Cross Creeks National Wildlife Refuge

Comprehensive Conservation Plan

U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region

September 2009

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COMPREHENSIVE CONSERVATION PLAN

Cross Creeks National Wildlife Refuge

Stewart County, Tennessee

U.S. Department of the Interior
Fish and Wildlife Service

Southeast Region
Atlanta, Georgia

September 2009

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I. Executive Summary

The U.S. Fish and Wildlife Service (Service) developed this Comprehensive Conservation Plan (CCP) to guide the management of Cross Creeks National Wildlife Refuge (NWR) in Stewart County, Tennessee. The CCP outlines the refuge's programs and corresponding resource needs for the next 15 years, as mandated by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act).

As part of the planning process, the Service conducted a biological review of the refuge's wildlife and habitat management program and a visitor services review of the refuge's public use program. The Service also held a public scoping and stakeholder meeting to solicit a wide range of public opinions on the issues the CCP should address. The comments and feedback from these stakeholders and from the public scoping meetings, as well as those from the biological and visitor services reviews, were considered and incorporated in the preparation of the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA). The Draft CCP/EA was completed and made available for public review and comment for a period of 30 days, from April 30 to June 1, 2009.

The Service developed and analyzed four alternatives. Alternative A was a proposal to maintain the status quo, or no change from current management of the refuge. Under this alternative, there would continue to be no active management of the refuge's forests, scrub-shrub habitat, and warm season grasses. There would be a reduced ability to manage water because of clogged structures from beaver or aquatic plants, neglected units (restricted by probable sedimentation in channels inside units and vegetation), and the timing of the operations schedule for Lake Barkley. Staff would continue to provide managed, limited hunting for deer, turkey, squirrel, and resident Canada geese. The refuge would also continue to provide quality fishing, offer opportunities for wildlife observation and photography throughout the refuge, and provide environmental education services to the public, including limited visits to schools, environmental education workshops, and on-site and off-site environmental education programs.

Alternative B would emphasize enhanced public use on Cross Creeks NWR. Additional efforts and expenditures would be made to expand the public use program, visitor facilities, and overall level of public use opportunities on the refuge. Special emphasis would be accorded to promoting the priority public uses of national wildlife refuges identified in the Improvement Act: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Alternative C would intensify and expand wildlife and habitat management at Cross Creeks NWR. This would increase benefits for wildlife species, which fulfills the refuge purpose and goals. Public use opportunities, and the refuge's efforts to provide these, would remain approximately as they are now.

Alternative D would balance an enhanced wildlife management program with increased opportunities for public use on the refuge. Wildlife and habitat management, as well as public use activities, would increase under this alternative.

The Service selected Alternative D for implementation because it directs the development of programs to best achieve the refuge's purpose and goals; emphasizes a landscape approach to land management; collects habitat and wildlife data; and ensures long-term achievement of refuge and Service objectives. At the same time, its management actions provide balanced levels of compatible public use opportunities consistent with existing laws, Service policies, and sound biological principles. It provides the best mix of program elements to achieve the desired long-term conditions within the anticipated funding and staffing levels, and positively addresses significant issues and concerns expressed by the public.

I. Background

INTRODUCTION

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

A planning team developed a range of alternatives that best met the goals and objectives of the refuge and that could be implemented within the 15-year planning period. The Draft CCP/EA was made available to state and federal government agencies, conservation partners, and the general public for review and comment. The comments from each entity were considered in the development of this CCP, describing the Service's preferred alternative.

PURPOSE AND NEED FOR THE PLAN

The purpose of the CCP is to develop a preferred action that best achieves the refuge purpose; attains the vision and goals developed for the refuge; contributes to National Wildlife Refuge System (Refuge System) mission; addresses key problems, issues and relevant mandates; and is consistent with sound principles of fish and wildlife management.

Specifically, the CCP is needed to:

- Provide a clear statement of refuge management direction;
- Provide refuge neighbors, visitors, and government officials with an understanding of Service management actions on and around the refuge;
- Ensure that Service management actions, including land protection and recreation/education programs, are consistent with the mandates of the Refuge System; and
- Provide a basis for the development of budget requests for operations, maintenance, and capital improvement needs.

FISH AND WILDLIFE SERVICE

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

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

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

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

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

NATIONAL WILDLIFE REFUGE SYSTEM

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

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

The Improvement Act established, for the first time, a clear legislative mission of wildlife conservation for the Refuge System. Actions were initiated in 1997 to comply with the direction of this new legislation, including an effort to complete comprehensive conservation plans for all refuges. These plans, which are completed with full public involvement, help guide the future management of refuges by establishing natural resources and recreation/education programs. Consistent with the Improvement Act, approved plans will serve as the guidelines for refuge management for the next 15 years. The Improvement Act states that each refuge shall be managed to:

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of comprehensive conservation plans that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System; and

- Recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority public uses; and allow refuge managers authority to determine compatible public uses.

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

Approximately 38 million people visited national wildlife refuges in 2002, most to observe wildlife in their natural habitats. As the number of visitors grows, there are significant economic benefits to local communities. In 2001, 82 million people, 16 years and older, either fished, hunted, or observed wildlife, generating $108 billion. In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in 7 years. At the same time, the number of jobs generated in surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than $2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana) – the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to $6.8 million per refuge, up 31 percent from $5.2 million in 1995. For each federal dollar spent on the Refuge System, surrounding communities benefited with $4.43 in recreation expenditures and $1.42 in job-related income (Caudill and Laughland, unpubl. data).

Volunteers continue to be a major contributor to the success of the Refuge System. Annually, some 38,000 volunteers contribute more than 1.4 million hours on refuges nationwide, a service valued at more than $22 million.

The wildlife and habitat vision for national wildlife refuges stresses that wildlife comes first; that ecosystems, biodiversity, and wilderness are vital concepts in refuge management; that refuges must be healthy and growth must be strategic; and that the Refuge System serves as a model for habitat management with broad participation from others.

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

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

LEGAL AND POLICY CONTEXT

Legal Mandates, Administrative and Policy Guidelines, and Other Special Considerations

Administration of national wildlife refuges is guided by the mission and goals of the Refuge System, congressional legislation, presidential executive orders, and international treaties. Policies for management options of refuges are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. Refer to Appendix III for a complete listing of relevant legal mandates.

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research and recreation on refuge lands; and provide a framework for cooperation between Cross Creeks NWR and other partners, such as the U.S. Army Corps of Engineers (Corps), National Park Service (NPS),Tennessee Wildlife Resources Agency (TWRA), and private landowners.

Select legal summaries of treaties and laws relevant to administration of the Refuge System and management of the Cross Creeks NWR are provided in Appendix III.

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

- Contribute to ecosystem goals, as well as refuge purposes and goals;
- Conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
- Monitor the trends of fish, wildlife, and plants;
- Manage and ensure appropriate visitor uses as those uses benefit the conservation of fish and wildlife resources and contribute to the enjoyment of the public; and
- Ensure that visitor activities are compatible with refuge purposes.

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

Biological Integrity, Diversity, and Environmental Health Policy

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

ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service.

NATIONAL AND INTERNATIONAL CONSERVATION PLANS AND INITIATIVES

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

This CCP supports, among other wildlife conservation efforts, the Partners in Flight Plan, the North American Waterfowl Management Plan, the Western Hemisphere Shorebird Reserve Network, and the National Wetlands Priority Conservation Plan.

North American Bird Conservation Initiative. Started in 1999, the North American Bird Conservation Initiative (NABCI) is a coalition of government agencies, private organizations, academic institutions, and private industry leaders in the United States, Canada, and Mexico working to ensure the long-term health of North America's native bird populations by fostering an integrated approach to bird conservation to benefit all birds in all habitats. The four international and national bird initiatives include the North American Waterfowl Management Plan, Partners in Flight, Waterbird Conservation for the Americas, and the U.S. Shorebird Conservation Plan.

North American Waterfowl Management Plan. The North American Waterfowl Management Plan is an international action plan to conserve migratory birds throughout the continent. The plan's goal is to return waterfowl populations to their 1970s levels by conserving wetland and upland habitat. Canada and the United States signed the plan in 1986 in reaction to critically low numbers of waterfowl. Mexico joined in 1994, making it a truly continental effort. The plan is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, private companies, and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species, and people. Plan projects are international in scope, but implemented at regional levels. These projects contribute to the protection of habitat and wildlife species across the North American landscape.

Partners in Flight Bird Conservation Plan. Managed as part of the Partners in Flight Plan, the Interior Low Plateaus physiographic area represents a scientifically based land bird conservation planning effort that ensures long-term maintenance of healthy populations of native land birds, primarily non-game land birds. Non-game land birds have been vastly under-represented in conservation efforts, and many are exhibiting significant declines. This plan is voluntary and non-regulatory, and focuses on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

U.S. Shorebird Conservation Plan. The U.S. Shorebird Conservation Plan is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected. The plan was developed by a wide range of agencies, organizations, and shorebird experts for separate regions of the country, and identifies conservation goals, critical habitat conservation needs, key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face.

Northern American Waterbird Conservation Plan. This plan provides a framework for the conservation and management of 210 species of waterbirds in 29 nations. Threats to waterbird populations include destruction of inland and coastal wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and industries, disturbance, and conflicts arising from abundant species. Particularly important habitats of the southeast region include pelagic areas, marshes, forested wetlands, and barrier and sea island complexes. Fifteen species of waterbirds are federally listed, including breeding populations of wood storks, Mississippi sandhill cranes, whooping cranes, interior least terns, and Gulf coast populations of brown pelicans. A key objective of this plan is the standardization of data collection efforts to better recommend effective conservation measures.

RELATIONSHIP TO STATE WILDLIFE AGENCY

A provision of the Improvement Act, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other federal agencies and state fish and wildlife agencies during the course of acquiring and managing refuges. State wildlife management areas, state wildlife refuges, and national wildlife refuges together provide the foundation for protection of species and biological diversity, and contribute to the overall health and conservation of fish and wildlife species in Tennessee.

The Tennessee Wildlife Resources Agency (TWRA) http://www.state.tn.us/twra/) is the state agency charged with game enforcement responsibilities and management of state natural resources in Tennessee. The TWRA manages approximately 1.35 million acres of state wildlife management areas and state wildlife refuges, coordinates the state's wildlife conservation program, and provides public recreation opportunities, including an extensive hunting and fishing program on state wildlife management areas.

An important part of the comprehensive conservation planning process is integrating common mission objectives where appropriate. The state's participation and contribution throughout this comprehensive conservation planning process provide for ongoing opportunities and open dialogue to improve the management of fish and wildlife resources in Tennessee.

II. Refuge Overview

INTRODUCTION

Signed on November 9, 1962, the Memorandum of Agreement between the Service and the Corps created Cross Creeks NWR. The creation of Cross Creeks NWR was mitigation for waterfowl habitat lost due to the flooding of the former Kentucky Woodlands NWR. This flooding occurred from the creation of Lake Barkley Reservoir, a project of Corps, in 1954. Public Land Order 4560 formally transferred land rights of Cross Creek NWR to the Service (USFWS 2007a; USFWS, no date-a).

The refuge's name originates from the intersection of North Cross Creek and South Cross Creek on the refuge. Cross Creeks NWR is 8,862 acres in size (USFWS 2005a). The mixture of open water, wetlands, woodlands, croplands, and grasslands creates a mosaic of wildlife-rich habitats (USFWS, no date-b). Table 1 shows figures for current estimated habitat acreage by type at Cross Creeks NWR (USFWS, no date-c). The refuge provides valuable wintering habitat for migrating waterfowl and bald eagles. It also provides habitat and protection for threatened and endangered species, such as gray bats, Indiana bats, and least terns (USFWS, no date-d).

Table 1. Approximate acreages of Cross Creeks NWR habitats/land cover

Habitat type	Acres
Open water	2,800
Wetlands	1,500
Woodlands	2,542
Croplands	1,300
Grasslands	600
Infrastructure	120
Total	**8,862**

Cross Creeks NWR stretches 12 miles on either side of the Lake Barkley Reservoir and the Cumberland River between Dover and Cumberland Cities, Tennessee (USFWS 2004) (Figure 1 and Figure 2). This river creates a north side and a south side of the refuge. The reservoir and refuge are on the middle transition portion of the Cumberland River between Cheatham Dam and Barkley Dam. The Corps operates Lake Barkley "primarily for flood control, hydropower, and navigation, as well as secondary purposes of recreation, water quality, water supply, and fish and wildlife habitat" (USFWS 2006a).

Multiple local roads cross the refuge (Figure 2). Cross Creeks NWR receives about 32,000-45,000 visitors annually (USFWS 2006a). Residents and non-residents generate $1.8 million in expenditures annually (USFWS, no date-d).

