

Sport Hunting
Decision Document Package
for
KEY CAVE NWR

Contents

1. Hunting Plan
2. EA

Sport Hunting
Decision Document Package
for
KEY CAVE NWR

Contents

1. Sport Hunting Plan

SPORT HUNTING PLAN

UNITED STATES FISH AND WILDLIFE SERVICE

KEY CAVE NATIONAL WILDLIFE REFUGE

FEBRUARY 2007

Recommended by _____ Date: _____
Refuge Manager

Reviewed by _____ Date: _____
Refuge Supervisor

Concurrence by _____ Date: _____
Regional Chief, NWRS

Approved: _____ Date: _____
Regional Director

Figure 1. Key Cave National Wildlife Refuge

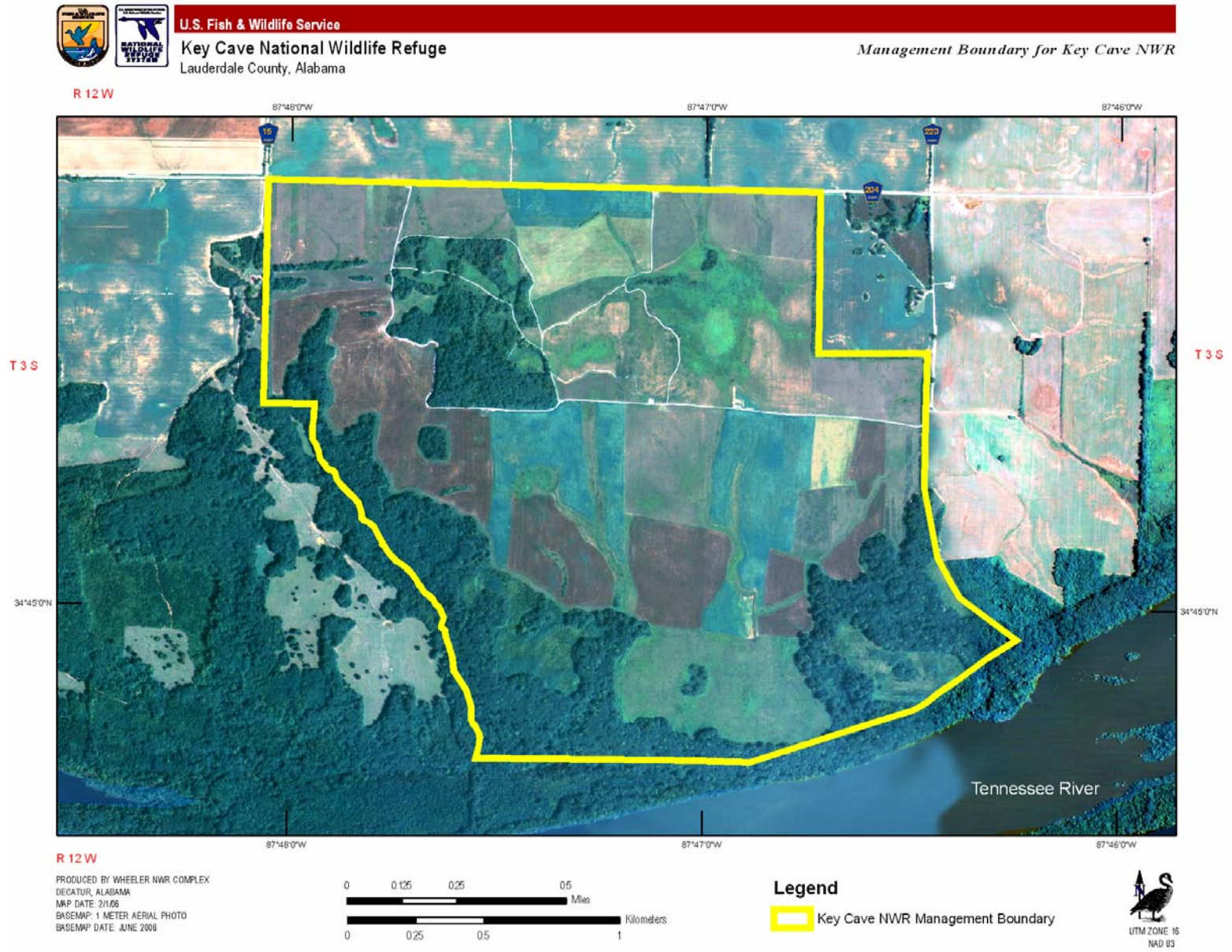


TABLE OF CONTENTS

| | PAGE |
|---|------|
| I. INTRODUCTION | 4 |
| II. CONFORMANCE WITH STATUTORY AUTHORITIES | 5 |
| III. STATEMENT OF OBJECTIVES | 5 |
| IV. ASSESSMENT | 6 |
| V. DESCRIPTION OF HUNTING PROGRAM | 8 |
| VI. MEASURES TAKEN TO AVOID CONFLICTS WITH OTHER MANAGEMENT OBJECTIVES | 9 |
| VII. CONDUCT OF THE HUNTING PROGRAM | 10 |
| APPENDIX – LITERATURE REFERENCES | 12 |

I. INTRODUCTION

Key Cave National Wildlife Refuge was established on January 3, 1997 in Lauderdale County, Alabama. The refuge consists of 1,060 acres along the northern shore of the Pickwick Reservoir of the Tennessee River and resides within the Limestone Valley physiographic subdivision. It is also underlain by Tusculumbia Limestone, whose weathering has produced many karst features, including numerous springs, sinkholes, and several underground cave systems. There are very few exposures of bedrock except for locations along the bluff line at the margin of the Tennessee River (Aley, 1990). Topology is comprised of flat to gently rolling upland terraces with slopes ranging from one to 15%. Elevation of the land surface generally ranges from about 500 to 580 feet above MSL (Kidd et al., 2001).

Prior to 1992, the Monsanto Company owned a large 1,060-acre tract of land just north of Key Cave and about five miles southwest of Florence, Lauderdale County, Alabama, in the high hazard risk area of the Key Cave Aquifer. In 1992 they sold this tract to The Conservation Fund, which held the land until the Service acquired the land five years later to establish Key Cave NWR.

Key Cave is the only known location for the federally endangered Alabama cavefish (*Speoplatyrhinus poulsoni*) and lies in a limestone karst area that contains numerous sinkholes and several underground cave systems. The area's sinkholes are an integral component of groundwater recharge to the caves. In addition to the Alabama cavefish, Key Cave also serves as a priority one maternity cave for the federally endangered gray bat (*Myotis grisescens*), as well as habitat for two species of blind crayfish (*Procambarus pecki* and *Cambarus jonesi*). Collier Cave, located approximately 1.5 miles upstream from Key Cave, and Collier Bone Cave are also considered potential habitat for these cave species. Cave entrances are located on TVA lands on the northern shore of Pickwick Lake. Furthermore, the refuge provides habitat for a variety of migratory and resident wildlife species. Several priority bird species commonly occurring on the refuge include: dickcissel, grasshopper sparrow, field sparrow, northern bobwhite, northern harrier, and short-eared owl.

Key Cave NWR consists of rolling hills, upland forests, and cropland. Currently, approximately 295 acres are in row crop production (corn, soybeans, or wheat) under a Cooperative Farm Agreement, 327 acres are in early successional fields or native warm season grasses (big bluestem, little bluestem, indiagrass, sideoats gramma, switchgrass, and eastern gamagrass), 122 acres of former cropland have been planted to hardwoods, 30 acres of erosion drainages are being restored to grassland or hedgerow habitat, 16 acres are managed as shallow water areas, 75 acres are being converted to an oak savanna, and the remaining 195 acres consist of upland forested land dominated by oaks and hickories. Key Cave NWR is located within the Interior Low Plateau physiographic region and is part of the Lower Tennessee-Cumberland Ecosystem.

II. CONFORMANCE WITH STATUTORY AUTHORITY

Key Cave NWR was established under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-742j, not including 742d-1), and the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544), to ensure that the biological integrity of Key Cave, Collier Cave, Collier Bone Cave, and their common aquifer remains intact.

This plan supports the priority public use provisions of the National Wildlife Refuge System Improvement Act of 1997. Hunting as specified in this plan is a wildlife-dependent recreational use and the law states that as such, it “shall receive priority consideration in national wildlife refuge planning and management.” The Secretary of Interior may permit hunting on a refuge if he/she determines that such use is compatible with the refuge purpose for which it was established. The hunting program would not materially interfere with or detract from the fulfillment of the purposes of the Refuge or mission of the National Wildlife Refuge System (603 FW).

Public hunting on Key Cave NWR is an appropriate and compatible form of wildlife oriented public recreation which is compatible with the purpose for which the refuge was established. Hunting, being a viable management tool when used wisely, often inhibits the overpopulation of species within a given habitat community and can provide for greater wildlife diversity. In this way the environment is preserved for the benefit of a variety of wildlife. The hunting program is designed to minimize potential conflicts with Refuge purposes. Hunting of small game (squirrel, rabbit, quail, raccoon, opossum) and migratory birds (doves) are permitted across the entire refuge.

