provides easily accessible on-site information to public users.	Signage = 20 units @ $400
	Trail Markers	$32,000	$1,600	Help to locate trailheads.	Signage = 80 units @ $400
	Warning signage	$64,000	$3,200	To promote and enhance safety.	Signage = 160 @ $400
	Regulatory Signs	$32,000	$1,600	Provides passive access restriction.	Signage = 80 units @ $400
Access Enforcement	Increased FTE staffing	$100,000	$100,000	Increased opportunity to monitor public use activities, refuge management and enforce access rules.	FTE position = 1 unit. Policy decision.
	Vehicles & support costs for enforcement staff	$35,000	$32,000	1 vehicle per new FTE, with 2.5 year replacement.	1 vehicle = 1 unit @ $35,000 + fuel, maintenance & amortized replacement.
	Gates	$24,000	$2,000	Provides active access restriction.	Gates & Signage = 10 units @ $2,400. New gates at certain ATV trails and upgrade to existing gates in disrepair.
Water Access Provisions	Devise improved water access plan.	$15,000	$0,000	Takes advantage of the Refuge's existing extensive water access system.	Cost is for the plan and map enhancement.
ATV Access Provisions	Clearly define Refuge Road and Access Policy	$0,000	$0,000	Provides for better understanding of trail needs to public.	See access enforcement - Administration of the ATV policy
Maintenance of ATV trails and roads	Increased FTE staffing	$100,000	$100,000	Increased opportunity to monitor public use activities, refuge management and enforce access rules.	FTE position = 1 unit . Policy decision.
	Material/supply costs for additional maintenance	$130,000	$130,000	Refuge will "catch up" with trail and road maintenance throughout the site. Assume a 5 year cycle to cover all 500 miles of ATV trails & 80 miles of gravel roads.	Cost is based on $5,000 X 6 miles of trail and gravel road for 80 miles and 500 ATV trails. The heavy equipment is supported through Maintenance Management System. $5,000/mi for gravel, $500/mi for dirt.
	Evaluate implementing an ATV User Fee	$25,000	$0	Provides the Refuge with a mechanism to recoup maintenance costs directly from those who benefit from this resource.	Seed money to help better understand user fee implementation issues.
Public Use & Provisions	Roadway Maintenance & Materials Management	$0	$7,500	Training regarding use of most optimal materials in managing gravel and dirt roads, trails, bridges, etc.	Maintenance staff training (workshops or conferences)
	Public use services & staff training	$50,000	$50,000	Increase visitation to visitor's center by school groups.	FTE position = 1/2 unit for added duties
	Education Liaison	$50,000	$50,000	Increase visitation to visitor's center by school groups.	FTE position = 1/2 unit for added duties
Ecotourism Enhancement	Foster relationships with private entities that support various ecotourism opportunities.	$10,000	$0,000	Increased partnership opportunity.	Cost for preparing a Request For Information from consultants or an internal workshop to gauge private interest.
Trail Network	Expand interpretive trail network	$400,000	$20,000	Provides additional public user amenity - particularly for children, the elderly, and the handicapped.	2 miles of new trail 8' wide and signage (1/4 mile on pilings/boardwalk).
	Interpretive signs	$16,000	$800	Provides easily accessible on-site information to public users.	Signage for new and existing trails = 40 units @ $400
Entrance Improvements	Install new left-turn lane at visitor Center Driveway on Highway 1.	$250,000	$13,000	Improves traffic safety along Highway 1.	Based on an earlier study conducted by FHWA estimate.
Scenic Byway Enhancements	Advance Signage	$15,000	$1,000	Provides information for pass-by drivers.	Joint effort with Scenic Byways. Assume shared costs.
Improve access to Clarendon Entrance	Difficult crossing at existing raised railroad abutment for large vehicles and trailers.	$30,000	$2,000	Safety and access improvements.	Calculate new costs for grading and improving line of sight. FHWA rail crossing safety funds may pay for some improvements.