Figure 1. Vicinity map of Cross Creeks NWR, Tennessee

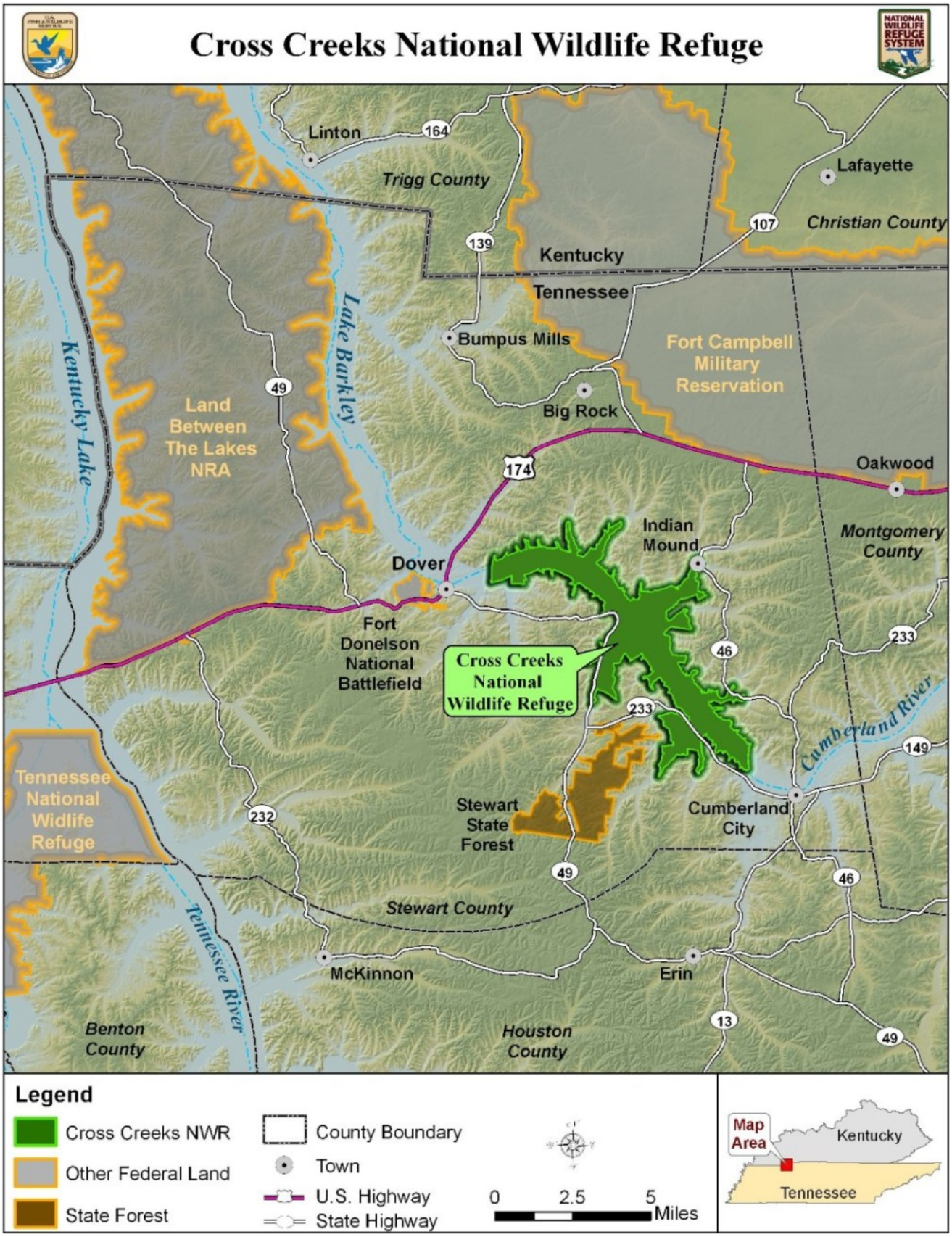
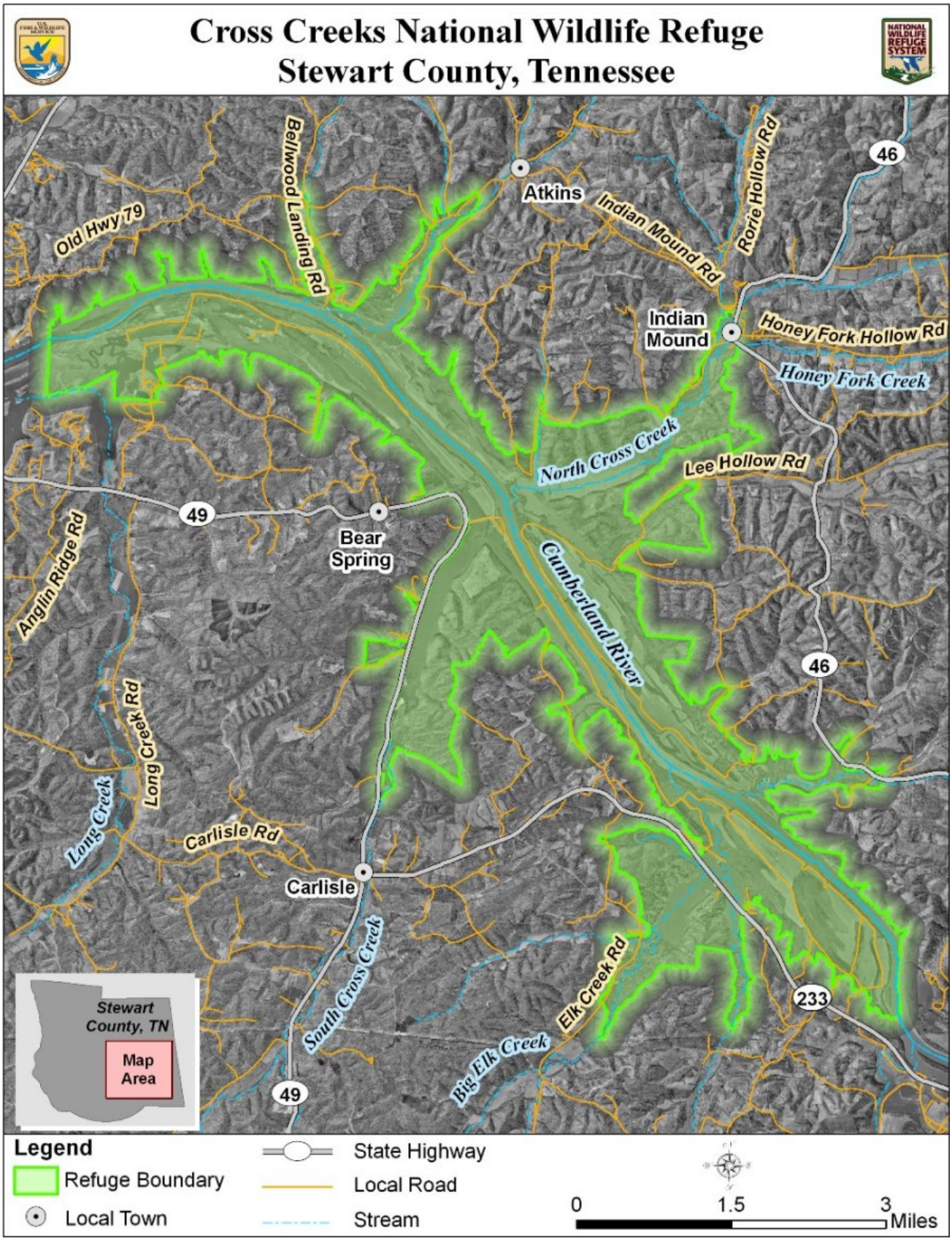


Figure 2. Local vicinity map of Cross Creeks NWR, Tennessee



Cross Creeks NWR is in the Tennessee-Kentucky part of the Mississippi Flyway. Peak wintering populations of ducks reached over 108,000 in the mid-1990s. Recently, duck populations have peaked at 35,000-50,000. Canada geese peak wintering populations reached over 73,000 twice in the early to mid-1990s. However, recent wintering populations are 4,000-5,000, with an average of 15,000 from 1997-2003 (Table 2) (USFWS 2006a; USFWS, no date-d).

Table 2. Wintering duck and goose populations (1986-2004)

Waterfowl Season	Duck Totals	Peak Date	Goose Totals	Peak Date
1986/87	37,463	1/10/87	27,600	1/24/87
1987/88	50,839	1/17/88	32,945	1/3/88
1988/89	58,548	1/24/89	33,735	1/17/89
1989/90	47,012	12/20/89	73,534	12/27/89
1990/91	54,339	12/27/90	19,183	12/27/90
1991/92	61,936	12/10/91	14,946	12/23/91
1992/93	60,895	1/13/93	14,639	1/23/93
1993/94	93,985	1/25/94	73,155	1/25/94
1994/95	71,100	1/21/95	19,400	1/21/95
1995/96	108,630	1/13/96	36,620	1/13/96
1996/97	59,425	12/23/96	11,240	1/21/97
1997/98	56,920	1/9/98	8,880	1/15/98
1998/99	45,950	1/8/99	20,362	1/15/99
1999/00	56,549	1/28/00	13,822	1/28/00
2000/01	44,037	12/28/00	20,023	1/12/01
2001/02	34,462	1/19/02	5,653	1/12/02
2002/03	28,360	12/29/02	4,047	1/19/03
2003/04	35,552	1/10/04	5,398	1/10/04
2004/05	51,219	12/30/04	5,251	12/30/04

(USFWS 2006a)

Bald eagles returned to the refuge in 1983 after a 22-year nesting absence in Tennessee. The refuge now contains a three active nests (USFWS 2008a). The refuge also supports an abundance of wildlife including over 650 species of plants, 250 species of birds, and 250 species of mammals, fish, reptiles, and amphibians (USFWS, no date-d).

REFUGE HISTORY AND PURPOSE

The Improvement Act states that each refuge is to be managed to fulfill the purpose for which it was established but also to fulfill the mission of the Refuge System. If there is a conflict between the two, the purposes for which the refuge was established takes precedence.

The establishing and acquisition authorities for Cross Creeks NWR include the Migratory Bird Conservation Act (16 U.S.C. 715-715r) and the Fish and Wildlife Coordination Act (16 U.S.C. 661-667). These documents state that the refuge:

1. "For use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

2. "Shall be administered by the Secretary of the Interior directly or in accordance with cooperative agreements…and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon."

In addition, Public Land Order 4560 identified the purposes of the refuge to be "To build, operate, and maintain sub-impoundment structures; produce food crops or cover for wildlife; to regulate and restrict hunting, trapping and fishing and to otherwise manage said lands and impoundment areas for the protection and production of wildlife and fish populations" (Public Land Order 1962).

Specifically, the objectives for Cross Creeks NWR are:

- To provide habitat for migratory birds, especially waterfowl.

- Provide habitat and protection for threatened and endangered species – gray bats, Indiana bats, and least terns (and formerly the now de-listed bald eagle and peregrine falcon).

- Provide wildlife-dependent recreation for the public.

- Provide environmental education for students, faculty, and private sector (USFWS, no date-d).

Cross Creeks NWR was established to provide feeding and resting habitat for migratory birds in the Tennessee-Kentucky portion of the Mississippi Flyway, with an emphasis placed on providing habitat for wintering waterfowl. Objectives are achieved through a habitat management program involving sixteen waterfowl impoundments and two deep-water reservoirs. Other methods are cultivation of about 1,200 acres of agricultural land and management of about 170 acres of moist-soil habitat (USFWS, no date-b). Management of the moist soils and impoundments uses a network of levees and water control structures to adjust water levels to provide food and habitat, as well as to manage water levels for agriculture. The cooperative farming program leaves unharvested a portion of the crops grown to provide food and shelter for waterfowl and other animals, while the entire crop on acreage planted by staff is left unharvested for the same purpose (USFWS 2006a).

SPECIAL DESIGNATIONS

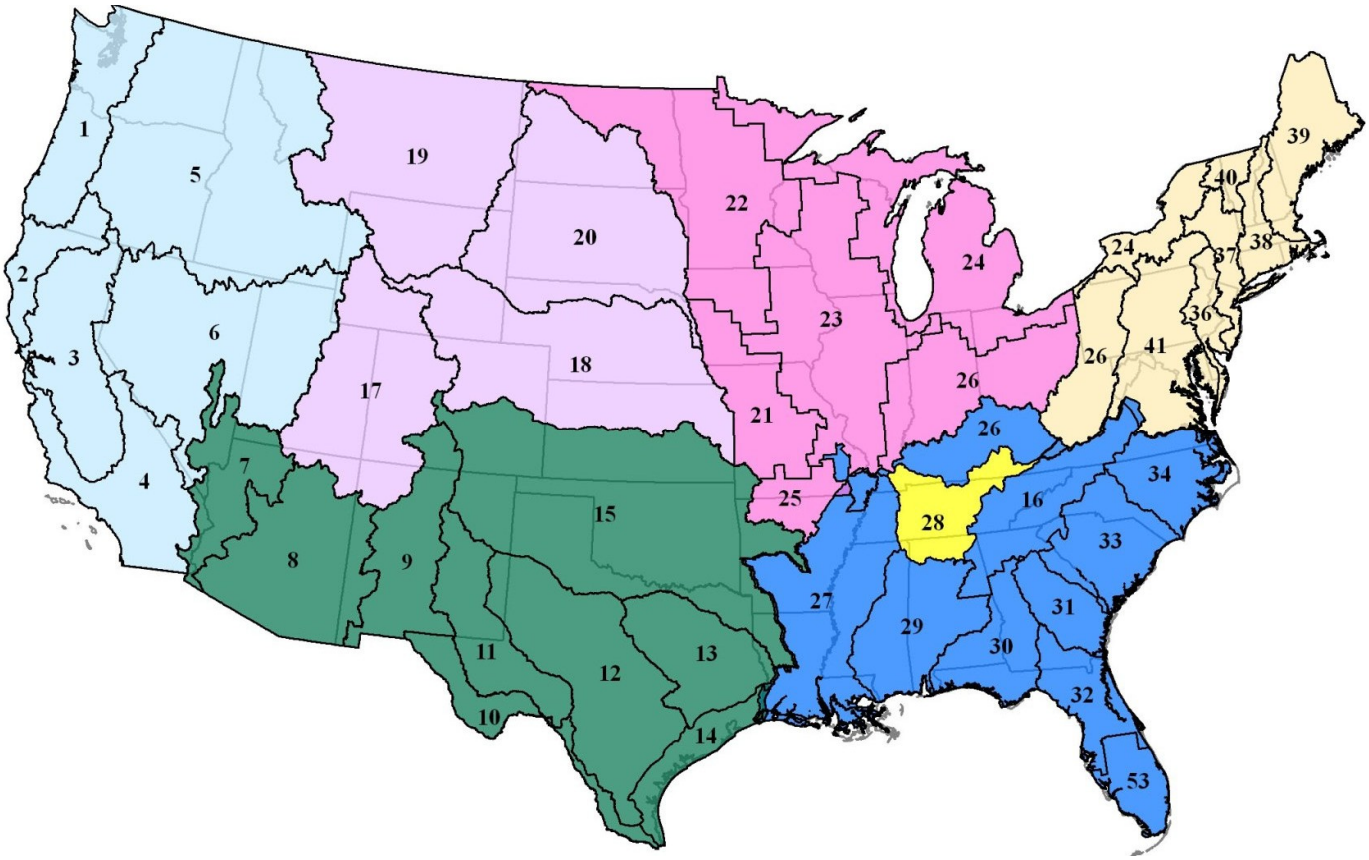
Cross Creeks NWR does not include any lands under special designation. That is, it does not contain congressionally designated wilderness areas, federally designated wild and scenic rivers, demonstration areas, or research natural areas. In addition, oil and gas activities do not occur on the refuge.

ECOSYSTEM CONTEXT

In approaching its mission to conserve wildlife and their habitats throughout the country, the Service has found it useful to divide the entire contiguous United States into 53 distinct ecosystems, drawn primarily along watershed boundaries (Figure 3). Cross Creeks NWR lies within the Lower Tennessee-Cumberland ecosystem (LTCE), which spans portions of Tennessee, Alabama, and Kentucky (28). This ecosystem is further divided into two subunits, the Lower Tennessee River watershed and the Cumberland River watershed. The refuge is in the Cumberland River watershed (LTCE, no date-a).

The LTCE team has developed a strategic planning approach to outline goals, objectives, and strategies to protect and restore the Service trust resources and ecological integrity within the LTCE (LTCE 1995). The LTCE team formed three subgroups – Aquatics, Migratory Birds, and Land Acquisition – to help achieve these plans. The first two subgroups identify priority watersheds, determine research need, and develop projects for the restoration and protection of marine life and migratory birds respectively (LTCE, no date-b; LTCE, no date-c). The last subgroup focuses on providing recommendations for land purchases for the Service (LTCE, no date-d).

Figure 3. Service-designated ecosystems in conterminous U.S.



The LTCE team collaborates with other agencies and concerned groups to help accomplish team objectives. Cross Creeks NWR has contributed to meeting the biological goals and objectives of the LTCE.

Cross Creeks NWR has a special role to play in the conservation of migratory birds. The refuge serves as an important wintering ground for thousands of migratory waterfowl using the Mississippi Flyway and provides a significant contribution to the North American Waterfowl Management Plan. Suitable wintering or nesting habitat occurs on the refuge for species including American black duck, mallard, gadwall, goldeneye, ring-necked duck, bufflehead, Canada goose, great blue heron, bald eagle, and others. In the last 20 years, wintering duck populations peaked at over 108,000 in 1995-96. During the same time period, Canada geese peaked at around 73,000 in 1989-90 and 1993-94, but has since declined to around 5,000 from 2001-2005. The Southern James Bay Population of Canada geese is an important component of the wintering Canada goose population, which has been in steady decline since the early 1990s. Over 40 percent of the black ducks in the Mississippi Flyway observed during the mid-winter survey from the 1970s through the mid-1990s occurred in Tennessee (White 1994; Sanders et al., 1995). Bald eagles nest on the refuge. The refuge also provides stopover habitat for at least 30 shorebird species. The abundance and diversity of managed wetlands at Cross Creeks NWR support at least 30 species of herons, egrets, rails, gulls, terns, and other waterbirds (USFWS 2006a).