Annual hunt administration costs including salary, equipment, boundary sign maintenance, fuel, etc. total \$20,000. Less than one full time employee equivalent is expended in conducting hunt-related activities. Funds are available to meet the conditions set forth in the Refuge Recreation Act. It is anticipated that funding would continue to be sufficient to continue the hunting program in the future. In summary, funds are available to continue the existing hunt program and proposed hunting activities should not interfere with the primary purposes for which the refuge was established.

III. STATEMENT OF OBJECTIVES

Although the conservation of Key Cave’s endangered species are the principal goal, the Service’s responsibility has expanded to include other objectives. The following general objectives are recognized:

- 1) Protect habitat for threatened and endangered species.
- 2) Promote habitat for a natural diversity of wildlife.
- 3) Enhance habitat for nongame migratory birds.

- 4) Provide opportunities for compatible outdoor recreation and environmental education and interpretation.

The objectives of the refuge hunt program are as follows:

- 1) To provide opportunities for high quality hunting experiences.
- 2) To allow compatible public use of a valuable renewable resource.

Conducting a well-managed hunt on Key Cave National Wildlife Refuge would assist the refuge in meeting one of its primary objectives, which provides the general public with quality wildlife-oriented recreational programs that are compatible with the purposes for which it was established.

Refer to Decision Document Package, Environmental Assessment for additional information.

IV. ASSESSMENT

1. Compatibility with Refuge Objectives

Hunting is one of the six wildlife-oriented recreational uses prioritized by the Refuge Improvement Act of 1997. The Secretary of Interior may permit hunting on a refuge if he/she determines that such use is compatible with the refuge purpose for which it was established. The hunting program would not materially interfere with or detract from the fulfillment of the purposes of the Refuge or mission of the National Wildlife Refuge System (603 FW). Hunting meets refuge objective number 4 by providing a compatible outdoor recreation activity.

2. Biological Soundness

Deer

White-tailed deer occur on the refuge, most likely at a low density because of the limited amount of forested habitat. Deer densities will likely increase as sections of the refuge are reforested and native grasses established. At the present time, no deer hunting is planned, however if deer densities increase, a deer hunt may be considered in the future.

Feral Hogs

Feral hogs are an extremely invasive non-native species that have recently been sighted on the refuge. They can harbor several infectious diseases, some of which can be fatal to wildlife. By rooting and wallowing, feral hogs destroy wildlife habitat. Damage includes erosion along waterways and wetlands and the loss of native plants. Additionally, feral hogs compete directly for food with deer, squirrels, and many other

birds and mammals. They are predators of small mammals and deer fawns as well as ground-nesting birds. At the present time, no feral hog hunting is planned, however if feral hog densities increase, a feral hog hunt may be considered in the future.

Migratory Birds

Key Cave NWR is closed to waterfowl hunting. Waterfowl have been found on the refuge when the currently dry 38-acre sinkhole held water during 1997-2000. If the sinkhole was to hold water again, some minor disturbances to waterfowl from small game hunters could occur as they make visual and audible contact with ducks using the sinkhole on the refuge. Due to the relatively low density of hunters using the refuge, this level of disturbance would be acceptable.

The current migratory bird hunts are limited to hunting doves. Doves are locally abundant and dove hunting is popular in this area. Dove hunting occurs throughout the refuge, but is primarily conducted on the 295 acres of refuge cropland. The Alabama Department of Conservation and Natural Resources – Division of Wildlife and Freshwater Fisheries (AWFF) records dove harvest rates on the adjacent 5,745-acre Seven Mile Island Wildlife Management Area (SMIWMA). During the last four years 2002-2005 an average of 913 doves per year was harvested during this period. Using harvest rates of 2 doves per man-day (AWFF- SMIWMA data) and the statewide average of 5.5 doves per man-day during this time (AWFF 2006), an estimated range of man-days per year, and with 35 total dove hunting days on the refuge, the estimate for annual dove harvest on Key Cave NWR is presented below.

10 man-days on opening day x 2 doves harvested/man-day = 20 doves harvested

15 man-days on opening day x 5.5 doves harvested/man-day = 82.5 doves harvested

1 man-day for the remaining 34 hunting days x 2 doves harvested/man-day = 68 doves harvested

1 man-day for the remaining 34 hunting days x 5.5 doves harvested/man-day = 187 doves harvested

Key Cave NWR estimated dove harvest range per hunting season is 88 – 270 doves.

Small Game (Quail, Rabbit, Squirrel, Raccoon, and Opossum)

Quail, rabbit, squirrel, raccoon, and opossum hunting occur throughout the refuge. Summer call count surveys for quail have been part of refuge management since 1998. In 2001 fall bobwhite quail covey counts were initiated and during 2004 breeding bird point count surveys were also initiated. All three of these different surveys indicate abundant bobwhite quail populations on Key Cave NWR.

Opossum and raccoon are hunted primarily at night. Raccoon are more sought after than

opossum by the public. Without hunting, raccoon and opossum populations may become elevated, thereby increasing depredation on quail and songbird nests at high rates. Research from Georgia (Staller et al., 2006) indicates raccoon and opossum are significant predators of quail nests, accounting for 26% of quail nest predation in this study. Hunting helps regulate opossum and raccoon populations; however, unless the popularity of this type of hunting increases, raccoons and opossums numbers will always be higher than desired. When these species populations become elevated, diseases such as distemper and rabies may reduce the populations. However, waiting for disease outbreak to regulate their numbers can be a human health hazard.

Although no studies have been conducted on small game within the refuge, studies have been conducted within and outside of Alabama to determine the effects of hunting on the population dynamics of small game. Results have consistently shown that small game, such as rabbits and squirrels, are not affected by hunting, but rather are limited by food resources. Gray squirrels, fox squirrels, and eastern cottontails are prolific breeders and their populations have never been threatened by hunting in Alabama even prior to the passing of modern hunting regulations.

3. Economic Feasibility

Annual hunt administration costs including salary, equipment, boundary and sign maintenance, fuel, etc. total \$20,000. Less than 1.0 full time staff equivalent is expended in conducting hunt-related activities. Funds are available to meet the conditions set forth in the Refuge Recreation Act. It is anticipated that funding would continue to be sufficient to continue the hunting program in the future.

4. Relationship with other Refuge Programs

None of the proposed hunts offer major conflicts with other hunts or with non-consumptive users. Portions of the small game and dove hunting seasons overlap but generally hunters are moving throughout the refuge thus minimizing contact with one another during the hunts. The refuge is only open to hunting during four days of the week (Monday, Tuesday, Friday, and Saturday) thus minimizing potential conflicts between non-consumptive users and hunters during the hunting season.

5. Recreational Opportunity

The upland nature of Key Cave NWR allows most of the area to be utilized for recreational activities. Recently established walking trails allow access to an elevated observation tower. The observation tower is also accessible by vehicles with a handicapped decal or placard. ATV's are not allowed on the refuge.

V. DESCRIPTION OF HUNTING PROGRAM

As a basis on which to establish a compatible hunting program, the entire refuge (Figure

1) is opened to hunting. Hunted species include small game (squirrel, rabbit, raccoon, opossum, and quail) and migratory birds (dove). Seasons and bag limits are the same as those set by the state of Alabama.

Annual consultation with the AWWF will continue. Spring meetings are held prior to the State's finalizing their regulations to ensure that any changes are properly coordinated. Conventional gun hunting will be used for all listed species. The use of non-toxic shot is not required. Permits will be required for all refuge hunts. Refuge permits will be included as part of the AWWF hunt permit for the adjacent Seven Mile Island Wildlife Management Area.

Enforcement of hunt regulations would primarily be carried out by full-time refuge law enforcement officers, supplemented with assistance from AWWF law enforcement personnel. No check stations would be used. It is estimated that 1.0 full-time equivalent involving three employees would be required to perform the minimal duties associated with refuge hunts. Cost for salaries, materials and equipment upkeep would be approximately \$20,000 annually.

VI. MEASURES TAKEN TO AVOID CONFLICTS WITH OTHER MANAGEMENT OBJECTIVES

A. Biological Conflicts

Refer to the Decision Document Package, Section 7 Evaluation.

September dove hunting is not likely to occur in close proximity to Key Cave (nearest agricultural field is approximately 0.5 kilometers), which is still used by gray bats during this period. The field nearest Key Cave has been replanted with trees and does not provide dove habitat. Additionally, gray bats using the cave generally fly to the Tennessee River to forage upon emergence from the cave and do not forage around the refuge's upland fields. October squirrel hunting on the adjacent Seven Mile Island WMA has not affected the gray bats in Key Cave, thus no conflicts are anticipated with squirrel hunting on the refuge. Hunting is not anticipated to adversely affect the cave dwelling Alabama cavefish.