White River National Wildlife Refuge Transportation Study

Table 5-1

Transportation Improvement and Enhancement Plan

Immediate Actions

Candidate Enhancement	Description	Enhancement Costs* 1st Year	Enhancement Costs* Annual	Benefits of Implementation	General Underlying Cost Assumptions
Improve Access to Red Cat Lake	Develop dirt road from Lost Lake to Red Cat.	$10,000	$500	Improve Refuge management and operations. Support Long-term wildlife diversity.	Most road improvements will be put in place by 3rd parties as part of ongoing forest management practices.
	Water crossing at Lost Lake and East Bayou.	$500,000	$25,000	Allows for more environmentally friendly solution versus gravel crossing.	Cost assumes a permanent high water, 120 in length, crossing.
Maddox Bay Refuge Management improvements	Develop dirt road from Brown's Shanty to Cut Bluff Slough to support adequate access for forest management practices.	$30,000	$1,500	Improve Refuge management and operations. Support Long-term wildlife diversity.	16 miles of dirt road with 1 bridge and signage.
	Water crossing at Maddox Bay Runout.	$500,000	$25,000	Allows for more environmentally friendly solution versus gravel crossing.	Cost assumes a permanent high water, 120 feet in length, crossing.
New Aberdeen Boat Ramp	Improve existing boat ramp.	$60,000	$3,000	Improve access to White River.	Improve existing high water boat ramp and parking area by increasing its length by 60 feet.
Frazier Lake Wildlife Drive	Provide improved signed interpretive drive from Visitor Center to Frazier Lake.	$298,000	$15,000	Provides enhancement for wildlife interpretation opportunities with visitors, schools, etc.	Roadway, Signage - Existing road, 1/4 mile on county owned road, then into refuge about 4 miles, paving - road is underwater part of year.
Hazardous Materials and Disaster Response Plan	Create plan to respond to potential of hazardous materials or munitions spill from local railroads, barges, pipelines, or tanker trucks passing through or near to the refuge.	$15,000	$10,000	Plan for disaster responses. Coordinate with local fire and rescue departments.	Cost is for a response plan and annual training and coordination with State and Federal agencies.
Railroad grade crossing safety assessment	Evaluate RR grade crossings for potential improvements through federal/state funding	$15,000	$0	Safety evaluation of RR grade crossings. Coordinate with RR, and local fire and rescue departments.	Cost is for an assessment of existing grade crossing problems such as the crossing at Clarendon)
* cost is in 2005 dollars	Total Cost	$3,026,000	$605,000		

White River National Wildlife Refuge Transportation Study
Table 5-2
Transportation Improvement and Enhancement Plan
Mid-Range Actions