REGIONAL CONSERVATION PLANS AND INITIATIVES

The State Wildlife Grants (SWG) program began in Fiscal Year 2002. Under this new program, Congress provided an historic opportunity for state fish and wildlife agencies and their partners to design and implement a more comprehensive approach to the conservation of America's wildlife. A requirement of SWG was that each state complete a Comprehensive Wildlife Conservation Strategy (CWCS) by October 1, 2005. Development of the CWCS was intended to identify and focus management on "species in greatest need of conservation." Congress expects SWG funds to be used to manage and conserve declining species and avoid their potential listing under the Endangered Species Act.

The Tennessee CWCS effort began in 2003. In late 2003, TWRA contracted with The Nature Conservancy (TNC) for the services of its state conservation planning manager to establish and lead a core planning team. The result of this team's work, as well as the collaboration of Tennessee's conservation partners, resulted in the production of the first edition of the state's CWCS. The Service approved the Tennessee CWCS in 2005. The CWCS uses a consolidated GIS system as a component for identifying wildlife species in the greatest need of conservation. The plan also describes the actions necessary for these species' restoration (TWRA 2005).

ECOLOGICAL THREATS AND PROBLEMS

ECOSYSTEM

Much of the region's economic activity – agriculture, lumbering, mining, and recreation – is based on using the watershed's natural resources. Sustaining most of these activities requires maintenance of a healthy ecosystem. Stress from human activities has adversely affected the ecological integrity of the LTCE, and there are indications that this stress is increasing. The exceptionally diverse but damaged mussel fauna illustrates the extent of these adverse impacts. This unique faunal group evolved and flourished in response to a free-flowing riverine ecosystem that was spared the periodic ravages of glaciation. However, since European settlement, and especially during the 20th century, this vast riverine

ecosystem was profoundly altered by impoundments (over 2,000 miles of its rivers are impounded), channelization, siltation, and water pollution. Historically, about 100 distinct mussel taxa existed in the LTCE. This once diverse and abundant fauna has been so decimated that nearly half (46 percent) of the species are either extinct (8 percent), classified as endangered (24 percent), or under review for federal protection (14 percent). During the twentieth century, no other wide-ranging faunal group within the continental United States experienced this degree of loss (LTCE 1995).

Other taxonomic groups are also in jeopardy. There are 74 species in the LTCE that are federally listed as threatened or endangered or are proposed for listing: 28 species of mussels, 19 species of plants, 10 species of fish, 8 species of mammals, 4 species of birds, 4 species of snails, and 1 arachnid. Additionally, based on data from the Breeding Bird Survey, 74 percent of the neotropical migratory bird species breeding in Tennessee suffered declining populations between 1980 and 1989 (LTCE 1995).

Environmental alteration and degradation are continuing challenges to the maintenance of a productive and healthy LTCE. Indigenous biological resources of the area are threatened by land conversion, poor land use practices, direct and indirect physical alteration of the area's rivers and streams, and both point- and non-point-source discharges of pollutants. Herbicides, insecticides, nutrients, and sediment are significant components of the agricultural runoff that adversely affects aquatic systems throughout the area. Acid precipitation and other airborne pollutants are having dramatic effects on aquatic and terrestrial communities, particularly at high elevations. An expanding human population and its increasing demand for renewable and nonrenewable resources further threaten natural resources. Contamination of both aquatic and terrestrial systems through the accidental release of toxic chemicals is a continuing threat. The expansion of urban and suburban areas within the ecosystem and the concurrent loss of forest, agricultural, and other types of open space associated with this expansion have reduced the quantity and quality of natural habitats available to fish and wildlife (LTCE 1995). Another potential threat to the ecosystem is climate change/global warming.

Given the abundance of ecosystem-altering influences past and present, a coordinated landscape-scale effort is necessary to reverse and prevent further declines in biological resources. A healthy ecosystem will provide much more than diverse flora and fauna. It will provide clean air and water, healthy soil, sustainable harvests from forests and fields, and abundant outdoor recreational opportunities for this and future generations (LTCE 1995).

CROSS CREEKS NATIONAL WILDLIFE REFUGE

Dam construction and operation, wastewater outfalls, navigation-related dredging, contaminants, and commercial sand and gravel dredging are likely contributors to the degradation of water quality and substrate habitat in and around the refuge. Habitat fragmentation, habitat degradation, contamination, and human disturbance cause declines of wildlife populations, especially shorebirds and waterbirds. With increasing human population and development in the area, these pressures will only intensify (USFWS 2006a).

Little of the original bottomland hardwood forest remains from the conversion to agricultural and waterfowl impoundments. This results in less habitat for forest-dependent species such as the prothonotary warbler. This is a top species of conservation concern by the Central Hardwoods Joint Venture (CHJV) and the Partners in Flight North American Landbird Conservation Plan (PIF). Other species of concern in this habitat are the belted kingfisher and the green heron. The abandonment of fields has created two habitats that were not historically present: grasslands and scrub-shrub habitats. These encourage native species that were originally uncommon. However, PIF's and

CHJV's species of concern that nest in these habitats include northern bobwhite, eastern meadowlark, blue-winged warbler, and prairie warbler (USFWS 2006a).

Invasive species clog pipes, inhibit water flow, and out-compete beneficial food and cover. Thus, invasive species present a significant obstacle to water management and to migratory bird utilization of pools. Invasive or undesirable species occurring at Cross Creeks NWR include alligatorweed, parrotfeather, spatterdock, kudzu, privet, castor bean, Apple of Peru and Japanese stilt plant. Through impeding water management, invasive species contribute to the less than maximum productivity of the agricultural fields for waterfowl food that requires flooding. Spatterdock exists in the ponds, and alligatorweed out-competes native wetland species. Japanese stilt plant impacts natural regeneration, causes tree stress, and affects nesting habitat (USFWS 2006a).

The refuge's role as a waterfowl sanctuary enhances hunting on nearby public and private lands, as well as providing opportunities for wildlife observation. Sanctuary is a critical part of annual waterfowl conservation and management. Sanctuary provides areas where birds can rest, gain fat, and develop pair bonds that improve the likelihood of successful nesting in the spring and summer. Nearby private waterfowl hunt areas are becoming larger and more developed with increased emphases placed on maintaining flooded food sources that support several thousand waterfowl. The location of the hunt clubs immediately adjacent to refuge boundaries limits the ability of the refuge to provide optimum foraging opportunities for waterfowl during the waterfowl hunting season because of baiting issues. Adjacent hunting also limits the areas that can be used for waterfowl sanctuary without exposing the ducks and geese to disturbance. Waterfowl usually need a buffer between hunters and a sanctuary.

A network of refuge levees and water control structures allows water levels to be controlled for optimum habitat for many species of wildlife. Flooding of the impoundments on the north side of the refuge is primarily rainfall-dependent. Water management capabilities relative to drawdowns are somewhat hindered in most impoundments by the operation schedule of Lake Barkley. The primary objectives of flood control and hydroelectric power dictate the schedule for Lake Barkley's water level operation, which occurs too late for moist-soil management (see the Water Quality and Quantity section below). Thus, the refuge has to use pumping to manage the water levels for moist-soil dewatering and the planting of agricultural fields. At present the refuge does not use pumps to fill impoundments.

PHYSICAL RESOURCES

CLIMATE

The climate for the refuge region is described as having warm, humid summers and mild winters (NOAA 1980; 1993). However, summer temperatures in the 1990s and winter lows well below freezing are not uncommon (Owenby and Ezell 1992). January is the coldest month, with an average temperature of 34.2 degrees Fahrenheit. July is normally the hottest, with an average temperature of 77.8 degrees Fahrenheit. Winters are mild with most snow occurring in January and February (NOAA 2004).

The average yearly rainfall is over 53 inches, with rainfall well distributed throughout all seasons and the wettest season is spring. March is the wettest month at 5.40 inches, and October is the driest at 3.51 inches (NOAA 2004). Seasonal floods in bottomlands and along the shoreline of Lake Barkley are more common during winter and spring months (USFWS 2006a).

GEOLOGY AND TOPOGRAPHY

The refuge is located mostly within Western Highland Rim of the Interior Low Plateau (TWRA 2005). Smalley (1980) describes the topography of the uplands of this region as "narrow winding to moderately broad undulating ridges flanked by steep side slopes" with narrow V-shaped valleys in the upper reaches of the intermittent streams, gradually becoming u-shaped and broader as the streams approach the major river bottoms. Land elevations range from approximately 640 to 354 feet MSL (USFWS 2006a).

Much of the refuge lies within the floodplain of the Cumberland River. These lands are nearly flat to gently sloping with well-drained to poorly drained soils. The remainder of the refuge acreage encompasses the hillsides surrounding the river valley, with a mixture of rolling hills and rocky high bluffs (USFWS 2006a).

SOILS

Refuge lands fall within two soil associations as described by the Stewart County Soil Survey (USDA 1942). The soils of the upland sites within the refuge are classified in the Bodine-Baxter-Nixa-Ennis soil association, which is found in 80 percent of the county. The bottomland sites are included in the Huntington-Lindside-Wolftever soil association, found in 5.5 percent of the county (USFWS 2006a).

“Narrow winding ridges and deep steep-walled v-shaped valleys” characterize the Bodine-Baxter-Nixa-Ennis soil association, found in the highly dissected uplands. Most of the upland forests on the refuge are of this association and have a typical make up of Dickson or Mountview soils on the ridge crests, Bodine or Baxter soils on the slopes, Greendale soils on the foot slopes and alluvial-colluvial fans, Humphrey soils on stream terraces, and Ennis soils on the stream bottoms. Limited occurrences of Pickwick and Paden soils are found on the high terraces, as well as limited occurrences of Lobelville and Lee soils on the bottoms (USFWS 2006a).

This soil association is not well suited to crop production and is primarily comprised of the Baxter or Bodine series. These soils are steep, well-drained to excessively drained, cherty, and have low fertility. Well-drained Dickson and Mountview soils occur on the wider ridgetops, but are isolated. The soils of the narrow tracts of bottomland and foot slopes commonly are deep, well-drained, moderately fertile with variable amounts of chert washed from the nearby hills. In some areas, the chert is common enough to interfere with cultivation (USFWS 2006a).

The Huntington-Lindside-Wolftever soil association is described by the Stewart County Soil Survey as “somewhat undulating, consisting of natural levees near the river and other low ridges and intervening swales or sloughs that run nearly parallel to the river.” Of the dominant soils in this association, the Wolftever is a deep soil which occupies the majority of this area and is commonly found adjacent to the bottom lands on the highest, best-drained parts of the terraces or second bottoms. Silty, moderately well-drained Lindside soils are found in long narrow strips along the old stream channels dissecting the bottoms or in sloughs. Well-drained loamy Huntington soils are typically found closest to the river in long narrow strips on the natural levees with some areas where these soils form broad areas up to 1/4-mile wide. Other less common soils in this association include the poorly drained Melvin soils, which are found in association with the Lindside soils. Sequatchie soil is found in association with Wolftever soils, but is always over sandy alluvim. Staser soils are found in the first bottoms, on the high natural levees. Robertsville soils are found in the terraces in broad depressed areas closest to the uplands. Taft soils are intermediate to the others, but are predominately found in association with Wolfever soils (USFWS 2006a).

This soil association is the most fertile and has been historically used for cultivation and pasture land. However, because of their close association to the river, these soils are subject to flooding and uses are limited by annual water fluctuations. At the time of the soil survey, the Cumberland River valley was the most productive in the country because of these rich soils (USFWS 2006a).

HYDROLOGY

Cross Creeks NWR lies within the Cumberland River Valley. The construction of the Barkley Lock, Dam, and Hydroelectric Power Plant across the Cumberland River near Grand Rivers, Kentucky, formed Lake Barkley. This structure is the last of five Corps facilities managing waters along the Cumberland River from Clay County, Tennessee, to Lyon County, Kentucky. The excess waters of Lake Barkley are discharged into the Cumberland River channel at the lock and dam, which then flows into the Ohio River. A 1 1/2-mile canal connects the Cumberland River with the Tennessee River approximately 1 mile upstream from the dam and allows water to freely flow between these two bodies of water (USFWS 2006a).

Drainage within much of the bottomlands on the refuge is dependent upon the water level of Lake Barkley and to a lesser degree, Kentucky Lake. Under normal water flows, the Corps has sole control over the water management of Lake Barkley and the Tennessee Valley Authority (TVA) has sole control over the water management of Kentucky Lake for the primary objectives of flood control and hydroelectric power production. Uncontrolled flooding of the bottomlands on the refuge occurs when heavy rains fall within the Cumberland River Valley or when the Ohio and/or Mississippi Rivers exceed flood stage, prompting the Corps to hold water in Lake Barkley and to order TVA to reduce discharges from Kentucky Lake (USFWS 2006a).

Site-specific drainage varies considerably throughout the refuge. Drainage within the bottomlands ranges from good to poor depending on the soil type. Upland sites have excellent to excessive drainage, primarily related to topographic position (USFWS 2006a).

There are sixteen impoundments and two deepwater reservoirs on the refuge, with varying water management capabilities. Some of the impoundments on the south side of the refuge have very good drainage and flooding potential. The two reservoirs serve to flood most of the impoundments on the south side during the fall and winter. Flooding of the impoundments on the north side of the refuge is primarily rainfall dependent. On the other hand, the water management capabilities relative to dewatering are somewhat hindered in most impoundments by the operation schedule of Lake Barkley (USFWS 2006a).

AIR QUALITY

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

Compared to other counties in the United States, Stewart County, Tennessee, has relatively high emissions of air pollutants. It ranks in the 90th percentile for nitrogen oxide emissions and sulfur dioxide emissions. For the other pollutants, the county is at or below the 40th percentile (Scorecard 2005).

Areas where the ambient air quality does not meet the NAAQS are said to be non-attainment areas. Areas where the ambient air currently meets the national standards are said to be in attainment. Stewart County, Tennessee, is in attainment for all six criteria pollutants (USEPA 2002a; USEPA 1995).

WATER QUALITY AND QUANTITY

In Tennessee, the most common causes of pollution in rivers and streams are sediment/silt, habitat alteration, pathogens, and nutrients. The main sources of these pollutants are agriculture, hydrologic modification, municipal dischargers, and construction. The leading causes of pollution in reservoirs and lakes are organic substances, like PCBs, dioxins, and chlordane, plus nutrients, sediment/silt, and low dissolved oxygen. The principal source of problems in reservoirs and lakes is the historical discharge of pollutants that have accumulated in sediment and fish flesh. Other sources include agriculture, hydrologic modifications, municipal dischargers, and construction (TDEC 2006).

"Fully supporting" means that the watershed is able to support all designated uses. Less than half of Barkley Reservoir is in Tennessee with the rest being in Kentucky. Lake Barkley Reservoir in Tennessee is fully supporting (TDEC 2006). Dam construction and operation, wastewater outfalls, navigation-related dredging, contaminants, and commercial sand and gravel dredging are likely contributors to the degradation of water quality and substrate habitat in and around the refuge (USFWS 2006a).

The TVA operates a coal-fired electric plant upstream on the Cumberland River at Cumberland City, Tennessee. Toxic wastes and air and water pollutants emitted by this plant are monitored by the Environmental Protection Agency (USEPA 2008).