B. Public Use Conflicts

The refuge attracts some non-consumptive users. Hunting will be limited to four days each week, thus providing opportunities for non-consumptive uses during the hunting season and minimizing conflicts between hunters and non-consumptive users.

There are no known conflicts between other groups of consumptive users. The greatest competition for hunting areas occurs during the opening week of dove season. This issue is usually self regulating.

C. Administrative Conflicts

The manpower and funding available to administer this hunt are adequate at the present time. Currently, labor intensive data is not collected during the hunts. Staggered tours of duty by law enforcement personnel minimizes manpower shortages.

VII. CONDUCT OF THE HUNT

A. Refuge-specific hunting regulations

Refuge-specific hunting regulations for this program:

A. *Migratory Game Bird Hunting.* Hunting of doves is allowed on the entire refuge in accordance with State regulations subject to the following conditions:

1. Hunters must possess and carry a signed refuge permit.
2. Dove hunting is allowed from noon until sunset.
3. Youth hunters under age 16 must successfully complete a State-approved hunter education course. Each youth hunter must remain within sight and normal voice contact of an adult age 21 or older. Each adult may supervise no more than two youth hunters.
4. It is unlawful to use horses on Key Cave NWR.

B. *Small Game Hunting.* Hunting of quail, squirrel, rabbit, raccoon, and opossum is allowed on the entire refuge in accordance with State regulations subject to the following conditions:

1. Conditions A1, A3, and A4 (to hunt small game) apply.

B. Anticipated Public Reaction to the Hunt

The public has generally supported the refuge hunting program with exceptions usually being a demand for more hunting, more access and longer seasons. Generally, the local public desires more hunting than less on the refuge. Public reaction from surrounding communities to all refuge hunts has been very favorable and should continue to be the same in the future. Nationally, there are some anti-hunting sentiments, and many organizations are opposed to hunting on national wildlife refuges. It is possible that some objections may be voiced to some or all of the hunts within this plan.

C. Hunter Application Procedures

Permits will be issued free of charge to all those who request a permit.

D. Description of Hunter Selection Process

See above procedures in VII - C.

E. Media Selection for Publicizing the Hunt

Newspapers throughout north Alabama are provided copies of an annual news release covering hunts. Permits will be available at the Wheeler NWR office, AFFF, and local stores.

F. Description of Hunter Orientation

No specific effort is made toward hunter orientation other than previously mentioned media coverage, brochures and personal contacts. Pre-hunt scouting is allowed since non-consumptive wildlife observation is open year round.

G. Hunter Requirements

(1) Age: Region 4 policy is adopted. In summary, all youth under age 16 must complete a hunter education course. Youths must be closely supervised (in sight and in normal voice contact) by an adult at least 21 years old. An adult may supervise no more than two youths under 16 years old on a small game or dove hunt.

(2) Allowable equipment: Weapons are allowed during open hunting season and are limited to those allowed by the State. For small game, shotguns are allowed; rifles and pistols are limited to rimfire. Migratory game bird hunting is limited to shotguns. Dogs may be used for migratory game bird and small game hunting. The use non-toxic shot is not required.

(3) Use of open fires: Open fires are not allowed.

(4) License and permits: Hunting permit for Key Cave NWR/Seven Mile Island WMA required. The license requirements are those required by the State of Alabama.

(5) Reporting harvest: No requirements for reporting kill are proposed. A questionnaire would be considered in the future.

(6) Hunter safety requirements: All hunters born on or after August 1, 1977 are required to complete an approved hunter education course.

Appendix Literature References

Aley, T. 1990. Delineation and hydrogeologic study of the Key Cave aquifer Lauderdale County, Alabama. U.S. Fish and Wildl. Serv. contract no. 14-16-0004-88-073. 114 pp.

Kidd, R. E., C.J. Taylor, and V.E. Stricklin. 2001. Use of ground-water tracers to evaluate the hydraulic connection between Key Cave and the proposed industrial site near Florence, Alabama, 2000 and 2001. U.S. Geological Survey. Water-Resources Investigations Report 01-4228. 20 pp.

Staller, E. L., J.P. Carroll, and W.E. Palmer. 2006. Identifying predators and nest fates of northern bobwhites using infrared 24-hr surveillance cameras. Univ. Georgia Warnell School of For. & Nat. Resour. Wildl. Manage. Ser. #5. 4pp.

Sport Hunting
Decision Document Package
for
KEY CAVE NWR

Contents

2. EA

Environmental Assessment

2007 Sport Hunt Plan

on

KEY CAVE NATIONAL WILDLIFE REFUGE
Lauderdale County, Alabama

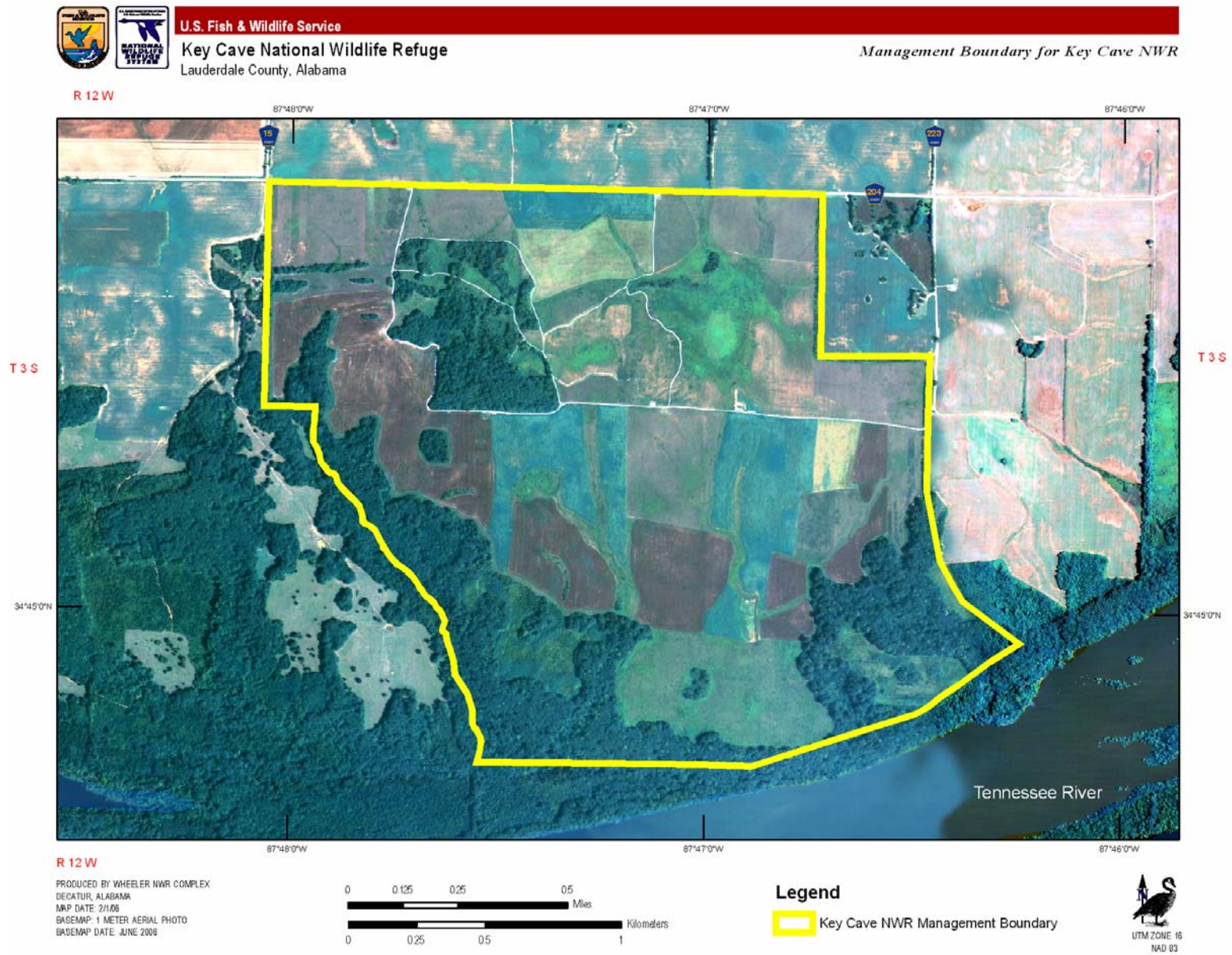
For Further Information, Contact:
Refuge Manager
U. S. Fish and Wildlife Service
Wheeler National Wildlife Refuge
2700 Refuge Headquarters Road
Decatur, AL 35603