Candidate Enhancement	Description	Enhancement Costs		Benefits of Implementation	General Underlying Cost Assumptions
		1st Year Imp. Cost	Annual Costs		
Improve Wayfinding to Refuge	Identify opportunities to be better recognized as part of the National Scenic Byways Initiative - Great River Road.	$15,000	$0,000	Could serve as potential wayfinding improvement funding source.	Cost is for planning & coordination.
Access Information	Highway Advisory Radio.	$40,000	$2,000	Cost of the equipment, cost to maintain it, program it	Radio System and signage = 4 units @ $10,000
Parking	Designate Parking areas in critical locations.	$33,000	$2,000	Provide visitors with parking that compliments wildlife conditions.	Trim trees, provide gravel parking & signage = 15 units @ $2200. Use in-house staff as needed.
	Identify no parking zones.	$8,000	$1,000	Maintains wildlife conditions in ecologically sensitive areas.	Signage = 20 @ $400 - same as above - this is mostly at ATV Trail heads to stop parking
Internal Refuge Signage	Road/Trail Mileage Markers	$50,000	$3,000	To be used as a way-finding tool. The markers would correspond to new maps of the area.	Markers = 1000 units @ $50
Access Enforcement	Increased staffing	$100,000	$100,000	Increased opportunity to monitor public use activities, refuge management and enforce access rules.	FTE position = 1 unit . Policy decision.
	Vehicles & support costs for enforcement staff	$35,000	$32,000	1 vehicle per new FTE, with 2.5 year replacement cycle	1 vehicle = 1 unit @ $35,000 + fuel, maintenance, & amortized replacement.
	Dirt Barriers (or other)	$8,000	$2,000	Provides active and physical access restriction	Barriers, signage = 10 units @ $750 - Put barriers and signage at non-ATV trails to keep ATVs out. Done by in-house staff using existing dozer
Maintenance of ATV trails and roads	Increased staffing (FTE)	$100,000	$100,000	Increased opportunity to monitor public use activities, refuge management and enforce access rules.	FTE position = 1 unit. Policy decision
Water Access Provisions	Next step is to implement improved water access plan	$5,000	$0,000	Takes advantage of the Refuge's existing extensive water access system.	Begin to coordinate with private vendors, identify needed physical infrastructure improvements.
Public Use & Provisions	Roadway Maintenance & Materials Management	$0	$10,000	Training regarding use of most optimal materials in managing gravel and dirt roads, trails, bridges, etc.	Maintenance staff training (workshops or conferences)
	Public use services	$50,000	$50,000	Increase visitation to visitor's center by school groups.	FTE position = 1/2 unit for added duties
	Education Liaison	$50,000	$50,000	Increase visitation to visitor's center by school groups.	FTE position = 1/2 unit for added duties
Scenic Byway Enhancements	Roadside pull-off (one)	$30,000	$2,000	1st park along Rt. 1 to provide information for pass-through drivers.	Signage, 2 or 3 parking spaces and landscaping, small pull over with gravel parking.
RV Provisions	Provide information regarding longer-term RV parking and amenities near refuge.	$5,000	$0,000	Provide enhanced amenities for travelers.	WRNWR will provide information of all campgrounds at the visitor center.
Ecotourism Enhancement	Develop plan with private entities relevant state agenceis that support various ecotourism opportunities.	$10,000	$0,000	Cost of implementation placed primarily on contractors or private vendors	Begin to coordinate with private vendors, identify needed physical infrastructure improvements.
Guided Tour Routes	White River (boat tour)	$5,000	$0,000	Additional opportunity to allow for wildlife observation/education/interpretation along the river.	Coordinate with vendors to offer tours to see the Ivory Billed Woodpecker once it is established. Cost is to list RFI advertisement.
	Frazier Lake Wildlife Drive (tram/bus tour).	$5,000	$0,000	Additional opportunity to allow for wildlife observation/education/interpretation (by others).	Seed money to promote future implentation by others.
Establish Canoe/Kayak Outfitter	Support the opportunity to rent canoe/kayak at White River Bridge by others	$5,000	$0,000	Additional opportunity to allow for wildlife observation along the river (by others).	Seed money to promote future implentation by others.
Highway 79 Reconstruction	Opportunity for new access from north.	$500,000	$25,000	Allows for a primary entrance to the North Unit which enhances and makes improvements to the new entrance.	Roadway, signage, kiosk, parking, and landscaping - all improvements that AHTD will not make
Cooks Lake Educational Center Access.	Pave county road to the center.	$50,000	$5,000	Better accommodations for school buses and accessible vans.	1 mile paving existing road @ $50,000
Holly Grove access improvements	Existing access is a combination of public and private roads.	$40,000	$2,000	Improve public access to the refuge's North unit from the East.	Roadway, signage, kiosk provision. Does not include land acquisition costs.
Campgrounds	Identify locations for implementation of new campgrounds on the North Unit.	$25,000	$2,000	Implement equitable amenities on the North Unit that exist at the South Unit. Increases communication with campers in case of an emergency.	Mow certain opening and mark trees to designate primitive camping areas in order to centralize campers, instead of having them spread out over a larger area.
Jack's Bay Access Road Improvements	Improve and pave road into Jack's Bay from Hwy 44	$100,000	$5,000	Improve Refuge amenities and access.	New 2 miles of access road and signage to the site. Cost is only for access road