As noted above in the section on hydrology, drainage within much of the bottomlands on the refuge is dependent upon the water level of Lake Barkley and to a lesser degree, Kentucky Lake. Lake levels are typically higher in the summer, reaching 359' mean sea level (MSL) and lowered to a winter pool level of 354 MSL for floodwater storage (USFWS 2006a).

On the refuge, a network of levees and water control structures allow water levels to be controlled for optimum habitat for many species of wildlife. Current water management capabilities, which are largely influenced by Lake Barkley Reservoir operations, significantly limit the area that can be planted in corn and then flooded. These crops provide food and shelter for migrating and resident wildlife. Currently, the operations' schedule requires that the Lake Barkley reservoir maintains its winter pool (354') until April 1, and then it quickly rises 5 feet to the summer pool elevation (359') by May 1. A slow fall drawdown begins on July 5 and reaches winter pool by December 1. The July 5 drawdown is too late to plant corn at low elevations and is on the late side of desirable moist-soil management drawdowns. The only option to improve refuge management capabilities is to increase pumping capacity (USFWS 2006a).

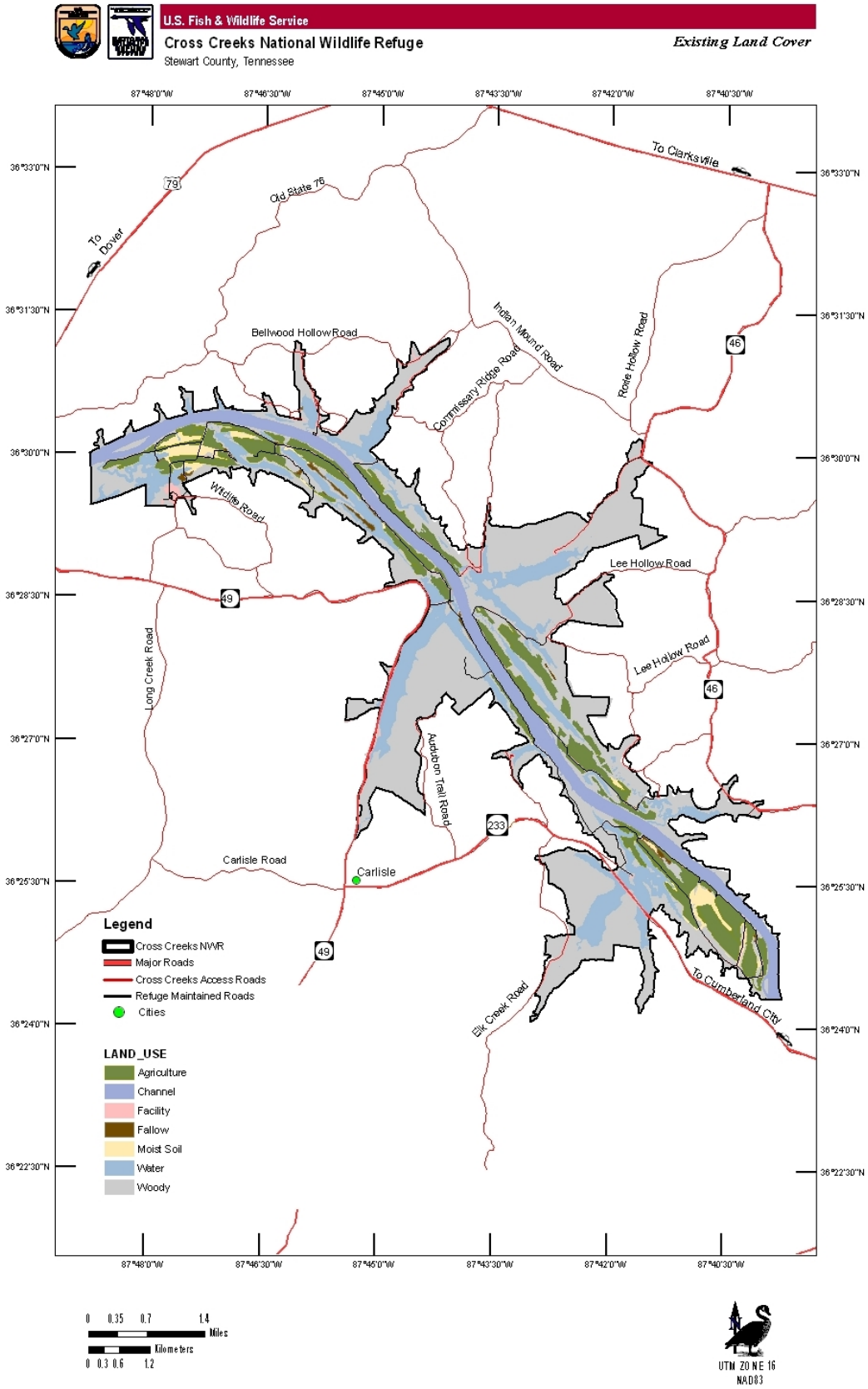
BIOLOGICAL RESOURCES

In the early 1990s, a detailed floristic inventory of the refuge was conducted by Austin Peay University and the results were published in the Journal of the Southern Appalachian Botanical Society. This inventory documented over 600 species, including several state-listed species.

HABITAT

Cross Creeks NWR consists of rich bottomlands surrounded by rolling, heavily forested hills and rocky, limestone bluffs. Deciduous woodlands characterize the surrounding hillsides, while the bottomlands primarily consist of open water impoundments and cultivated fields. The types of habitats found on the refuge are cropland, moist-soil vegetation, forested uplands, isolated bottomland hardwoods, and open water habitats. A biological review in 2006 of Cross Creeks NWR discussed these five habitats. Brief descriptions of each of the Cross Creeks NWR habitats are given below (USFWS 2006a). Figure 4 depicts the layout of the refuge's various habitats or land cover.

Figure 4. Distribution of habitats and land cover at Cross Creeks NWR



Cropland

Refuge cropland acres vary in total production each year between 1,200-1,300 acres, depending on specific fields in production and those left fallow. There are currently (2008) two cooperative farmers on the refuge, one on the north side of the Cumberland River and one on the south side. Crops planted by cooperative farmers consist of corn, soybeans, and winter wheat. A strict corn/soybean rotation is maintained with roughly half the acres in each crop in a given year. The current refuge share is 25 percent of the corn, which is left standing in the fields following the harvest of the farmer's share. In substitution for 25 percent of the soybeans, the refuge's share consists of several acres of winter browse that is planted by the cooperative farmers. In accordance with current refuge policy cooperative farmers plant winter wheat at a 1:1 ratio for soybeans. During most years and in order to meet the objective for goose browse, the refuge must also plant several acres of winter wheat or a substitute crop to make up the difference. In addition, the refuge staff currently plants several impoundments in Japanese millet each year for wintering waterfowl (USFWS 2006a).

Moist Soil

Currently around 170 acres are actively managed for moist-soil production on the refuge. A network of levees and water control structures allows water levels to be controlled for optimum habitat for many species of wildlife. Current staffing levels limit active control of moist-soil areas to only water manipulation. Much of the original moist-soil habitat has reverted to woody vegetation and invasive aquatic plants, due to inactive management (USFWS 2006a). (See croplands for details about water level issues.)

Forested Uplands

Historically, the refuge acreage of forested uplands was estimated at one-third of the total refuge acreage. With reforestation projects and natural regeneration, current GIS technology has estimated the forested/woody acreage to now encompass approximately 2,542 acres (somewhat less than one-third of the refuge). The majority of the forest is comprised of upland stands that are predominantly oak-hickory (USFWS 2006a).

Bottomland Hardwoods

A small isolated block of remnant bottomland hardwoods occurs in Rattlesnake Hollow and reforested tracts of various oak species run along portions of the main road on the south side of the river. Bottomland hardwood forests historically comprised the floodplain of the Cumberland River. A large number of these forests at Cross Creeks NWR has been converted to agriculture and waterfowl impoundments. Currently, there exists one small tract (under 10 acres) of mature bottomland hardwood forest, consisting of large (greater than 50 cm diameter breast height), flood tolerant trees (USFWS 2006a). One small patch was planted to cypress in the early 1980s.

Bottomland hardwood forests provide habitat for numerous species of breeding birds, including several listed as species of concern by the Central Hardwoods Joint Venture (CHJV) and the PIF. Bottomland hardwoods provide acorns, invertebrates, and some moist-soil seeds. Bottomland hardwoods, with a good red oak component and subject to annual flooding, are essentially nonexistent on the refuge (USFWS 2006a).

Open Water

Cross Creeks NWR has many open water areas, among them the Cumberland River/Lake Barkley, Cub Creek, North Cross Creek, and South Cross Creek. Some of the water impoundments also have open water. Several species of gulls and terns, including the endangered least tern, may frequent the open water and mudflats of the refuge and adjacent Lake Barkley during migration and wintering periods. The deeper water habitats found in the Elk Creek and South Cross Creek Reservoirs attract loons and grebes (USFWS 2006a).

WILDLIFE

Its diversity of aquatic and terrestrial habitats enables many wildlife species to make the refuge their home either during the entire year, during the winter months as many waterfowl do, or during temporary stopovers as do some migratory songbirds (USFWS no date-b). The refuge focuses most of its efforts on waterfowl habitat management, but a variety of these habitat management practices benefits numerous other species. Over 250 bird species have been observed on the refuge. An additional 26 species have been observed and are listed as “accidental” birds (USFWS 2006a). The abundance and diversity of managed and natural wetlands support at least 30 species of herons, egrets, rails, gulls, terns, and other waterbirds. The large bodies of water scattered along the refuge host a diversity of waterbirds associated with lacustrine (lake-related) habitats. In addition, up to 230 species of mammals, fish, reptiles, and amphibians may use the refuge for part or all of their life cycle (USFWS, no date-b).

Waterfowl

Cross Creeks NWR serves as an important wintering ground for thousands of migratory waterfowl using the Mississippi Flyway. The refuge winters between 34,000 – 108,000 ducks. The refuge also serves as an important area for wintering American black ducks. Over 40 percent of the black ducks in the Mississippi Flyway observed during the mid-winter survey from the 1970s through the mid-1990s occurred in the State of Tennessee (Sanders et al., 1995). Other waterfowl species present in considerable numbers during fall and winter include the mallard, gadwall, American wigeon, green-winged teal, pintail, and ring-necked duck. Waterfowl species that nest on the refuge are the wood duck, hooded merganser, and giant Canada goose (resident population) (USFWS 2006a).

Orr et al., (1998) identified Cross Creeks NWR as one of the three critical terminal wintering regions for migratory Canada geese that show fidelity for Deep South wintering areas. The Southern James Bay Population of Canada geese has made up an important component of the wintering Canada goose population. Winter peak populations have varied widely over the last 20 years, ranging from just over 4,000 to 73,000 geese. The average mid-winter inventory population of geese from 1985-89 was 15,400 geese on Cross Creeks NWR. More recently, waterfowl surveys on the refuge indicate a significant decline of geese. The average peak has slumped to approximately 5,000 geese (USFWS 2006a).

A diversity of habitat types occurs on the refuge, with many of them serving to meet the foraging needs of waterfowl. The managed foraging habitat primarily consists of agricultural grains and browse, with some moist-soil areas available. Natural unmanaged habitats also provide important foraging, loafing, pair-bonding, and roosting areas. These natural areas include aquatic plant colonies, mudflats, flooded woodlands, open waters, and scrub-shrub wetlands (USFWS 2006a).

Marsh Birds

Population sizes and trends for many marsh-dependent species are poorly known. Given their secretive nature, they tend to be difficult and costly to survey accurately. The habitats in which they occur are prone to significant impacts from habitat destruction, habitat fragmentation, differing marsh management practices, and other factors. Priority marsh bird species identified by Conway (2005) and are known or suspected to occur on Cross Creeks NWR include: king rail, Virginia rail, sora, American bittern, least bittern, pied-billed grebe, and American coot. Better information and management are needed for these species in many places inland in the southeastern United States (Hunter et al., 2006). Systematic marsh bird surveys have not been conducted and incidental observation data are few (USFWS 2006a). Very little marsh bird habitat is currently present on the refuge.

Shorebirds

Many shorebird species face significant threats from habitat loss, habitat degradation, and human disturbance. There is little existing information for many species that would allow a determination of how shorebird populations have been affected by alterations to their habitat. Despite major ongoing conservation efforts, many shorebird populations are declining. Seven highly imperiled shorebird taxa and 23 taxa of high concern are identified in the U.S. Shorebird Conservation Plan (Brown et al., 2001), several of which are in need of management or monitoring in the southeastern United States (Hunter 2002). Among those known or suspected to occur on or near Cross Creeks NWR are highly imperiled birds, such as the piping plover and the buff-breasted sandpiper. Birds of high concern include the American golden-plover, solitary sandpiper, upland sandpiper, western sandpiper, short-billed dowitcher, American woodcock, and Wilson's phalarope (USFWS 2006a).

Shorebird use of habitats at Cross Creeks NWR is poorly known. As with marsh birds, systematic shorebird surveys have not been conducted and incidental observation data are few. The refuge provides stopover habitat for at least 30 shorebird species. The timing and duration of the moist-soil and agricultural impoundments coincides with the spring migration period of most shorebird species. During the fall when most of the impoundments are in the process of being flooded, shorebird habitat occurs mostly on Lake Barkley during the Corps' annual drawdown. Several species of gulls and terns, including the endangered least tern, may frequent the open water and mudflats of the refuge and adjacent Lake Barkley during migrating and wintering periods (USFWS 2006a).

Colonial Nesting Waterbirds (long-legged waders)

Like most waterbird species, many colonial waterbird species have experienced population declines related to habitat loss and fragmentation, human disturbance, and the effects of contaminants. Colonial waterbird species of concern identified in the North America Waterbird Conservation Plan (Kushlan et al., 2002) and known to occur on Cross Creeks NWR include the little blue heron and snowy egret. Species of moderate concern are the yellow-crowned night-heron, black-crowned night-heron, and white ibis (USFWS 2006a).

Colonial waterbird use of habitats on Cross Creeks NWR is relatively well-known. Great blue herons, though not presently at risk, nest at two locations on the refuge. One great blue heron rookery is on the north side of the Cumberland River. In May 2006, this rookery had 12 to 20 active nests. The other rookery has not been actively monitored. Systematic surveys of colonial nesting waterbirds have not been conducted, though incidental observation data is good (USFWS 2006a). Since great blue heron nesting colonies facilitate nesting by other species, such as the little blue heron, a species of high concern, and the great egret, systematic surveys are important in documenting if and when

other species have initiated nesting in association with great blue herons (Hunter et al., 2006). However, post-breeding dispersal foraging habitats are especially important for the little blue heron, the snowy egret, and the wood stork (USFWS 2006a).

Upland Forest Birds

The upland forests within Cross Creeks NWR were historically comprised of mature, mesic deciduous forests on rolling hills and rocky, limestone bluffs. These bluffs comprise the majority of the refuge boundary on the north and south sides of the Cumberland River. Upland forest cover currently consists of various age stands ranging from young natural regeneration (under 10 years old) to mature stands of deciduous trees (over 60+ years old). These forests provide habitat for numerous species of upland forest birds, including many listed as species of concern in the CHJV Plan (Fitzgerald 2003), the PIF Interior Low Plateaus Plan (Ford et al., 2000), and the PIF North American Landbird Conservation Plan (Rich et al., 2004). Bird species of concern in mature upland forests at Cross Creeks NWR include the cerulean warbler, worm-eating warbler, wood thrush, Kentucky warbler, Louisiana waterthrush, whip-poor-will, yellow-throated vireo, Acadian flycatcher, yellow-billed cuckoo, great crested flycatcher, and eastern wood-pewee (USFWS 2006a).