Prepared by:
U. S. Department of Interior
Decatur, Alabama
February 2007

TABLE OF CONTENTS

| | | |
|-----------|--|----|
| Chapter 1 | PURPOSE AND NEED FOR ACTION | 6 |
| Chapter 2 | ALTERNATIVES INCLUDING THE PROPOSED ACTION | 7 |
| Chapter 3 | AFFECTED ENVIRONMENT | 8 |
| Chapter 4 | ENVIRONMENTAL CONSEQUENCES | 15 |
| Chapter 5 | CONSULTATION AND COORDINATION WITH OTHERS | 31 |
| Appendix | LITERATURE REFERENCES..... | 32 |

Figure 1. Key Cave National Wildlife Refuge





U.S. Fish & Wildlife Service

Key Cave National Wildlife Refuge
Lauderdale County, Alabama

Location Map

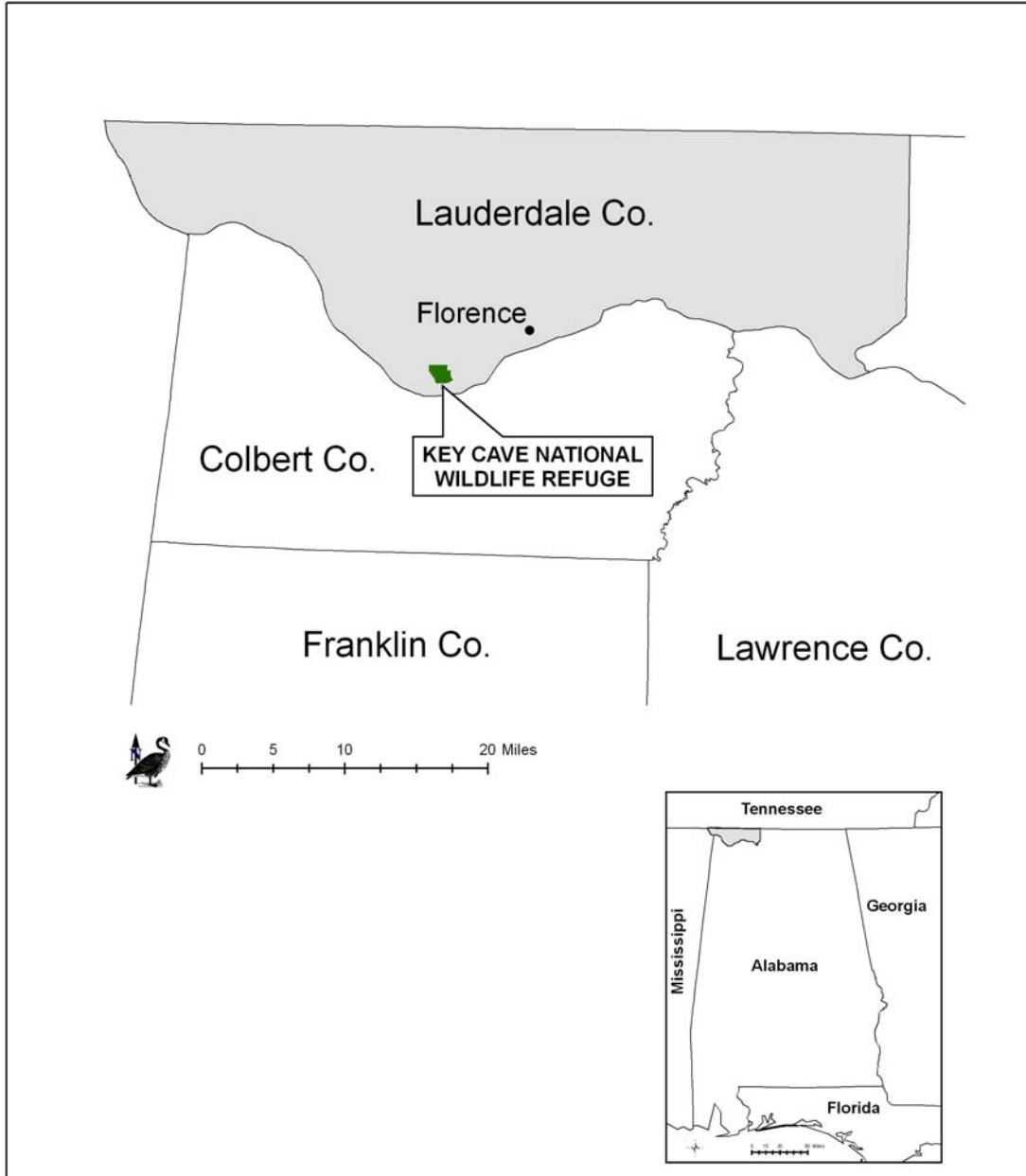


Figure 2. Location of Key Cave National Wildlife Refuge.

Chapter 1 Purpose and Need for Action

The federally legislated purpose for which Key Cave NWR was established under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-742j, not including 742d-1), and the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544), is to ensure that the biological integrity of Key Cave, Collier Cave, Collier Bone Cave, and their common aquifer remains intact.

The National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd et seq.) provides authority for the U. S. Fish and Wildlife Service (Service) to manage the Refuge and its wildlife populations. In addition it declares that compatible wildlife-dependent public uses are legitimate and appropriate uses of the Refuge System that are to receive priority consideration in planning and management. There are six wildlife-dependent public uses: hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation. It directs managers to increase recreational opportunities including hunting on National Wildlife Refuges when compatible with the purposes for which the Refuge was established and the mission of the National Wildlife Refuge System.

In response to a 2003 lawsuit filed by the Fund for Animals, the Service will amend or rewrite environmental assessments that describe hunting programs at twenty-three national wildlife refuges located in the Southeast Region. The new environmental assessments will address the cumulative impacts of hunting at all refuges which were named in or otherwise affected by the lawsuit. This document addresses the hunting programs at Key Cave National Wildlife Refuge in Alabama.

The proposed action is needed to implement the 2007 Sport Hunting Plan for Key Cave NWR which would provide the public with a high quality recreational experience and provide the refuge with a wildlife management tool to promote the biological integrity of the refuge.

Chapter 2 Alternatives Including the Proposed Action

This chapter discusses the alternatives considered for hunting on Key Cave National Wildlife Refuge. These alternatives are the 1) no hunt action and 2) proposed action which implements the Refuge's current hunt - 2007 Sport Hunting Management Plan.

2.1 No Action Alternative: No Hunting

Under this alternative, hunting would not occur on the 1,060-acre refuge. This would be a change to current public use and wildlife management programs.

2.2 Proposed Action: 2007 Sport Hunting Plan for Key Cave NWR

The proposed action would continue hunting on the entire 1,060-acre refuge (Figure 1), which has been ongoing since the Finding of No Significant Impact in 1998. All or parts of the refuge may be closed to hunting at any time if necessary for public safety, to provide wildlife sanctuary, or for administrative reasons.

Refer to 2007 Sport Hunting Plan for Key Cave NWR for specific regulations.

Chapter 3 Affected Environment

The Key Cave National Wildlife Refuge (NWR) was established on January 3, 1997. It is located in Lauderdale County in northwest Alabama (Figure 2). The refuge contains 1,060 acres that is bound on the south by Tennessee Valley Authority lands administered by the Alabama Department of Conservation and Natural Resources – Division of Wildlife and Freshwater Fisheries as Seven Mile Island Wildlife Management Area, and on the west, east and north by privately owned land.

Prior to 1992, the Monsanto Company owned a large 1,060-acre tract of land just north of Key Cave and about five miles southwest of Florence, Lauderdale County, Alabama, in the high hazard risk area of the Key Cave Aquifer. In 1992 they sold this tract to The Conservation Fund, which held the land until the Service acquired the land five years later to establish Key Cave NWR.

Key Cave is the only known location for the federally endangered Alabama cavefish (*Speoplatyrhinus poulsoni*) and lies in a limestone karst area that contains numerous sinkholes and several underground cave systems. The area's sinkholes are an integral component of groundwater recharge to the caves. In addition to the Alabama cavefish, Key Cave also serves as a priority one maternity cave for the federally endangered gray bat (*Myotis grisescens*), as well as habitat for two species of blind crayfish (*Procambarus pecki* and *Cambarus jonesi*). Collier Cave, located approximately 1.5 miles upstream from Key Cave, and Collier Bone Cave are also considered potential habitat for these cave species. Cave entrances are located on TVA lands on the northern shore of Pickwick Lake. Furthermore, the refuge provides habitat for a variety of migratory and resident wildlife species. Several priority bird species commonly occurring on the refuge include: dickcissel, grasshopper sparrow, field sparrow, northern bobwhite, northern harrier, and short-eared owl.

3.1 Physical Environment

Key Cave NWR exists along the northern shore of the Pickwick Reservoir of the Tennessee River and resides within the Limestone Valley physiographic subdivision. It is also underlain by Tusculumbia Limestone, whose weathering has produced many karst features, including numerous springs, sinkholes, and several underground cave systems. There are very few exposures of bedrock except for locations along the bluff line at the margin of the Tennessee River (Aley, 1990). Topology is comprised of flat to gently rolling upland terraces with slopes ranging from one to 15%. Elevation of the land surface generally ranges from about 500 to 580 feet above MSL (Kidd et al., 2001).