White River National Wildlife Refuge Transportation Study
Table 5-2

Transportation Improvement and Enhancement Plan

Mid-Range Actions

Candidate Enhancement	Description	Enhancement Costs		Benefits of Implementation	General Underlying Cost Assumptions
		1st Year Imp. Cost	Annual Costs		
Jack's Bay Improvements (Turner field)	Parking lot, landscaping, and trail.	$100,000	$5,000	Improve Refuge amenities and access.	Parking, signage and paved trail for ADA compliance. Cost is for initial site improvements to .5 mile of trail
Rehabilitate county road to Ethel entrance	Resurface connecting county road.	$50,000	$3,000	Poor road conditions near Ethel. Require improved Refuge access.	Roadway, signage - Was gravel road, county paved it and now in disrepair.
Boat ramp Improvements	Hudson's Landing	$35,000	$6,000	Improve water access to White River.	Boat ramp - Improving existing ramp and provide some parking. Site has some siltation build-up problems.
	Indian Bayou	$70,000	$4,000	Improve water access to Indian Bayou.	Boat ramp - New construction - new ramp
	Total Cost	$1,524,000	$411,000		

White River National Wildlife Refuge Transportation Study

Table 5-3

Transportation Improvement and Enhancement Plan

Long-Range Actions

Candidate Enhancement	Description	Enhancement Costs		Benefits of Implementation	General Underlying Cost Assumptions
		1st Year Imp. Cost	Annual Costs		
Access Enforcement	Increased staffing	$ 100,000.00	$100,000	Increased opportunity to monitor public use activities, refuge management and enforce access rules.	FTE position = 1 unit . Policy decision.
	Video surveillance	$20,000	$1,000	Provides real time surveillance of critical areas. To be used when a specific problems arise such as poaching or other illegal activities.	Video equipment = 2 units @ $5,000.
Water Access Provisions	Devise Improved water access plan	$15,000	$0,000	Takes advantage of the refuges existing extensive water access system.	Use existing boat ramps, then use motorized boats or kayaks.
Shuttle Bus Access	Shuttle bus to nearby communities	$5,000	$0,000	Opportunity for wildlife interpretation with local residents, community groups, and students (by others).	Seed money to promote implentation by others
Public Use and Provisions	Roadway Maintenance & Materials Management	$0	$10,000	Training regarding use of most optimal materials in managing gravel and dirt roads, trails, and bridges.	Maintenance staff training (workshops or conferences)
	Public use services	$50,000	$50,000	Increase visitation to visitor's center by school groups.	FTE position = 1/2 unit for added duties
	Education Liaison	$50,000	$50,000	Increase visitation to visitor's center by school groups.	FTE position = 1/2 unit for added duties
Scenic Byway Enhancements	Roadside pull-off	$30,000	$2,000	Second park along Highway 79 to provide information for pass-though drivers (first pull-off was in the mid-range improvement plan)	Signage, 2 or 3 parking spaces and landscaping, small pull-over with gravel parking.
Ecotourism Enhancement	Foster relationships with private entities that support various ecotourism opportunities.	$5,000	$0,000	Cost of implementation placed primarily on contractors or private vendors	Cost of implementation placed on private vendors.
Guided Tour Routes	White River (boat tour)	$5,000	$0,000	Additional opportunity to allow for wildlife observation/education/interpretation along the river (by others).	Seed money to promote implentation by others
	Frazier Lake Wildlife Drive (tram/bus tour).	$5,000	$0,000	Additional opportunity to allow for wildlife observation/education/interpretation (by others).	Seed money to promote implentation by others
Develop Wallace Bottoms Site	Possible first Arkansas Post site.	$50,000	$3,000	Provides enhanced historical interpretation opportunity.	Roadway, signage, landscaping - future partnership with NPS for Quapaw tribe, Arkansas County, and Arkansas Archaeological Department.
	Total Cost	$335,000	$216,000		