The Partners in Flight plan (Rich et al., 2004) has population goals for these species, which still need to be stepped down to the level of the Central Hardwoods Bird Conservation Region (BCR) and Cross Creeks NWR. The global population goals for many species on the list range from increasing populations 100 percent for the cerulean warbler to increasing populations 50 percent for the wood thrush, prothonotary warbler, Kentucky warbler, and maintaining current populations, which is desired for the remainder of the species listed above. Species of highest conservation concern require specific attention at the refuge and Lake Barkley area (USFWS 2006a).

Scrub-shrub Birds

Historically, Cross Creeks NWR maintained approximately one-third of the refuge in forest cover. Natural succession and abandonment of agricultural fields have contributed to the acreage of this habitat type; the majority of these newer reforested areas are still in scrub-shrub or early successional forest. The addition of extensive amounts of early successional forest has likely resulted in an increase in the abundance of a cohort of species that were likely uncommon when the area was primarily mature forest and agriculture. Managing for scrub-shrub near mature forest decreases forest fragmentation in the landscape and may increase habitat quality for mature forest nesting species by providing foraging opportunities for fledglings, as well as a buffer from nest predators and parasites (i.e., brown-headed cowbirds) (USFWS 2006a).

Scrub-shrub provides habitat for numerous species of early successional forest birds, including many listed as species of concern by the CHJV and the PIF North American Landbird Conservation Plan. Bird species of concern nesting in scrub-shrub at Cross Creeks NWR include the blue-winged warbler, prairie warbler, field sparrow, white-eyed vireo, yellow-breasted chat, brown thrasher, and eastern towhee (USFWS 2006a).

The 2005 PIF plan has population goals for scrub-shrub species, which still need to be stepped down to the level of the Central Hardwoods BCR and the refuge. The global population goals for many species on the list range from increasing populations 50 percent for blue-winged and prairie warblers to maintaining current population levels for white-eyed vireo, brown thrasher, and eastern towhee. Species of highest conservation concern require specific attention at the local scale (USFWS 2006a). The northern bobwhite is also a high-priority species at the refuge and occupies scrub-shrub habitats (Dimmick et al., 2002).

Grassland Birds

Historically, grassland was not a component of the habitats found at Cross Creeks NWR where the landscape was dominated by forest and agriculture. Grasslands provide habitat for many species of breeding birds, including many listed as species of concern by the CHJV, the PIF North American Landbird Conservation Plan, and the Northern Bobwhite Initiative (Dimmick et al., 2002). Bird species of concern that nest in grasslands at Cross Creeks NWR include the eastern meadowlark, field sparrow, and northern bobwhite. Grasslands provide nesting, foraging, and roosting areas for these species, but they are commonly found along hedgerows and in scrub-shrub habitat as well. Other species of high conservation concern rarely occurring at Cross Creeks NWR include Henslow's sparrow and grasshopper sparrow. The Henslow's sparrow is not identified on the Cross Creeks NWR species list, although the largest breeding population in Tennessee occurs at Ft. Campbell, less than 20 miles away (USFWS 2006a).

Bottomland Hardwood Forests Birds

Bottomland hardwood forests provide habitat for numerous species of breeding birds, including several listed as species of concern by the CHJV and the PIF North American Landbird Conservation Plan. The top species of conservation concern that breeds in the BLH at Cross Creeks NWR is the prothonotary warbler. Other species of concern that utilize bottomland systems for foraging and perching include the belted kingfisher and green heron. The Swainson's warbler, which is not identified on the bird list for the refuge, would be a rare breeding bird.

The 2005 PIF plan has population goals for bottomland hardwood species, which still need to be stepped down to the level of the Central Hardwoods BCR and the refuge. The global population goals for many species on the list range from doubling global populations of swallow-tailed kite, to a 50 percent increase in prothonotary warbler populations, and maintaining current population levels for Swainson's warbler and others. Species of highest conservation concern require specific attention at the local scale (USFWS 2006a).

Other Birds

The refuge serves as a survey area for the Audubon Society's Christmas Bird Counts (USFWS, no date-d) in which many of the species already discussed are observed.

Barn owls are an uncommon species of owl that commonly nests and roosts in manmade structures. The PIF plan has recognized the barn owl as a species of concern due to its scattered distribution, unknown population status, and rarity (USFWS 2006a).

The American woodcock is a migratory bird species that utilizes forest and scrub-shrub communities near open fields. Woodcock have experienced a range-wide population decline over the last 12 to 15 years (Kelley 2004; Kelley et al., 2006). The primary limiting factors are lack of high-quality habitats (early successional scrub-shrub wetlands sites and high-density stands of saplings). Most woodcock in Tennessee are migratory; fall migration is at its peak in Tennessee in late November and December and spring migration is in mid-to-late February. Migration and preferred winter habitats include moist areas with a very high sapling stem density (less than 2 inches in diameter), especially sweetgum and pine, brushy streams and ditch channels, and cane and briar thickets. Nocturnal habits cause most woodcock to seek out open fields near forest lowlands, where such fields are clear of dense grasses, but contain bare ground patches or rows within mowed or plowed fields (USFWS 2006a).

Favorable turkey habitat and a healthy, huntable population of turkeys exist throughout the refuge. These game birds benefit from the hundreds of acres of grain crops planted each year throughout the area. It is common to encounter in excess of 300 birds in a single flock feeding in agriculture fields during the winter. A significant portion of the grain intended for waterfowl is probably consumed by turkeys. With current (2008) harvest regulations allowing the take of only one bearded turkey per season, the annual turkey population is more related to weather factors, primarily during the spring nesting season, rather than to impacts of hunting (USFWS 2006a).

Mammals

Deer are abundant throughout the refuge, utilizing the diversity of habitats. They heavily use the agricultural fields from summer through the winter months. Foraging activities of high-density deer populations can have a significant negative impact on forest regeneration as well as on agricultural crops. For this primary reason limited hunting of deer is allowed throughout most of the refuge to keep the deer herd in a healthy condition and reduce habitat damage (USFWS 2006a).

Gray and fox squirrels are abundant, particularly where suitable mast-producing hardwoods occur. Squirrels, particularly fox squirrels, also utilize grain crops on the refuge. Due to their high potential reproductive rate, directly related to the availability of hard mast, and high natural mortality rates, it is unlikely that any long-term changes in squirrel population densities have occurred within the available habitat (USFWS 2006a).

Other mammals include beaver, raccoon, muskrat, and groundhog (USFWS, no date-b). Small mammals on the refuge include white-footed mouse, eastern chipmunk, cottontail rabbit, and eastern mole. Several species of bats inhabit the Cross Creeks NWR (USFWS 2005a).

Amphibians and Reptiles

Baseline information for these species does not exist. Nevertheless, Cross Creeks NWR has 70 species of reptiles and amphibians present from documented sightings and expected presence from natural distribution ranges overlapping the refuge (USFWS 2005a; USFWS 2006a).

Fish

The refuge – including Lake Barkley Reservoir on the Cumberland River and adjacent tributaries and impoundments – contain 80 species of fish (USFWS 2005a; USFWS 2006a). Crappie, largemouth bass, bluegill, and catfish are the most sought after species by anglers (USFWS, no date-b).

THREATENED AND ENDANGERED SPECIES

Cross Creeks NWR has diverse habitats which support populations of federally listed species. Protection of these species and their habitats is a priority of the refuge. Federally listed species occurring or known to have historically occurred on the refuge are the Indiana bat (*Myotis sodalis*), gray bat (*M. grisescens*), least tern (*Sterna antillarum athalassos*), piping plover (*Charadrius melodus*), orangefoot pimpleback (*Plethobasus cooperianus*), and pink mucket (*Lampsilis abrupta*) (USFWS 2006a). The bald eagle (*Haliaeetus leucocephalus*) was delisted in 2007, but still protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. This dramatic bird is not only the national symbol but a symbol of Americas' wildlife heritage and Americans' commitment to restore threatened and endangered wildlife.

Indiana Bat and Gray Bat

Indiana bats and gray bats have been collected in Stewart County, Tennessee. It is likely that they periodically occur on the refuge even though there are no records for either species. The refuge has suitable foraging habitat. There are no known caves on the refuge, but caves may be present in the limestone bluffs within close proximity to the refuge. The forested areas contain suitable summer maternity habitat for Indiana bats needed to contribute to the recovery plan for this species (USFWS 1999; USFWS 2006a).

Least Tern

The least tern only occurs on the refuge during spring and fall migrations. Most observations have consisted of single birds. Since no formal shorebird surveys are conducted on the refuge, it is suspected that most occurrences go unnoticed (USFWS 2006a).

Piping Plover

The piping plover is probably a very rare fall migrant on the refuge. However, its occurrence is unverified (USFWS 2006a).

Orangefoot Pimpleback and Pink Mucket Mussels

The orangefoot pimpleback and pink mucket mussels, listed as federally endangered, were historically found in the Cumberland River within the refuge boundary. Lacking surveys, it can only be speculated as to the current existence of these mussel species within refuge boundaries. Dam construction and operation, wastewater outfalls, navigation-related dredging, contaminants, and commercial sand and gravel dredging are likely contributors to the degradation of water quality and substrate habitat in and around the refuge that call into question the continued presence of these species locally (Hubbs et al., in draft).

CULTURAL RESOURCES

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

The area within and surrounding Cross Creeks NWR is rich in history and prehistory. Archaeological investigations indicate that the earliest known presence of human beings may have occurred about 8,000 years ago during the Paleoindian/Early Archaic period. Evidence uncovered by research archaeologists indicates that early inhabitants were hunters and gatherers along the watercourses and within the forests of the area (USFWS 2005a).

Limestone, timber, and deposits of iron ore were all locally abundant. In addition, plentiful streams furnished power and river systems provided transportation to markets. The confluence of these factors spurred the development of an iron industry in the Stewart County, Tennessee, area. This industry reached its peak during the 1850s. The remains of one of the many iron furnace stacks – Bellwood Furnace – is located on refuge property. This site is listed on the NRHP (USFWS 2005a).

The local area is also extremely rich in Civil War history. Nearby Fort Donelson National Battlefield, just downstream from the refuge on the Cumberland River, preserves the battlefield at which in early 1862 a then relatively unknown Union general – Ulysses S. Grant – claimed his first major victory in the war. If Grant had not won at Fort Donelson, then arguably, there would have been no Shiloh, Vicksburg, Appomattox Court House, or White House in his and the nation's future.

SOCIOECONOMIC ENVIRONMENT

Cross Creeks NWR is located in Stewart County, Tennessee. The refuge is near the city of Dover. The refuge is about 75 miles northwest of Nashville, Tennessee (USFWS, no date-b).

Stewart County has about 1/5 the population density of the State of Tennessee (27 versus 130 people per square mile). In 2005, Stewart County's estimated population was 12,969, about 0.22 percent of Tennessee's population of 5,962,959. The county and state population increased by 4.8 percent from 2000 to 2005 (USCB 2007).

About 1/4 of Stewart County's workforce is in management, professional, and related occupations and about another 1/4 is in production, transportation, and material moving occupations. The next highest occupational sector is sales and office occupations at about 20 percent. The biggest employer in industry jobs is manufacturing at about 19 percent followed by educational, health, and social services at about 18 percent. Table 3 shows employment by major industrial sectors (USCB 2007).

Tennessee's statistics are below the national averages for people below the poverty line and median household and per capita income. Tennessee's statistics are well below the national averages for educational attainment levels. Stewart County's statistics are lower for these indicators than Tennessee as a whole. The exception is for people below the poverty line where Stewart County's level conforms to the national average.

In terms of race and ethnicity, non-Latino whites dominate state and county populations. In fact, Stewart County has 93.6 percent non-Latino whites compared to 77.9 percent for Tennessee and 66.9 percent for the USA. This indicates that Stewart County is less diverse and has fewer minorities than the state or the nation. Table 4 illustrates economic and demographic statistics on the county, state, and national level (USCB 2007).

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

As noted earlier, Cross Creeks NWR is an important wintering ground for thousands of migratory waterfowl using the Mississippi Flyway, and is especially important for black ducks and the Southern James Bay Population of Canada geese. Wintering populations of 34,000-108,000 ducks have been documented on the refuge. Cross Creeks NWR's habitat diversity provides for the foraging needs of these waterfowl. The refuge's managed foraging habitat consists mainly of agricultural grains and

browse along with some moist soil areas. The refuge's unmanaged, natural habitats – including aquatic plant colonies, mudflats, flooded woodlands, open waters, and scrub-shrub wetlands – also provide important foraging, loafing, pair-bonding, and roosting areas.

Table 3. Employment of civilian population 16 years and older by industry

Industry	Percent of Population
Agriculture, Forestry, Hunting, Fishing, and Mining	2.9
Construction	10.1
Manufacturing	18.9
Wholesale Trade	1.8
Retail Trade	9.5
Transportation, Warehousing, and Utilities	11.0
Information	1.6
Finance, Insurance, Real Estate, and Rental and Leasing	4.6
Professional, Scientific, Management, Administrative, and Waste Management Services	3.9
Educational, Health, and Social Services	17.9
Arts, Entertainment, Recreation, Accommodation and Food Services	6.8
Other Services (except for Public Administration)	3.8
Public Administration	7.2

Source: (USCB 2007)

Table 4. Comparison of demographic statistics for Stewart County, Tennessee, and the USA

Category	Stewart County, TN	Tennessee	USA
Median Household Income	$34,725	$37,925	$43,318
Per Capita Income	$16,302	$19,393	$21,587
% Below Poverty	12.7	13.5	12.5
% High School Graduates	74.3	75.9	80.4
% Bachelor Degree	10.2	19.6	24.4
% White*	93.6	77.9	66.9
% Black	2.6	16.8	12.8
% Hispanic**	1.3	3.0	14.4
% Asian	1.5	1.2	4.3
% Native American	0.6	0.3	1.0

Source: (USCB, 2007)
*This percentage is of non-Latino whites. ** Indicates Hispanic ethnicity of any race
Note: The numbers do not add to 100 percent due to difference between race (white, black) and ethnicity (Latino and non-Latino) and not including people who identify as multiple races or some other race.

The refuge's role as a waterfowl sanctuary enhances waterfowl hunting on nearby public and private lands. It also provides opportunities for wildlife observation at Cross Creeks NWR. Waterfowl sanctuary is crucial to annual waterfowl conservation and management; it furnishes areas where birds can rest, gain fat, and develop pair bonds that improve the probability of successful nesting in the spring and summer.

To benefit resident wood ducks, the refuge provides and maintains 24 nesting boxes for wood ducks. They are maintained in accordance with the 2003 Regional Wood Duck Management Guidelines for nest box programs. There is not presently any active management for shorebirds, colonial nesting waterbirds, or marsh birds at Cross Creeks NWR. While there is also no active management of landbirds, the refuge partners with others to conduct an annual Christmas Bird Count and North American Migration Count (in conjunction with International Migratory Bird Day).

As mentioned above, active habitat manipulation at Cross Creeks NWR is inhibited by water levels on Lake Barkley Reservoir, which is operated by the Corps "primarily for flood control, hydropower, and navigation, as well as secondary purposes of recreation, water quality, water supply, and fish and wildlife habitat."