Upland soils derived from the decay of high-grade limestone rock are found on Key Cave NWR. The properties of these soils are closely related to those of the parent rock and are underlain with clay or limestone. The Decatur, Dewey, and Fullerton soil series make up approximately 80% of the land acreage on the refuge and have silt loam to silty clay loam textures (Sherard, 1971). These soils are well to moderately-drained and depth to

bedrock average between 25 and 50 feet deep (Moser and Hyde, 1974). Small pockets of the Grasmere series can be found along small drainage ways and in shallow depressions. Soils in the Grasmere series drain moderately to poor and have silty-clay loam textures (Sherard, 1971).

Key Cave NWR does not have any perennial streams that currently flow across the refuge. Before the Service took ownership of the land, several large erosion ditches were present. Refuge personnel installed three shallow water areas and rehabilitated drainage channels to reduce erosion, thus enhancing the water quality for endangered species inhabiting Key Cave. A 38-acre sinkhole lake once held water on the refuge; however it has been dry since September of 2000. Numerous sinkholes are found in close proximity to the refuge and are an integral component of groundwater recharge to Key Cave, Collier Cave, and Collier Bone Cave.

In 1990, the Ozark Underground Laboratory conducted a study to determine the underground recharge area for the cave system. The recharge area was divided into four potential risk areas: high hazard, moderately high hazard, moderate hazard, and low hazard (Aley, 1990). The refuge resides in the high hazard risk area of the Key Cave Aquifer Recharge Zone.

The recharge zone is approximately 16 square miles and is located in karst topology underlain by Tuscumbia limestone. Surface drainage is poor and essentially all runoff water enters the groundwater system by sub-surface drainage. Only a portion of the water in the Key Cave Aquifer passes through Key Cave. The estimated mean annual discharge from the entire Key Cave Aquifer is approximately 15 to 20 cubic feet per second (cfs). This flow rate is subject to precipitation events and can fluctuate greatly (Aley, 1990). Waters from Pickwick Lake seldom, if ever, flow into the cave.

Key Cave NWR is within the Interior Low Plateau physiographic region and is a part of the Lower Tennessee-Cumberland Ecosystem.

3.2 Vegetation

Specific acreage by habitat is as follows: 295 acres are in row crop production (corn, soybeans, or wheat) under a Cooperative Farm Agreement, 327 acres are in early successional fields or native warm season grasses, 122 acres of former cropland have been planted to hardwoods, 30 acres of erosion drainages are being restored to grassland or hedgerow habitat, 16 acres are managed as shallow water areas, 75 acres are being converted to an oak savanna, and the remaining 195 acres consist of upland forested land dominated by oaks and hickories. Undesirable species such as bermuda grass, fescue, *Sericea lespedeza*, and cocklebur are also present. A detailed description of the major vegetation types are listed below.

Dry (Upland) Hardwood Forest

As of this date a Forest Management Plan has not been developed for Key Cave NWR, but as per the June 18, 1997 Regional Reforestation of Federal Lands Memorandum, the

refuge has reforested approximately 122 acres along the refuge's southern boundary. Native hardwoods such as white oak, northern red oak, water oak, Shumard oak, cherrybark oak, common persimmon, and flowering dogwood were planted with the help of volunteers. With this additional acreage, Key Cave NWR has approximately 317 acres of upland hardwood forests.

Oak Savanna Forest

An oak savanna forest is a community of scattered oak trees above a layer of grasses and forbs. The trees are spread out so that there is no closed canopy and the grasses and forbs receive plenty of sunlight. It is a transition ecosystem between grassland and woodland environments, so it is an important habitat for both woodland and prairie species. On Key Cave NWR, a 75-acre oak woodlot is currently being converted to oak savanna habitat to help promote a diversity of wildlife species.

Cropland

Currently at Key Cave NWR, farmers plant approximately 295 acres annually through a cooperative farming agreement in which a portion of the crop remain in the fields as rent. Rent portions are 20% for the refuge and the remaining 80% is the farmers share. Crops grown are to support a variety of wildlife are primarily corn and soybeans, and occasionally wheat.

Grasslands

Native warm season grassland restoration has been on-going since the establishment of Key Cave NWR in 1997. Currently, approximately 327 acres of native warm season grasslands consisting of big bluestem, little bluestem, indiagrass, sideoats gramma, switchgrass, and eastern gamagrass are maintained for management of grassland-dependent and early successional species. Prescribed fire is used to maintain the native warm season grasses.

Karst Formations (Caves and Sinkholes)

Key Cave NWR is located in area of karst topology that has numerous sinkholes and caves that surround the refuge. When the refuge was first established in 1997, it had a 38-acre sinkhole pond on the property. However, the sinkhole has been dry since September of 2000, only holding a small amount of water for very short durations. Just south of the property boundary for Key Cave NWR lies the entrance to Key Cave. To the southeast of the refuge lie the entrances to Collier Cave and Collier Bone Cave. All three cave entrances are located on lands owned by TVA.

Shallow Water Areas

In 1999, two small (1-2 acre) shallow water areas (SWAs) were constructed to capture runoff surface water within grassed waterways. Then during late 2001 and early 2002, a larger (approximately 10 acres) SWA was constructed, which included a 700-foot dike

and a 24-inch screwgate WCS. These SWAs were designed to provide habitat for waterfowl and other wetland associated wildlife, as well as to capture silt from erosion before it enters the Key Cave aquifer. However, none of the SWAs have held much water since they were constructed.

3.3 Wildlife Resources

Key Cave NWR provides habitat for a variety of migratory and resident wildlife species. One hundred and sixty-five bird species have been sighted on the refuge. Several grassland-dependent bird species are commonly seen during the breeding season, including: dickcissel, grasshopper sparrow, field sparrow, and northern bobwhite. Northern harriers can be seen flying low over refuge grasslands searching for prey during the winter months and short-eared owls can also be seen occasionally during the winter. Other commonly seen wildlife species include cottontail rabbits, coyotes, white-tailed deer, gray squirrels, eastern meadowlarks, mourning doves, horned larks, and eastern bluebirds.

Recently, feral hogs have been documented on Key Cave NWR. These invasive animals have been destroying habitat and damaging crops. Observations indicate that the population of feral hogs is increasing at Key Cave NWR. Current efforts to control the feral hogs by refuge staff and volunteers have been unsuccessful. Many other wildlife species can be found on Key Cave NWR, including a wide variety of invertebrates (including two species of blind crayfish (*Procambarus pecki* and *Cambarus jonesi*) in the Cave), amphibians, reptiles, and mammals.

3.4 Threatened and Endangered Species

3.4.1 Alabama Cavefish

Key Cave NWR is the only known location of the Alabama cavefish (*Speoplatyrhinus poulsoni*), a small blind colorless fish which inhabits the underground pools in Key Cave. Only nine specimens are known to exist in scientific collections, and few individuals have been observed in the wild. Considering the limited distribution and the few specimens seen or collected, this species appears to be one of the rarest of all North American freshwater fish (Boschung and Mayden, 2004).

3.4.2 Gray Bat

The Cave is also a priority one maternity cave for the endangered gray bat (*Myotis grisescens*). Gray bat emergence counts are conducted annually at Key Cave and have averaged 33,400 gray bats since 1997. Approximately 12,000-13,000 young gray bats are produced annually by this maternity colony.

3.5 Fishery Resources

Other than the Alabama cavefish occurring in Key Cave, the only other known fish inhabiting the cave is the southern cavefish (*Typhlichthys subterraneus*). No other fishery resources exist on the refuge.

3.6 Cultural Resources

The body of federal historic preservation laws has grown dramatically since the enactment of the Antiquities Act of 1906. Several themes recur in these laws, their promulgating regulations, and more recent Executive Orders. They include: 1) each agency is to systematically inventory the “historic properties” on their holdings and to scientifically assess each property’s eligibility for the National Register of Historic Places; 2) federal agencies are to consider the impacts to cultural resources during the agencies’ management activities and seek to avoid or mitigate adverse impacts; 3) the protection of cultural resources from looting and vandalism are to be accomplished through a mix of informed management, law enforcement efforts, and public education; and 4) the increasing role of consultation with groups, such as Native American tribes, in addressing how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups. The U.S. Fish and Wildlife Service, like other federal agencies, are legally mandated to inventory, assess, and protect cultural resources located on those lands that the agency owns, manages, or controls. The Service’s cultural resource policy is delineated in 614 FW 1-5 and 126 FW 1-3. In the Service's Southeast Region, the cultural resource review and compliance process is initiated by contacting the Regional Historic Preservation Officer/Regional Archaeologist (RHPO/RA). The RHPO/RA will determine whether the proposed undertaking has the potential to impact cultural resources, identify the “area of potential effect,” determine the appropriate level of scientific investigation necessary to ensure legal compliance, and initiates consultation with the pertinent State Historic Preservation Office (SHPO) and federally recognized Tribes.