In order to furnish forage for waterfowl and other wildlife, the refuge has an active cooperative farming program that cultivates crops (e.g., corn, soybeans, and winter wheat) on between 1,200-1,300 acres annually.

Waterfowl would be best served by growing corn in fields that can later be flooded. However, current water management capabilities, largely determined by operations on Lake Barkley Reservoir, limit the area that can be planted in corn and then flooded. The corn that cannot be flooded to the proper depth has to be mechanically manipulated (knocked down) to make the grain available.

Approximately 170 acres are actively managed as moist soil habitat which requires soil disturbance periodically to set back plant succession.

Sixteen impoundments and two deep-water reservoirs are on the refuge. Their water management capabilities vary. Some of the impoundments on the south side of the refuge have very good potential for drainage and flooding. The two reservoirs serve to flood most of the impoundments on the south side during the fall and winter. Flooding of the impoundments on the north side of the refuge largely depends on rainfall; dewatering is somewhat hindered in most impoundments by the operation schedule of Lake Barkley.

Cross Creeks NWR's upland habitats are dominated by hardwood deciduous forests, scrub-shrub, and a small area of warm season grasses.

Invasive Plants Control

Several species of invasive or undesirable plants, both aquatic and terrestrial, are currently found on the lands managed by Cross Creeks NWR. Spatterdock or yellow pond lily, alligatorweed, apple of Peru, castor bean, parrotfeather, and the Japanese stilt plant are all documented on the refuge. However, the exact locations and extent of infestation are largely unknown.

Invasive and undesirable plants can significantly impact the production of native plants in wetland habitats, including impoundments, ditches and moist-soil units, at Cross Creeks NWR and elsewhere. These plants and sedimentation have also impacted the ability to move water through certain impoundments. If these processes are left unchecked, the affected ditches would eventually become nonfunctional. At present, the refuge carries out limited annual herbicide spraying of aquatic plants alligatorweed, spatterdock, and parrotfeather. Mechanical control – mowing and disking – is also conducted on certain upland plants. Periodic drawdowns are also an acceptable method of controlling invasive aquatic plants in impoundments.

Animal Control Program

Animal control is a management tool that addresses issues such as infrastructure damage, habitat damage, and invasive exotic species. Methods can range from relocation, using means such as live capture, harassment, and habitat modification, to removal, using methods such as capture and euthanasia, shooting, and lethal trapping.

Animal control efforts at Cross Creeks NWR are currently limited to addressing problems beavers cause with water control structures on the south side of the refuge. Beavers frequently clog pipes with debris to the point that they are nonfunctioning. Most of the water control structures on the north side of the refuge are inoperable due to beaver activities. The muskrat is another species that is known to damage refuge infrastructure by burrowing into levees, which can eventually lead to levee failure. If muskrat damage to levees is observed, control efforts for this species should be employed.

Crop depredation by resident Canada geese directly impacts the habitats managed for migratory birds, including competition for the grain planted for and left for waterfowl and over-browsing of natural habitats. The refuge addresses this problem by controlling resident geese populations through hunting.

At banding sites, many predators can become imprinted on these locations as an easy source of food and can render the site useless. Controlling individual marauders may be required.

The nutria is a large rodent native to South America and now naturalized in the southeastern United States. They prefer semi-aquatic habitats and often burrow into riverbanks and levees. Nutria are very prolific and can quickly overpopulate an area. Once nutria are established in an area, they tend to target vegetation essential to maintaining waterfowl populations. There have not been any sightings on the refuge at this time, but nutria have been documented in west Tennessee and in the Tennessee River in northern Alabama. It is anticipated that nutria will eventually occur on the refuge, if they are not already present. When they arrive, steps should be taken to eradicate them from the refuge.

Feral hogs provide popular sport hunting in many parts of the country, although introduction of this large mammal causes significant damage to wildlife habitats. The refuge has received reports that feral hogs have been released on or near the refuge in recent years. As a result, the refuge should monitor the possible occurrence of this species on the refuge and, if discovered, take immediate actions to eradicate it from the refuge.

VISITOR SERVICES

Presidential Executive Order 12996 and the Improvement Act recognized six priority public uses on national wildlife refuges as long as they were compatible with the purposes for which the refuges were established. These uses include hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, which “have been and are expected to continue to be generally compatible uses.” However, these uses are by no means the only permitted public uses on national wildlife refuges. Other uses have been and can continue to be permitted if they are determined to be compatible with the refuge purposes. Some of these include: general boating, canoeing, hiking, and bicycling. All-terrain vehicles are not permitted on Cross Creeks NWR. (See Appendix VI for the uses that are permitted on Cross Creeks NWR.)

Cross Creeks NWR is located about a mile off of Highway 49. An estimated 32,000-45,000 people visit Cross Creeks NWR annually. The refuge is located in close proximity to the Land Between the Lakes National Recreational Area operated by the USDA Forest Service, Fort Donelson National Battlefield (NPS), Fort Campbell Military Reservation, Stewart State Forest, and the State of Tennessee’s Barkley Wildlife Management Area (USFWS, no date-d). Tennessee NWR is within a half-hour’s drive to the west.

The fishing program is the largest public use program on the refuge. Hunting, wildlife viewing and photography, and environmental education are also popular programs. Second to fishing, the primary refuge management emphasis has been on environmental education. There is active participation of volunteers and refuge staff promoting awareness and environmental education in the local communities and schools.

The entire refuge, including the refuge bottomlands used to provide winter waterfowl habitat and sanctuary, is closed to public access from November 15 to March 16, to protect these trust species from human disturbance (USFWS, no date-d). Areas around occupied bald eagle nests are closed to public entry during the nesting season to promote successful fledging of eaglets. When the refuge

waterfowl management units are closed to public entry, several of the units can still be viewed from the refuge visitor center (USFWS 2004).

A variety of signs, such as entrance, boundary, and regulatory, is located throughout the refuge at public use areas. Refuge entrance signs direct the visitor to the visitor center. Signs, kiosks, publications, and the web site provide visitors and prospective visitors with clear information. Two entrance signs are posted on the south side at State Highway 49 before turning on to the main refuge road and at State Highway 49 turning on to South Cross Creek Dike Road. There is another less conspicuous entrance sign on Bellwood Hollow Road and Bellwood Road. Signs on the north side of the refuge have been frequent targets of theft and vandalism (USFWS 2004).

Refuge regulations are communicated to visitors through the use of publications. The refuge's general brochure is designed to welcome visitors and provide basic refuge information, regulations and a map of the public use area. The refuge also has a hunting brochure, a fishing brochure, a bird list, and an amphibians/fish/mammals/reptiles list. The refuge website has pertinent information and links. All of these brochures are available for off-hour visitors at outdoor brochure boxes found at the visitor center and headquarters buildings, as well as the outdoor kiosk next to the visitor center. Figure 5 shows the refuge's public use facilities.

Hunting

Cross Creeks NWR is open to hunting of squirrel, deer, turkey, and resident Canada geese. Hunting is permitted in designated areas only, which exclude the office vicinity, visitor center, maintenance areas, and within 100 yards of a private dwelling (USFWS 2006b). Many other uses of the refuge coincide with the hunting season, and some refuge neighbors expressed safety concerns during public scoping about hunting occurring near private residences.

Although the refuge lacks on-site law enforcement staff, a limited degree of law enforcement staff provided by Tennessee NWR and from Service law enforcement staff stationed at Fort Campbell (USFWS 2004). The refuge also receives assistance from TWRA staff on law enforcement activities. Hunting information is publicized through news releases, visitor contact at the refuge office and visitor center, and distribution of hunting brochures (USFWS 2004).

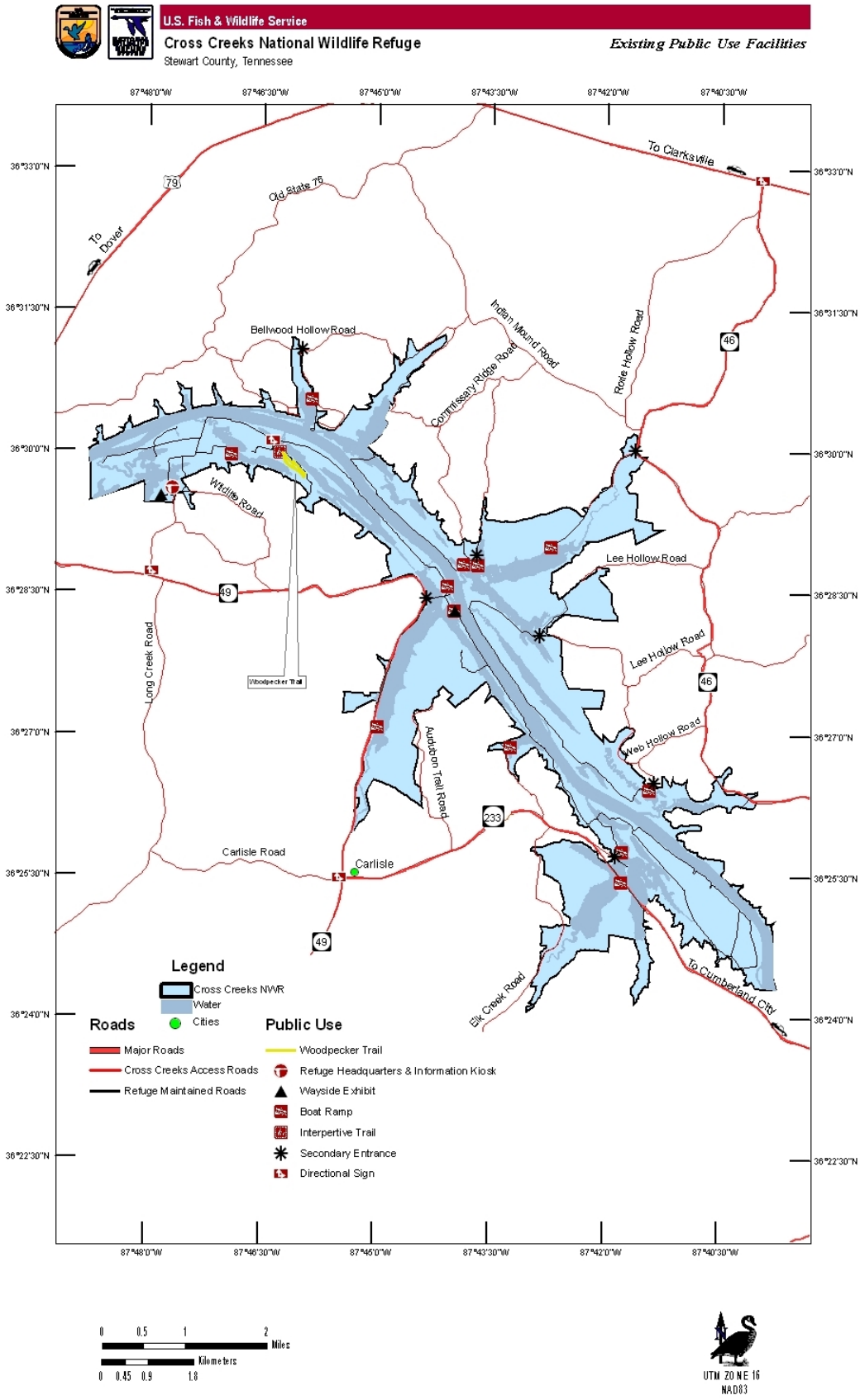
Fishing

Sport fishing is the most popular visitor use at Cross Creeks NWR and about 3,260 acres are open for access to fishing on the refuge. Many military personnel and local citizens fish at the refuge. Open season for Elk and South Cross Creek Reservoirs and all the refuge pools is mid-March through mid-November. Boat access is permitted year-round to the water of Lake Barkley. However, public access to the refuge impoundments is limited to daylight use only (USFWS 2005b). Fishing access in some areas may be closed to the public because of flooding, management purposes, or to minimize disturbance to nesting bald eagles or waterfowl (USFWS 2004).

Wildlife Observation and Photography

The main refuge road, the waterfowl impoundments, Woodpecker Trail, and Lake Barkley offer excellent wildlife viewing opportunities for birders and other enthusiasts. When waterfowl impoundments are closed to the public, there is still outstanding viewing from the visitor center and adjacent areas (USFWS 2004).

Figure 5. Public use facilities at Cross Creeks NWR



A wildlife drive for motorists (auto tour route) begins at the visitor center and provides visitors a panoramic view of refuge impoundments and upland forested areas. The drive allows viewing of waterfowl, shorebirds, wading birds, raptors, neotropical migratory birds, deer, and turkey. The drive is closed November 15 through March 16, but the view from the visitor center overlook can be more spectacular in winter, especially when thousands of ducks and geese are using the pools and agricultural fields. A 1-mile long foot trail, Woodpecker Trail, is open from March 16 through November 14. The trail provides excellent opportunities for viewing spring wildflowers, migratory and resident songbirds, as well as other wildlife. Refuge bird lists and mammal/reptile/amphibian lists are available at the office or visitor center. The refuge is listed in the Tennessee Wildlife Viewing Guide and is one of several officially designated wildlife observation areas in the state (USFWS, no date-d).

Environmental Education and Interpretation

The refuge has worked with local schools to develop an environmental awareness curriculum. The refuge was also a sponsor and main organizer of the Stewart County Earth Camp conducted every summer for up to 30 or more campers. Other contributors included the Park Service, Forest Service, Corps of Engineers, and Tennessee Wildlife Resources Agency, and Stewart County civic groups (USFWS 2004). With the loss of the refuge's park ranger position in early 2008, Earth Camp has been discontinued indefinitely. As requested, the refuge staff gives presentations to local schools and civic groups (USFWS 2004).

Located on Wildlife Road about 1 mile off of Highway 49, the visitor center, administrative office, and maintenance yard are the main facilities at Cross Creeks NWR. Wildlife exhibits, audio-visual presentations, an observation window, amphitheatre style stairway, and a 3-panel outdoor kiosk are located at the visitor center. The auto tour route (the main south side refuge road), foot trail, seasonal fishing, hunting, and wildlife observation are the main visitor activities. The refuge visitor center is closed on the weekend; however, an outdoor, 3-panel kiosk next to the visitor center, and accessible at all times, has interpretive panels and refuge brochures for visitors (USFWS 2004).

PERSONNEL, OPERATIONS, AND MAINTENANCE

Cross Creeks NWR currently has four permanent full-time employees and one temporary/intermittent employee, for a total of five employees. They include a refuge manager, office assistant, maintenance mechanic, equipment operator, and temporary tractor operator. The refuge's annual 2008 fiscal budget was $311,000 (USFWS, no date-d).

Cross Creeks NWR is divided into two distinct management units (north side and south side), with Lake Barkley and the Cumberland River bisecting the refuge in the middle. As a result, the refuge can be accessed by water from a variety of locations along the river shoreline. The refuge headquarters, including administrative site, visitor center, and maintenance yard, is on the South Unit of the refuge off of Wildlife Road near Lake Barkley. The North Unit of the refuge is more isolated and inaccessible (USFWS 2004).

All roads open for the public to drive are gravel. Stewart County maintains the county roads that transect the refuge, but does not maintain entrance roads leading to various parts of the north side of the refuge. In general, the county maintains all roads up to the refuge boundary, and some gravel roads serving homes which cross the refuge boundary. Gravel roads which go to public use or refuge facilities are maintained by the refuge. The parking area at the headquarters can accommodate 10 or more automobiles, and buses have room to turn around. There is also ample parking at the visitor center. Handicap parking is clearly marked. The parking areas at the boat ramps, on both north and south sides of the river, can accommodate anywhere from 2 to 10 vehicles.

Hunters can park along the side of the refuge roads to access hunting areas. Refuge entrance gates that control vehicular access to refuge winter waterfowl habitat are closed from November 15 through March 16 (USFWS 2004).

Partnerships and Volunteers

Cross Creeks NWR enjoys active, productive partnerships with a number of agencies, institutions, and individuals. Among these are the Tennessee Valley Authority, USDA Forest Service, National Park Service, Fort Campbell, Tennessee Wildlife Resources Agency, and Bear Creek WMA (Corps).
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There is active participation of volunteers and refuge staff promoting awareness and environmental education in the local communities and schools (USFWS 2004). Other tasks volunteers perform are waterfowl banding, wildlife surveys, maintenance projects, research studies, and conducting tours (USFWS 2005a). Other priorities prevent the refuge from expanding the volunteer program. Volunteer management will involve additional staff to orient and manage volunteers and provide needed services to supplement current refuge programs. Because of the proximity to Fort Campbell, Land Between the Lakes, and other public land management, there are excellent opportunities for recruiting volunteers and building a stronger volunteer program (USFWS 2004).

The refuge staff has made an effort to start a Friends group. However, at this time, there has been insufficient interest from the community to do so. The refuge will continue to pursue interest in starting a support group. The newly formed Friends group at Tennessee NWR has expressed interest in possibly assisting with the establishment of such a group at Cross Creeks NWR. Many national wildlife refuges around the country enjoy the support of Friends groups, which can take many events, including fund-raising and providing volunteers and outreach, to surrounding communities.

III. Plan Development

PUBLIC INVOLVEMENT AND PLANNING PROCESS

In accordance with Service guidelines and NEPA recommendations, public involvement has been a crucial factor throughout the development of this CCP for Cross Creeks NWR. This CCP has been written with input and assistance from interested citizens, conservation organizations, and employees of local and state agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for the refuge. The Service, as a whole, and the refuge staff, in particular, are very grateful to each one who has contributed time, expertise, and ideas to the planning process. The staff remains impressed by the passion and commitment of so many individuals for the lands and waters administered by the refuge.

Prior to public scoping in 2007, the Service carried out a Visitor Services Review in 2004 and a Biological Review in 2006. The Visitor Services Review was conducted by Service public use and outreach specialists. The review team toured the refuge and identified and discussed the current status of public use programs. Their report made short-term, medium-term, and long-term recommendations for enhancing and improving these programs.

In the Biological Review, a diverse team of federal and state personnel undertook a holistic examination of habitat and wildlife management programs at the refuge. The team then considered how the refuge might fit into accomplishing a number of relevant system-wide and landscape conservation needs. The Biological Review team included staff from the refuge, as well as Service fish and wildlife biologists from the Division of Ecological Services and Division of Migratory Birds. In addition, wildlife biologists from TWRA and the Corps participated. The team's goals, objectives, and strategies set forth in its final report entitled, *Wildlife and Habitat (Biological) Review for Cross Creeks National Wildlife Refuge*, were instrumental in preparing the goals, objectives, and strategies listed in Chapter IV of this CCP.

The core planning team, which consists of the refuge manager, park ranger, a Service natural resources planner from the Regional Office, and a contractor, with experience in comprehensive conservation planning, met for the first time in December 2006, for a tour of the refuge and an overview of its habitat and wildlife resources and public use programs, facilities, and opportunities. The core planning team also conducted additional internal scoping and prepared a preliminary schedule and plans for public involvement. The core team developed a mailing list of the public, landowners, state and tribal agencies, non-profit organizations, and local governments. Letters were sent notifying these parties of the planning process being initiated, and encouraging their participation in the scoping of issues in preparation for developing the CCP.

TWRA was invited in January 2007 to participate on the planning team tasked with preparing the CCP. At an intensive 2-day workshop held in July 2007, the planning team drafted the goals, objectives, and strategies that are the heart of this CCP, guiding refuge management in the coming 15 years. In addition, the team crafted four alternative management approaches for evaluation in the environmental assessment, which was Section B of the Draft CCP. The Corps and the Tennessee NWR also participated in this workshop.

The refuge held one open house and public scoping meeting at the Stewart County Public Library in Dover, Tennessee, on February 27, 2007. Approximately 35 people attended. Presentations about the refuge and the CCP process followed an open house. Afterwards, meeting participants had the

opportunity to publicly express their concerns about the refuge and ideas and suggestions for its future management. In addition, a comment form was distributed for attendees and other interested parties to submit their written comments. Written comments could be submitted right at the meeting, mailed subsequently, or sent via email. A total of 12 comment forms and letters was received during scoping for this CCP. Some of the letters included multiple names, and one person sent two different letters.

SUMMARY OF ISSUES, CONCERNS AND OPPORTUNITIES

The planning team identified a number of issues, concerns, and opportunities related to wildlife conservation, habitat management, refuge recreation, and law enforcement. Additionally, the planning team considered federal and state mandates, as well as applicable local ordinances, regulations, and plans. The team also directed the process of obtaining public input through a public scoping meeting, comment forms, e-mails, letters, and personal contacts. All public and advisory team comments were considered, however, some issues important to the public fall outside the scope of this CCP. The team has considered all issues raised through this planning process, and has developed a CCP that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in the team's best professional judgment, are most significant to the refuge. A summary of the significant issues follows.

FISH AND WILDLIFE POPULATION MANAGEMENT

- Ability to attract and keep waterfowl.
- Help all wildlife – quail, whip-poor-will, owls.
- Return to original intent of inviolate sanctuary instead of the encouragement and expansion of exploitation of the wildlife seeking sanctuary at the refuge. [23 people]
- Produce more waterfowl lands (fields flooded, removal of trees not supporting waterfowl, and plant trees).
- Use refuge for early wood ducks.
- Convert to more modern methods of areas where animals/birds can peacefully exist.
- Maintaining the property for wildlife is most important.
- Include both sides of the Cumberland River during bird counts.
- Hunting is not for deer population control when TWRA has a policy of increasing deer population until half their licensed hunters bag a deer.
- Predator management and native species reintroduction should be closely evaluated. Species do not need government management, just better private landowner incentives.
- Non-game birds should have the same level of priority as other birds, with the realization that the refuge cannot become a sanctuary for all species.

- Create permanent and actively managed shorebird habitat of a series of ponds regulated by adjustable gates. These would be in addition to moist-soil management, which attracts only a limited scope of shore birds and may not be in peak condition during migration season.

- Add American bittern, sedge wren, and marsh wren to the marsh bird species listed for surveys and marsh habitat management.

- Because their presence on the refuge is accidental or extremely casual, eliminate the swallow-tailed kite, white ibis, and wood stork from active management considerations.

- Because the studies in the area have occurred for years, the types of birds found and their habitats are already well known. Reduce or eliminate the amount and time of monitoring the groups of birds. Spend this time providing habitats for these species. Use the theme "Build It and They Will Come."

- Consider managing some areas on refuge for quail. Quail Unlimited may help. Incorporate food and cover plants for quail.

- Implement woodcock management for habitat. Most winter in north Alabama.

HABITAT MANAGEMENT

- Lake water levels are controlled by the Corps of Engineers. At times, these levels are not conducive to refuge management plans.

- Review cropland management and explore options for grassland and old field management.

- Need better control of invasive plants in the lake.

- Crowding population.

- Invasive plants.

- Return to clearing and farming for waterfowl.

- Maintain the grown-up areas except in flooded areas like before.

- Due to global warming and other factors, a management plan for 15 years is not possible and the time frame should be shorter.

- Manage habitats for groups of non-game birds, not just Tier I or rare species.

- The managed shorebird habitat attracts all shorebirds (including species of management concern, such as piping plover and buff-breasted sandpiper) and would be at optimum condition during migration season. Reduced mowing and cultivation of fields would free-up the resources (mainly time) needed for the project.

- Increase non-game grassland habitat.

- Increase forest habitat by taking areas out of cultivation and reverting them to forested habitat. Focus on increasing patch size areas already forested on the refuge.

- Improve forest structure, specifically upland forest habitat, by selective cutting and deer control (increase deer hunts).

- Free up land for non-game bird habitats by allowing only targeted farming by refuge personnel. By retaining all of the crops produced, less land would be needed for cultivation and this acreage should be focused on high use waterfowl areas.

- Because current frequency of roadside cutting is not necessary, eliminate or reduce roadside cutting to once a year or longer to free up resources. The scrubby vegetation that will result is valuable for a variety of species of plants and animals.

- Leave fields and edges covered in summer growth to increase wintering habitat for non-game birds (non-neotropical species). This provides food for the prey and birds as well as providing cover for feeding and roosting.

- Increase non-game bird habitat away from waterfowl.

- Water levels in Lake Barkley are a concern.

- Pond lilies, spadderdock, American Lotus, and other invasives should be addressed.

RESOURCE PROTECTION

- Residential development adjacent to the refuge has resulted in access, trespass, and public use issues.

- Reduce illegal artifact collecting.

- Not enough law enforcement.

- Fishers produce so much litter the fishing areas look like dump sites. These individuals should be fine or banned from area.

- For deterrence and conviction of violators, replace missing southern boundary signs and hang closed signs when the refuge is closed. People currently hunt and gather artifacts during the refuge's closed season by this route.

- Keep the facility for daytime only use because the potential of over-hunting of other species like deer and waterfowl outweigh the benefit of raccoon hunting.

- Some citizens are willing to help apprehend violators.

- Refuge needs to clearly post rules on website and on refuge.

- Hunters using the refuge trespass and otherwise annoy/endanger refuge neighbors. Need to police the areas better for obnoxious activities or close the area for a season. No consequences encourage the behaviors.

- Trash, especially large objects, is prevalent. Refuge needs to clean up trash, particularly the large objects dumped years ago.

- Lack of assisting people in documenting and preserving cultural assets. Promote preservation of refuge's cultural assets by people with emotional ties to refuge. Be able to direct interested volunteers to a source of technical information to assist them with their efforts.

- No federally held land should exist. Only state-held land should exist.

- Public lands are managed for recreation of a wealthy few and for protection of species.

- Law enforcement needs improvement; the slow response time is a problem that appears to be due to understaffing.

- Keep closed/locked gates closed and locked to reduce trash, misuse, etc. Some try to drive around gates.

VISITOR SERVICES

- Improve boat ramp access and litter control.

- Explore options for handicapped hunts.

- No justification for hunting on refuge. [23 people]

- Poor relationship between refuge and its neighbors because of the hunting issue. [23 people]

- Concern for safety of neighbors from high-powered rifles and other weapons used for deer hunting. This hunting use is recent and contrary to original refuge purpose of animal preservation.

- Allowing hunting causes problems for adjoining landowners.

- Ban hunting and place emphasis on other uses, including fishing, wildlife observation and photography, and environmental education and interpretation. These activities are safer and serve a broader public.

- Prior to allowing hunting, refuge and landowners worked cooperatively to resolve issues. Currently, landowners feel management is unresponsive to landowners' concerns.

- Doe-only deer hunts, no waterfowl hunts.

- Limit use by keeping gates closed.

- Hunting disturbs and alters wildlife breeding behaviors and behavior patterns. Hunting occurring simultaneously with other uses is a serious safety risk. [23 people]

- Hunting is encouraged by management instead of other activities. Hunting occurring in spring and fall prevents other uses being safely pursued.

- Ban all hunting. It is a safety risk to other recreationists.

- Many enjoy using the refuge for biking, walking, and wildlife viewing. Biking and hiking should continue to be available seasonally.

- Refuge archery deer hunting, quota deer hunts, and youth camps are well done. The first two help with managing the deer populations and providing hunters with opportunities for catching trophies. The latter has a wonderful reputation with parents and children.

- Smoking on refuge during droughts can cause fires that can burn out a neighbor. Ban smoking. Flicked butts can cause fires. Butts take up to 26 years to biodegrade and one cigarette butt in a gallon of wild water is sufficient to kill off all daphnia. Cigarettes are more worrisome than bullets.

- Tourism causes overuse and should be an indicator of overuse rather than an indicator of success. Criteria for public use of the refuge should be: does it harm the environment and does it endanger or harm neighbors or others?

- Because hunting occurs, change name of refuge to something other than refuge. Hunting should only occur to keep a species from overpopulation, which was the understanding of environmental groups.

- It is petty not to allow swimming on the refuge when wading for fishing is allowed; swimming does not cause harm.

- The rules surrounding permits and photography on the refuge are onerous – refuge's use of any photographs, length and cost of permit (twice the cost of a hunting permit), and requirement of submitting a shooting schedule.

- One or two monitored gates should be the only access to the land to discourage misuse, etc.

- The neighbors should not complain about the other users of the refuge who have the same rights to the land.

- No additional deer or turkey hunting is needed on the refuge.

- Hunting and wildlife observation do not mix near the interpretive trail. The interpretive trail should be a non-hunting area.

- It would be reasonable to increase the hunting use fee to $20, $30 or $40.

- There should be fees to fish. Fishing sites are the most trashed areas.

- The refuge needs to control hunts better. Need more quota hunts.

- Put a quota on first weekend of turkey season to provide a quality hunt.

- First two weeks of hunting season are the most crowded and problematic.

- Hunters and fishers litter and leave trash.

- Earth camp is the best outreach to kids versus same types of day camps in the area. Earth Fair environmental education programs are well-organized and effective.

- Use fees for all refuge users should be considered.

REFUGE ADMINISTRATION

- Hiring a full-time officer is a top priority
- The only public use position on the refuge staff is targeted for elimination. This will result in less emphasis on public use and the need to create a self-service public use program.
- Waterfowl specialist is needed to assess reconditioning process of refuge to attract and hold waterfowl like it was intended.
- The budget cuts causing reduced staff and services of the refuge are sad. The refuge offers a wonderful resource for our area.
- Lack of attention to both sides of the refuge. Pay attention to both sides of Cumberland River. Attention is lacking on the opposite side from the headquarters of Cumberland River.
- Insensitive treatment of refuge's former landowners; lack of consideration to neighbors. Be considerate.
- Because most of the refuge staff has been there for years, eliminate the manager position instead of the interpretive specialist position. Eliminating the interpretive specialist will greatly reduce the educational value of the refuge.
- Nature preserves and wildlife preserves are comparable to Russian/Soviet lands because they entail the taking of private land and then restricting uses by the public.
- The management and staff are increasingly less competent.
- Fill the Biological Review recommended biologist position with a non-game bird biologist.
- Refuge needs to improve maps for the public; the status of roads (whether they are private or refuge) needs to be better delineated on maps and on grounds.
- Need to define boundaries better on the ground so people don't wander off the refuge. Also, identify roads on 911 system for emergency purposes; work with the county government.
- There are many problems with hunters going off refuge and ignoring the boundary. Surrounding landowners' only major problem with the refuge is with some hunters (primarily turkey hunters) who trespass, drive and park on private roads, and represent a safety hazard, etc. Zone those areas of the refuge next to private, adjoining landowners as no-hunting.
- Public recognizes refuge funding problems; refuge should seek partnerships with private groups to raise funds.
- Delineate boundaries of refuge; in some areas the boundary is not clear (either not enough signs or signs have fallen, disappeared, are not visible, etc.)

WILDERNESS REVIEW

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

In sum, no lands at Cross Creeks NWR meet the stringent criteria for being designated by Congress as a unit of the National Wilderness Preservation System. The refuge does not contain 5,000 contiguous roadless acres, nor does it "generally appear to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."