3.7 Socio Economic

Lauderdale County forms the northwest corner of Alabama with 100 miles of frontage on the Tennessee River. The earliest economic enterprise was the farming of cotton in the early 1800’s. Cotton is still the major crop and agriculture continues to be the dominant land use. Population estimates, land area, population density, percent population change, per capita income, and percent of population below the poverty level are listed in Table 1 for Lauderdale County and the state of Alabama (U.S. Census Bureau 2005a and 2005b).

Table 1. Comparison of demographic statistics for Lauderdale County and Alabama, based on U.S. Census 2005 data.

| <i>Area</i> | <i>Land Area (sq. miles)</i> | <i>Population (2005 estimate)</i> | <i>Pop. Density (residents/ sq. mile)</i> | <i>% pop. change (2000-2003)</i> | <i>Per Capita Income (\$)</i> | <i>% below poverty</i> |
|----------------|------------------------------|-----------------------------------|---|----------------------------------|-------------------------------|------------------------|
| Lauderdale Co. | 669 | 87,691 | 131 | -0.5 | 18,626 | 14.4 |
| Alabama | 50,744 | 4,557,808 | 88 | 1.9 | 18,189 | 16.1 |

Hunting is a traditional form of outdoor recreation for many people in Lauderdale County and for some households, hunting participation provides food at a much cheaper cost.

Chapter 4 Environmental Consequences

This chapter describes the foreseeable environmental consequences of implementing the two management alternatives in Chapter 2. When detailed information is available, a scientific and analytic comparison between alternatives and their anticipated consequences is presented, which is described as “impacts” or “effects.” When detailed information is not available, those comparisons are based on the professional judgment and experience of refuge staff and Service and State biologists

4.1 Effects Common to all Alternatives

4.1.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment. This assessment has not identified any adverse or beneficial effects for either alternative unique to minority or low-income populations in the affected area. Neither alternative will disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations.

4.1.2 Public Health and Safety

Each alternative would have similar minimal to negligible effects on human health and safety.

4.1.3 Refuge Physical Environment

Impacts of each alternative on the refuge physical environment would have similar minimal to negligible effects. Some disturbance to surface soils, topography, and vegetation would occur on the refuge as a result of hunting; however effects would be minimal. The refuge would also control access to minimize habitat degradation.

Impacts to the natural hydrology would have negligible effects. The refuge expects impacts to air and water quality to be minimal and only due to refuge visitors’ automobile emissions and run-off from road and trail sides. The effect of these refuge-related activities on overall air and water quality in the region are anticipated to be relatively negligible. Existing State water quality criteria and use classifications are adequate to

achieve desired on-refuge conditions; thus, implementation of the proposed action would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws.

Impacts associated with solitude are expected to be minimal given time and space zone management techniques, such as only allowing hunting four days each week, used to avoid conflicts among user groups.

4.1.4. Cultural Resources

Under the hunting alternative, hunting, regardless of method or species targeted, is a consumptive activity that does not pose any threat to historic properties on and/or near the Refuge.

4.1.5. Facilities

Maintenance or improvement of existing facilities (i.e. parking areas, roads, and trails) will cause minimal short term impacts to localized soils and waters and may cause some wildlife disturbances and damage to vegetation.

4.2 Summary of Effects

4.2.1 Impacts to Habitat

No Action Alternative

Under this alternative, no hunting would occur on Key Cave NWR. This course of action would result in the loss of a desirable public outdoor recreation opportunity, i.e. public hunting.

Although hunters would not be traversing across the 1,060-acre refuge, which could cause damage to individual plants by trampling vegetation, non-consumptive users would still be able to walk throughout the area.

Proposed Action Alternative

Under this alternative the entire refuge would be open to hunting and damage to individual plants by trampling vegetation could occur; however anticipated damage to vegetation should be minor. Vehicles would be confined to existing parking areas.

4.2.2 Impacts to Hunted Wildlife

No Action Alternative

Mortality of individual hunted animals would not occur under this alternative. Disturbance by hunters to hunted wildlife would not occur; however, other public uses

that cause disturbance, such as wildlife observation and photography, would still be permitted.

Raccoon and opossum populations could increase above the refuge's carrying capacity. The likelihood of starvation and diseases, such as distemper and rabies, would increase. Depredation on quail and songbird nests by raccoon and opossum would likely increase in proportion to their increasing populations.

Proposed Action Alternative

Mortality of individual hunted animals would occur under this alternative, estimated by the refuge to be an annual maximum range of 250–300 doves, 75-100 squirrels, 50-75 quail, 50-75 rabbits, 30-50 raccoons and 15-25 opossum. Hunting causes some disturbance to not only the species being hunted but other game species as well. However, time limitations (hunting four days per week) established by refuge regulations would minimize incidental disturbance.

Hunting of raccoon and opossum would help maintain their populations at or below carrying-capacity. The likelihood of starvation and diseases, such as distemper and rabies in raccoon and opossum, would be decreased.

During development of this hunting plan, we considered the possibility of allowing only non-toxic shot for hunting with shotguns on Key Cave NWR. However, we did not choose to implement this option. We determined that lead shot could be allowed for hunting dove and small game because the refuge is an upland refuge, waterfowl are not being hunted, and the 38-acre sinkhole lake is only used sporadically by small numbers of waterfowl. Dove and quail could possibly ingest lead shot during feeding activities. However, chances of dove or quail ingesting lead shot are mitigated by rotation of dove hunting fields and by the relatively light hunting pressure observed during previous hunting seasons.

4.2.3 Impacts to Non-hunted Wildlife

No Action Alternative

Raccoon and opossum may become overpopulated, depredating quail and songbird nests at high rates. A Georgia study (Staller et al., 2006) indicated that raccoon and opossum are significant predators of quail nests, accounting for 26% of quail nest predation.

Disturbance to non-hunted wildlife would not occur on the refuge; however, non-consumptive users would still be permitted to access this land, which might cause disturbance to wildlife.

Proposed Action Alternative

Populations of raccoon and opossum would be decreased through hunting under this alternative. Depredation rates of quail and songbirds and their nests would decrease.

Disturbance to non-hunted wildlife would increase slightly. However, significant disturbance would be unlikely for the following reasons. Small mammals, including bats, are inactive during most of the fall and winter hunting seasons. These species are also nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Hibernation or torpor by cold-blood reptiles and amphibians also limits their activity during most of the hunting season when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season. Invertebrates are also not active during cold weather and would have few interactions with hunters during the hunting season. The refuge has estimated current hunter density on peak days to be no more than 1 hunter per 29.5 acres. During the vast majority of the hunting season, hunter density is much lower (1 hunter/295 acres). Refuge regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles are restricted to parking areas and the harassment or taking of any wildlife other than the game species legal for the season is not permitted. Disturbance to the daily wintering activities, such as feeding and resting, of birds might occur, but would be transitory as hunters traverse habitat. Disturbance to birds by hunters would probably be commensurate with that caused by non-consumptive users. The possibility of songbirds ingesting spent lead shot does exist but is unlikely to become problematic and is mitigated by rotation of dove hunting fields and by the relatively light hunting pressure observed during previous hunting seasons.

4.2.4 Impacts to Endangered and Threatened Species

No Action Alternative

If hunting does not occur on the refuge, there would be less chance of adversely affecting threatened and endangered species.

Proposed Action Alternative

A potential disadvantage of this alternative is its effect on endangered species on the refuge such as the gray bat and Alabama cavefish. Both these species are cave dwelling and effects from hunting are unlikely. However, a Section 7 Evaluation associated with this assessment was conducted, and it was determined that the proposed action is not likely to adversely affect these species (Refer to 2007 Section 7 Evaluation for Sport Hunting on Key Cave NWR).

4.2.5 Impacts to Refuge Facilities (roads, trails, parking areas, dikes)

No Action Alternative

Damage to parking areas and walking trails due to hunter use during wet weather periods would not occur; however, other users would still be using parking areas and walking trails, thereby necessitating periodic maintenance. Additionally, costs associated with law enforcement for a hunting program would not be applicable.

Proposed Action Alternative

Additional damage to parking areas and walking trails due to hunter use during wet weather periods might occur. The current hunt program on the refuge for the past nine years has shown these impacts to be minimal. There would be some costs associated with law enforcement for a hunting program. These costs should be minimal relative to total refuge operations and would not diminish resources dedicated to other refuge management programs.

4.2.6 Impacts to Wildlife Dependant Recreation

No Action Alternative

The public would not have the opportunity to harvest a renewable resource, participate in wildlife-oriented recreation that is compatible with the purposes for which the refuge was established, have an increased awareness of Key Cave NWR and the National Wildlife Refuge System; nor would the Service be meeting public use demand. Public relations would not be enhanced with the local community.

Proposed Action Alternative

As public use levels expand across time, unanticipated conflicts between user groups may occur. Experience has proven that time zoning (e.g., establishment of separate use periods) is an effective tool in eliminating conflicts between user groups. Conflicts between hunters and non-consumptive users might occur but would be mitigated by time (only hunting four days each week and non-hunting season).

The public would be allowed to harvest a renewable resource, and the refuge would be promoting a wildlife-oriented recreational opportunity that is compatible with the purpose for which the refuge was established. The public would have an increased awareness of Key Cave NWR and the National Wildlife Refuge System and public demand for hunting would be met. The public would also have the opportunity to harvest a renewable resource in a traditional manner, which is culturally important to the local community. This alternative would also allow the public to enjoy hunting at no or little cost in a region where private land is leased for hunting. This alternative would allow youth the opportunity to experience a wildlife-dependant recreation, instill an appreciation for and understanding of wildlife, the natural world and the environment and promote a land ethic and environmental awareness.

4.3 Cumulative Impacts Analysis

4.3.1 Anticipated Direct and Indirect Impacts of Proposed Action on Wildlife Species.

4.3.1.1 Migratory Birds

The U.S. Fish and Wildlife Service annually prescribe frameworks, or outer limits, for dates and times when hunting may occur and the number of birds that may be taken and possessed. These frameworks are necessary to allow State selections of season and limits for recreation and sustenance; aid Federal, State, and tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which States may select season dates, bag limits, shooting hours, and other options for each migratory bird hunting season. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, Federal annual regulations both allow and limit the hunting of migratory birds.

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any ... bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the U.S. Fish and Wildlife Service as the lead federal agency for managing and conserving migratory birds in the United States. Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four Flyways for the primary purpose of managing migratory game birds. Each Flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each State and Province in that Flyway. Key Cave NWR is within the Mississippi Flyway and is part of the Eastern Mourning Dove Management Unit.

The process for adopting migratory game bird hunting regulations, located in 50 CFR part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule making process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulations-development schedules, based on "early" and "late" hunting season regulations. Early hunting seasons pertain to all migratory game bird species in Alaska,

Hawaii, Puerto Rico, and the Virgin Islands; migratory game birds other than waterfowl (e.g. dove, woodcock, etc.); and special early waterfowl seasons, such as teal or resident Canada geese. Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl seasons not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties (USFWS 2006). Under the proposed action, Key Cave NWR estimates a maximum of 250–300 doves would be harvested each year. This harvest impact represents 0.0002% of Alabama’s four-year average harvest of 1,629,275 doves (AWFF 2006).

Because the Service is required to take abundance of migratory birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, State and Provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of State and Federal Governments. After Service establishment of final frameworks for hunting seasons, the States may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks but never more liberal. Season dates and bag limits for National Wildlife Refuges open to hunting are never longer or larger than the State regulations. In fact, based upon the findings of an environmental assessment developed when a National Wildlife Refuge opens a new hunting activity, season dates and bag limits may be more restrictive than the State allows. At Key Cave NWR, season length is more restrictive for doves than the State allows.

NEPA considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, “Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88– 14),” filed with the Environmental Protection Agency on June 9, 1988. We published Notice of Availability in the Federal Register on June 16, 1988 (53 FR 22582), and our Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment, “Duck Hunting Regulations for 2006-07,” and an August 24, 2006, Finding of No Significant Impact. Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53376), the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, Federal Register notice (71 FR 12216). More information may be obtained from: Chief, Division of Migratory Bird Management, U.S. Fish and Wildlife

Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NWR, Washington, DC 20240.

4.3.1.2 Small Game (Quail, Squirrel, Rabbit, Raccoon and Opossum)

Quail are non-migratory and therefore are not regionally affected by hunting. Only local effects will be discussed. The early successional habitat that quail favor is abundant on the refuge and quail populations have increased as early successional habitat has been restored and managed (based on annual survey data 1998-2006). Quail populations have increased from an estimated two coveys in 1998 to a four-year average (2003-2006) of 16 coveys under the current hunting program. Under the proposed action, Key Cave NWR estimates a maximum of 50–75 quail would be harvested each year. This harvest impact represents 0.0002% of Alabama's four-year average harvest of 326,075 quail (AWFF 2006).

Squirrels, rabbit, raccoon, and opossum cannot be affected regionally by refuge hunting because of their limited home ranges. Only local effects will be discussed. Opossum and raccoon are hunted primarily at night. Raccoon are more sought after than opossum by the public. Hunting helps regulate opossum and raccoon populations; however, unless the popularity of this type of hunting increases, raccoons and opossums numbers will always be higher than desired. When populations of these species become elevated, diseases such as distemper and rabies may reduce the populations. However, waiting for disease outbreak to regulate their numbers can be a human health hazard. Cumulative adverse impacts to raccoon and opossum are unlikely considering they reproduce quickly, are difficult to hunt due to their nocturnal habits, and are not as popular for hunting as other game species.

Studies have been conducted within and outside of Alabama to determine the effects of hunting on the population dynamics of small game. Results from studies have consistently shown that small game, such as rabbits and squirrels, are not affected by hunting, but rather are limited by food resources. The refuge consulted with biologists at the Alabama Wildlife and Freshwater Fisheries Division (AWFF) in association with this assessment on the cumulative impacts of hunting on rabbits and squirrel. Under the proposed action, Key Cave NWR estimates a maximum of 75-100 squirrels and 50-75 rabbits would be harvested each year. This harvest impact represents 0.0002% and 0.0004% of Alabama's four-year average harvest of 528,000 squirrels and 197,925 rabbits, respectively (AWFF 2006). Gray squirrels, fox squirrels, and eastern cottontails are prolific breeders and their populations have never been threatened by hunting in Alabama even prior to the passing of hunting regulations as we know them today.

4.3.1.4 Non-hunted Wildlife

Non-hunted wildlife would include non-hunted migratory birds such as songbirds, wading birds, raptors, and woodpeckers; small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, skinks, turtles, lizards, salamanders, frogs and toads; and invertebrates such as butterflies, moths, other insects and spiders. Except for migratory birds and some species of migratory bats, butterflies

and moths, these species have very limited home ranges and hunting could not affect their populations regionally; thus, only local effects will be discussed.

Disturbance to non-hunted migratory birds could have regional, local, and flyway effects. Regional and flyway effects would not be applicable to species that do not migrate such as most woodpeckers, and some songbirds including cardinals, titmice, wrens, chickadees, etc. The cumulative effects of disturbance to non-hunted migratory birds under the proposed action are expected to be negligible for the following reasons. Hunting season would not coincide with the nesting season. Long-term future impacts that could occur if reproduction was reduced by hunting are not relevant for this reason. Disturbance to the daily wintering activities, such as feeding and resting, of birds might occur. Disturbance to birds by hunters would probably be commensurate with that caused by non-consumptive users.

The cumulative effects of disturbance to non-hunted migratory birds under the proposed action are expected to be negligible for the following reasons. However, disturbance would be unlikely for the following reasons. Small mammals, including bats, are inactive during winter when hunting season occurs. These species are also nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Hibernation or torpor by cold-blood reptiles and amphibians also limits their activity during the hunting season when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season. Encounters with reptiles and amphibians in the early fall are few and should not have cumulative negative effects on reptile and amphibian populations. Invertebrates are also not active during cold weather and would have few interactions with hunters during the hunting season. The refuge has estimated current hunter density on peak days to be no more than 1 hunter per 29.5 acres. During the vast majority of the hunting season, hunter density is much lower (1 hunter/295 acres). Refuge regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles are restricted to parking areas and the harassment or taking of any wildlife other than the game species legal for the season is not permitted.

Although ingestion of lead-shot by non-hunted wildlife could be a cumulative impact, it is not likely due to rotation of dove fields and limited hunting pressure at Key Cave NWR.

Some species of bats, butterflies and moths are migratory. Cumulative effects to these species at the “flyway” level should be negligible. These species are in torpor or have completely passed through Alabama by peak hunting season in Nov-Jan. Some hunting occurs during September and October when these species are migrating; however, hunter interaction would be commensurate with that of non-consumptive users.

4.3.1.5 Endangered Species

Endangered and threatened species that utilize the refuge are gray bats and Alabama cavefish. A Section 7 Evaluation was conducted in association with this assessment for opening hunting on Key Cave NWR. It was determined that the proposed alternative would not likely adversely affect these endangered species.

As noted above, the endangered species occurring on the refuge are the Alabama cavefish and gray bat, which are both found in Key Cave. The entrance to the cave is fenced to prevent unauthorized entry. The cave entrance is adjacent to the refuge on land managed by the Alabama Department of Conservation and Natural Resources as the Seven Mile Island Wildlife Management Area (WMA). Currently, October squirrel hunting takes place on the WMA with no adverse impacts to the endangered species in Key Cave. Proposed September dove hunting will not occur in close proximity to Key Cave, which is used by gray bats at this time. Dove hunting is proposed to occur in upland agricultural fields a minimum of 0.5 kilometers north of Key Cave. Upon emergence from the cave, bats generally fly south, away from the refuge to forage along the Tennessee River. Minimal disturbance to gray bats is expected from dove hunting. During the majority of the proposed hunting seasons (November - February) gray bats are not using Key Cave and are hibernating in different caves. Disturbance to gray bats from hunting is unlikely, as are disturbances to the Alabama cavefish during any hunting season. Since hunting seasons were initiated during 1998 no known disturbances to these species has occurred as a result of hunting.

Refer to the Section 7 Evaluation for the 2007 Sport Hunting on Key Cave NWR for more information.

4.3.2 Anticipated Direct and Indirect Impacts of Proposed Action on Refuge Programs, Facilities, and Cultural Resources.

4.3.2.1 Wildlife-Dependant Recreation

As public use levels expand across time, unanticipated conflicts between user groups may occur. The Refuge's visitor use programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities. Experience has proven that time zoning (e.g., establishment of separate use periods, only hunting four days each week) is an effective tool in eliminating conflicts between user groups.

The level of recreation use and ground-based disturbance from visitors would be largely concentrated at trails and parking areas. This could have a negative effect on nesting bird populations. However, the hunting season is during fall and winter and not during most birds' nesting period.

The opportunities for hunting would continue under the proposed action. Hunting would be used to keep resident wildlife in balance with the habitat's carrying capacity, resulting in long-term positive impacts on wildlife habitat.

The refuge would control access under this alternative to minimize wildlife disturbance and habitat degradation, while allowing hunting as a compatible wildlife-dependent recreation.

4.3.2.2 Refuge Facilities

The Service defines facilities as: “Real property that serves a particular function(s) such as buildings, roads, utilities, water control structures, raceways, etc.” Under the proposed action those facilities most utilized by hunters are: parking areas and trails. Maintenance or improvement of existing facilities (i.e. parking areas, roads, and trails) will cause minimal short term impacts to localized soils and waters and may cause some wildlife disturbances and damage to vegetation. The facility maintenance and improvement activities described are periodically conducted to accommodate daily refuge management operations and general public uses such as wildlife observation and photography. These activities will be conducted at times (seasonal and/or daily) to cause the least amount of disturbance to wildlife. Siltation barriers will be used to minimize soil erosion, and all disturbed sites will be restored to as natural a condition as possible. During times when roads are impassible due to flood events or other natural causes those roads, parking areas and trails impacted by the event will be closed to vehicular use.

4.3.2.3 Cultural Resources

Hunting, regardless of method or species targeted, is a consumptive activity that does not pose any threat to historic properties on and/or near the Refuge. In fact, hunting meets only one of the two criteria used to identify an “undertaking” that triggers a federal agency’s need to comply with Section 106 of the National Historic Preservation Act. These criteria, which are delineated in 36 CFR Part 800, state:

- 1- an undertaking is any project, activity, or program that can alter the character or use of an archaeological or historic site located within the “area of potential effect;” and
- 2- the project, activity, or program must also be either funded, sponsored, performed, licenses, or have received assistance from the agency.

Consultation with the pertinent State Historic Preservation Office and federally recognized Tribes are, therefore, not required.

4.3.2.4 Anticipated Impacts of Proposed Hunt on Refuge Environment and Community

The refuge expects no sizeable adverse impacts of the proposed action on the refuge environment which consists of soils, vegetation, air quality, water quality and solitude. Some disturbance to surface soils and vegetation would occur during hunts; however impacts would be minimal. The refuge would also control access to minimize habitat degradation.

The refuge expects impacts to air and water quality to be minimal and only due to refuge visitors’ automobile vehicle emissions and run-off on road and trail sides. The effect of these refuge-related activities, as well as other management activities, on overall air and water quality in the region are anticipated to be relatively negligible, compared to the contributions of industrial centers, power plants, and non-refuge vehicle traffic. Existing

State water quality criteria and use classifications are adequate to achieve desired on-refuge conditions; thus, implementation of the proposed action would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws.

Impacts associated with solitude are expected to be minimal given time zone management techniques, such as only hunting four days each week, used to avoid conflicts among user groups.

The refuge would work closely with State, Federal, and private partners to minimize impacts to adjacent lands and its associated natural resources; however, no indirect or direct impacts are anticipated. The hunts would continue public hunting opportunities and have positive impacts on the general public, nearby residents, and refuge visitors. The refuge expects increased visitation and tourism as the hunt continues bringing in additional revenue to local communities but not a significant increase in overall revenue in any area.

4.3.2.5 Other Past, Present, Proposed, and Reasonably Foreseeable Hunts and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. The proposed hunt plan has been designed so as to be sustainable through time given relatively stable conditions. Changes in refuge conditions, such as sizeable increases in refuge acreage or public use, are likely to change the anticipated impacts of the current plan and would trigger a new hunt planning and assessment process.

The implementation of any of the proposed actions described in this assessment includes actions relating to the refuge hunt program (see 2007 Sport Hunting Plan for Key Cave NWR). These actions would have both direct and indirect effects however, the cumulative effects of these actions are not expected to be substantial.

The past refuge hunting program is the same as the proposed action in season lengths, species hunted, and bag limits. The refuge does not foresee any changes to the proposed action in the way of increasing the intensity of hunting in the future.

4.3.2.6 Anticipated Impacts if Individual Hunts are Allowed to Accumulate

National Wildlife Refuges, including Key Cave NWR, conduct hunting programs within the framework of State and Federal regulations. Key Cave NWR is at least as restrictive as the State of Alabama (squirrel, rabbit, quail, raccoon, and opossum) in season length but allows fewer days for hunting each week. By maintaining hunting regulations that are as, or more, restrictive than the State, individual refuges ensure that they are maintaining seasons which are supportive of management on a more regional basis. The proposed hunt plan has been reviewed and is supported by the Alabama Department of

Conservation and Natural Resources – Division of Wildlife and Freshwater Fisheries (AWFF). Additionally, refuges coordinate with AWFF annually to maintain regulations and programs that are consistent with the State management program.

Chapter 5 Consultation and Coordination with Others

The Alabama Department of Conservation and Natural Resources – Division of Wildlife and Freshwater Fisheries (AWFF) concurs and fully supports the regulated consumptive public use of the natural resources associated with the Key Cave NWR (Refer to Letters of Concurrence). The Fish and Wildlife Service also provided an in depth review by the Regional Office personnel and staff biologists. Numerous contacts were made throughout the area of the refuge soliciting comments, views, and ideas into the development of the accompanying hunting plan.

Appendix Literature References

- Alabama Division of Wildlife and Freshwater Fisheries. 2006. Alabama Hunting Survey 2005 – 2006 Season. Wildl. Restoration Prog. Grant # W-35, Study 6. Montgomery, AL. 28pp.
- Aley, T. 1990. Delineation and hydrogeologic study of the Key Cave aquifer Lauderdale County, Alabama. U.S. Fish and Wildl. Serv. contract no. 14-16-0004-88-073. 114 pp.
- Boschung H.T.Jr. and Mayden R. L. 2004. Fishes of Alabama. Smithsonian Books, W.W. Norton & Company 960 pp.
- Kidd, R. E., C.J. Taylor, and V.E. Stricklin. 2001. Use of ground-water tracers to evaluate the hydraulic connection between Key Cave and the proposed industrial site near Florence, Alabama, 2000 and 2001. U.S. Geological Survey. Water-Resources Investigations Report 01-4228. 20 pp.
- Moser, P. H. and L. W. Hyde. 1974 Environmental geology; an aid to growth and development in Lauderdale, Colbert, and Franklin Counties, Alabama. Atlas Ser. 6, Geol. Surv. Of Ala. 45 pp.
- Sherard, H. 1971. Soil Survey for Lauderdale County, Alabama, United States Department of Agriculture, Soil Conservation Service, U.S. Gov't Printing Off. 47 pp.
- Staller, E. L., J.P. Carroll, and W.E. Palmer. 2006. Identifying predators and nest fates of northern bobwhites using infrared 24-hr surveillance cameras. Univ. Georgia Warnell School of For. & Nat. Resour. Wildl. Manage. Ser. #5. 4pp.
- U.S. Census Bureau. 2005a. County Population Estimates. <<http://www.census.gov/population/www/estimates/popest.html>>. U.S. Bureau of the Census, Population Division. Washington, DC.
- U.S. Census Bureau. 2005b. U.S. Census 2000 Redistricting Data (Public Law 94-171). <<http://www.census.gov>> and <<http://factfinder.census.gov>>.
- U.S. Fish and Wildlife Service. 2006. Waterfowl population status, 2006. Division of Migratory Bird Management, Laurel, Maryland, 60 pp.