IV. Management Direction

INTRODUCTION

The Service manages fish and wildlife habitats, considering the needs of all resources in decision-making. But first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the Improvement Act is for the Service to maintain the ecological health, diversity, and integrity of refuges. Public uses are allowed if they are appropriate and compatible with wildlife and habitat conservation. The above-mentioned Act identified hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation as priority wildlife-dependent public uses of the Refuge System. Hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are therefore emphasized in this CCP.

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

Four alternatives for managing the refuge were considered: Alternative A – No Action Alternative (Current Management Direction); Alternative B – Public Use Emphasis; Alternative C – Wildlife Management Emphasis; and Alternative D – Enhanced Wildlife Management and Public Use Program. Each of these alternatives was described in the Alternatives section of the Environmental Assessment, which was Section B of the Draft CCP. The Service chose Alternative D as the preferred management direction.

Implementing the preferred alternative will result in a continuing emphasis on managing habitat for waterfowl, but with expanded management on behalf of other indigenous wildlife. The refuge will also increase opportunities for compatible, wildlife-dependent visitation. It is crucial that a law enforcement presence sufficient to protect the public and natural and cultural resources be provided.

VISION

Cross Creeks NWR was established alongside Lake Barkley Reservoir in 1962 on land transferred from the Corps. It was set aside as part of a mitigation agreement between the Service and the Corps for the inundation of wetlands habitat on the former Kentucky Woodlands National Wildlife Refuge after the construction of Barkley Dam and the inundation of Lake Barkley. The establishing purpose of the refuge was to provide an inviolate sanctuary and manage habitat for migratory birds. Subsequent statutes also mandate the refuge to manage wildlife and habitat in general and for public uses.

Over the foreseeable future, Cross Creeks NWR will continue its emphasis on managing habitat for waterfowl. The refuge will also expand its management activities to include other native birds and wildlife species. In addition, the refuge will strive to be a model for wise land stewardship, including management for all indigenous species of flora and fauna and the control of invasive plants and animals.

Cross Creeks NWR will also continue to serve the American people by expanding opportunities for compatible, wildlife-dependent recreation, such as hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. An adequate law enforcement presence will be provided in order to protect the public and natural and cultural resources. Refuge staff will build on existing partnerships with other agencies and stakeholders in implementing this vision.

GOALS, OBJECTIVES, AND STRATEGIES

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

These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the Improvement Act, the mission of the Refuge System, and the purposes and vision of Cross Creeks NWR. With adequate staffing and funding as outlined in Chapter V, Plan Implementation, the Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

FISH AND WILDLIFE MANAGEMENT

Goal 1: Contribute to healthy and viable native wildlife and fish populations representative of the Lower Tennessee-Cumberland River Ecosystem (LTCE), with special emphasis on migratory birds.

Discussion: Cross Creeks NWR was originally established as a sanctuary for wintering migratory birds and for the conservation and management of all native wildlife, resident as well as migratory. The refuge's diverse habitats support a comparably diverse assemblage of flora and fauna, including several listed species. The refuge is within the Cumberland River watershed of the Service's designated LTCE, and has contributed to meeting the biological goals and objectives of the LTCE.

Objective 1-1: <u>Ducks</u> – Provide foraging habitats to meet the needs of 33,100 to 44,400 ducks for 110 days and other habitats needed for loafing, roosting, molting, and other needs.

Discussion: Cross Creek NWR's complex of managed wintering habitats for ducks will contribute to meeting the goals of the North American Waterfowl Management Plan, Central Hardwoods Joint Venture, and Lower Cumberland and Tennessee Ecosystem Team Bird Conservation Plans. The refuge is an important wintering ground for tens of thousands of ducks using the Mississippi Flyway. It is particularly important for wintering American black ducks. Other well-represented species during the fall and winter include the mallard, gadwall, American wigeon, green-winged teal, pintail, and ring-necked ducks.

Strategies:

- Continue to make available on the refuge a complex of moist-soil habitat, flooded crops, upland crops, and bottomland hardwoods.
- Continue to farm at the current level to provide unharvested corn (or an equivalent amount of other grains) for wintering ducks.
- As much of the refuge share of corn as possible should be kept in locations that are flooded to a depth at which the grain is accessible to ducks. On remaining areas, corn stalks should be mechanically knocked to the ground (manipulated) to make ears and kernels available to ducks.
- Adjust the harvest strategy from strips to blocks, as much as possible, to retain the refuge's share in the locations that will be readily utilized.
- Assess the availability of quality bottomland hardwood habitats for ducks and determine ways to enhance and potentially increase this habitat type.
- Identify and implement means to overcome the impacts that areas adjacent to waterfowl hunting areas are having on refuge waterfowl management strategies.

- Conduct an analysis to determine the portions of the agricultural fields where crops cannot be manipulated. Develop a plan that includes maps depicting impacted areas, acres involved, and tentative habitat objectives that would not involve manipulated grain crops.

- The refuge's share of grain crops should not be taken within the impacted areas if the crop would have to be manipulated to make it available to ducks.

- Consider converting some of the impacted agriculture lands to bottomland hardwoods with a strong red oak component. This will provide waterfowl foraging habitat as well as to help meet forest passerine habitat needs.

- Consider increasing the acquisition boundary as a buffer for forest passerine and waterfowl management.

- Waterfowl population surveys should be conducted at least monthly from November through February. Record the number of birds observed by water management unit and where feasible, habitat type.

- Conduct quantitative analyses of the refuge waterfowl unit survey data, vegetative data, and environmental data to determine if waterfowl use can be correlated with these variables.

- Conduct research that will produce refuge-specific models to better estimate foraging carrying capacity for the managed habitats on the refuge.

Objective 1-2: <u>Geese</u> – Provide adequate foraging habitat to meet the needs of 15,400 migratory Canada geese for 90 days. Evaluate need for foraging habitat every 5 years and adjust accordingly.

Discussion: Cross Creeks NWR is one of three critical terminal wintering regions in the south for migratory Canada geese. The Southern James Bay Population of Canada geese has comprised an important component of the wintering Canada goose population on the refuge. Peak winter populations have varied widely over the last two decades, ranging from just over 4,000 to 73,000 geese. The average mid-winter inventory population of geese from 1985-89 was 15,400 geese. More recently, waterfowl surveys on the refuge indicate a significant decline in goose numbers, with winter peaks averaging approximately 5,000.

The strategies below assume that roughly half of the goose foraging needs will be provided by corn (or an equivalent amount of other grain) and half by green browse. To the extent possible, some moist-soil habitat, flooded crops, upland crops, and green browse should be available within large open areas that are relatively free of woody vegetation and human disturbance.

The strategies under Objective 1-1 on ducks should be consulted as well when implementing this objective.

Strategies:

- In traditional use areas, some large open fields, such as harvested grain or planted wheat fields, should be available for those geese arriving in late September and early October.

- Continue to farm at the current level to provide unharvested corn (or an equivalent amount of other grains) in traditional goose use areas where geese are not reluctant to feed.

- Unharvested row crops that occur in locations where flooding is not likely should be made available to waterfowl throughout the wintering period by mechanically knocking the crop to the ground.
- Provide winter browse in traditional goose use areas (i.e., areas open enough to attract and hold geese).
- In traditional goose use areas, habitats should be kept in an open state (large open fields and clean shorelines) so birds will not be reluctant to use these areas. Woody vegetation along the shoreline in these areas should be removed every 3 to 5 years, as needed.
- Every 5 years, reevaluate the foraging needs of geese and adjust foraging needs as appropriate to sustain or increase the migratory population.

Objective 1-3: <u>Waterfowl Sanctuary</u> – Continue to provide sanctuary for wintering waterfowl and other migratory birds from November 15 – March 16, backed up by increased enforcement to reduce illegal disturbance and trespass. Within 5 years of the date of the CCP, seek opportunities for limited wildlife observation within sanctuary.

Discussion: The refuge's role as a sanctuary enhances waterfowl hunting on nearby public and private lands, as well as providing opportunities for wildlife observation. Waterfowl sanctuary is a critical part of annual waterfowl conservation and management; sanctuary provides areas where birds can rest, gain fat, and develop pair bonds that improve the probability of successful nesting in the spring and summer. It is important that these indispensable activities not be disturbed by refuge visitation. However, limited and carefully monitored wildlife observation opportunities within the sanctuary would provide a service to the public. Opening a portion of the refuge to wildlife observation for a portion of the time can be done on an experimental basis.

Strategies:

- Protect high use wintering waterfowl habitat from human disturbance by closing roads, lands, and waters to public access.
- Maintain the entire refuge as a waterfowl sanctuary by not allowing waterfowl hunting during the wintering period. Since the refuge is a relatively small narrow corridor along the flood plain of the Cumberland River, there is not sufficient area to allow waterfowl hunting without significantly impacting the integrity of the refuge as a sanctuary.
- Continue with the 100 percent closure from November 15-March 16 that now exists on the refuge, until a thorough examination of the prospects for limited wildlife observation facilities and opportunities is completed.
- Consult with other refuges supporting substantial wintering waterfowl populations on their experiences with allowing different wildlife observation facilities, such as wildlife drives, trails, observation platforms and decks, boardwalks, and blinds. Ascertain what the most important parameters connected with waterfowl disturbance are, [e.g., size and salience of artificial structures, proximity to flocks and water, noise (both human and mechanical), numbers of people].
- Conduct an analysis to determine the portions of the agriculture fields where crops cannot be manipulated. Develop a plan that includes maps depicting impacted areas, acres involved, and tentative habitat objectives that would not involve manipulated grain crops.
- The refuge's share of grain crops should not be taken within the impacted areas if the crop would have to be manipulated to make it available to ducks.
- Consider converting some of the impacted agriculture lands to bottomland hardwoods with a strong red oak component. This will provide waterfowl foraging habitat as well as help meet forest passerine habitat needs.

- Provide a greater law enforcement presence to deter violations, such as shooting onto the refuge from the adjacent private lands, and trespass to retrieve downed birds.

Objective 1-4: Wood Ducks – Provide 20-50 properly located and maintained nesting boxes, brood rearing habitat, and feeding areas throughout the refuge.

Discussion: Wood ducks are an important species harvested in Tennessee and the southeast, often ranking first or second in ducks retrieved by the hunting public. Wood duck boxes can make a positive contribution to the well being of this species if properly constructed, located, predator proofed, and managed (yearly maintenance). The Biological Review Team recommended following the objectives and strategies as outlined in the Updated 2003 Guidelines for Wood Duck Management and Banding (Regional Office Division of Migratory Birds).

Strategies:

- At least one nest box check should be made after the breeding season to ensure the box and predator guards are in good condition and to refresh nesting material.
- Expand the number of nesting boxes in suitable brood-rearing habitat, but only if personnel are available for maintenance.
- Map location of boxes, archive species use and nest productivity for wood duck and any other species using the boxes (e.g., screech owl).
- Improve forest and brood habitats via longer timber rotations for riverine hardwoods (100 years).
- Recognize importance of natural cavities and larger, older trees being retained to improve natural cavity formation (see Regional Guidelines regarding wood duck management).
- During timber harvest and thinning activities, those trees that are most likely to develop natural cavities normally should not be cut.
- Recognize that beaver ponds and greentree sites are favored areas for wood duck broods, black ducks, roosting waterfowl, etc.
- Assess the availability of forested and scrub-shrub wetlands on the refuge and assure these habitat types are present throughout the refuge.

Objective 1-5: Marsh Birds – Determine the status of priority marsh bird species at Cross Creeks NWR.

Discussion: Population sizes and trends for many marsh-dependent species are poorly known. Given their secretive nature, they tend to be difficult to survey accurately. The habitats in which they occur are vulnerable to habitat destruction, and, they are also subject to differing marsh management practices and other factors. Priority marsh bird species known or suspected to occur on Cross Creeks NWR include the king rail, Virginia rail, sora, American bittern, least bittern, pied-billed grebe, and American coot. Better information and management are needed for these species in many inland places in the southeastern United States.

There is a lack of suitable and extensive marsh bird habitat. Therefore, systematic marsh bird surveys have not been conducted and incidental observation data are few. The consensus of the Biological Review was that the initial focus of marsh bird management activities on the refuge should be directed at determining marsh bird status and habitat use.

Strategies:

- Conduct inventory of marsh bird species using Standardized North American Marsh Bird Monitoring protocols in order to determine the number of breeding and migrating birds in conjunction with refuge point counts and/or surveys such as Migratory Bird Day.
- Collect and file incidental staff and visitor observation information on numbers of birds, potential nesting observations, and habitat use.

Objective 1-6: Shorebirds – Determine the status of shorebirds at Cross Creeks NWR and implement active shorebird management on at least one impoundment during fall migration. Develop additional partnerships with other agencies, non-governmental organizations, and the public in efforts to inventory shorebirds and possibly in certain habitat management activities.

Discussion: As noted in Chapter II, a number of shorebird species are seriously threatened by habitat loss, habitat degradation, and human disturbance. Despite substantial ongoing conservation efforts, many shorebird populations continue to decline. Seven highly imperiled shorebird taxa and 23 taxa of high concern are identified in the U.S. Shorebird Conservation Plan, several of which are in need of management or monitoring in the southeastern United States. There is a paucity of information on the use of habitats by shorebirds at Cross Creeks NWR. Systematic shorebird surveys have not been conducted and incidental observation data are few. The consensus at the Biological Review was that the initial focus of shorebird management activities on Cross Creeks NWR should be directed at determining shorebird status and habitat use.

Strategies:

- Develop a baseline shorebird inventory through systematic surveys according to the International Shorebird Survey (ISS) protocol.
- Quantify shorebird numbers, length of stop-over, and habitat utilization through systematic inventory during fall (mid-July through September) and spring (mid-March through May) migration.
- Conduct species-specific inventory for buff-breasted sandpiper (short grass areas) and piping plover (early fall migratory).
- If piping plovers are of annual occurrence, work with partners to facilitate providing optimal habitat through earlier drawdowns of Lake Barkley.
- Collect and file incidental staff and visitor observation information on shorebird numbers, potential nesting observations, and habitat use.
- Actively manage appropriate shorebird habitat, where feasible.
- Implement active shorebird habitat management on a minimum of one impoundment annually. Consider Pools 2, 3, and 6 for habitat management.
- Working with partners, determine shorebird habitat availability and use on Lake Barkley.
- In concert with the Corps, conduct shorebird surveys on Lake Barkley according to ISS protocol (see http://www.pwrc.usgs.gov/iss/iss.html) to track shorebird use and timing of migration.
- Working with partners, facilitate a drawdown schedule on Lake Barkley that provides suitable shorebird habitat during fall migration (July through September).

Objective 1-7: Long-Legged Wading Birds – Develop a baseline inventory through systematic surveys. Also, develop additional partnerships with other agencies, non-governmental organizations, and the public in efforts to inventory and possibly in certain habitat management activities.

Discussion: Long-legged wading bird use of habitats at Cross Creeks NWR is relatively well-known. Great blue herons nest at two locations on the refuge. The initial focus of colonial waterbird management activities at Cross Creeks NWR should be directed at determining nesting populations and productivity. Since great blue heron nesting colonies facilitate nesting by other species such as the little blue heron, a species of high concern, and the great egret, systematic surveys are important in documenting if and when other species initiate nesting in association with great blue herons. However, post-breeding dispersal foraging habitats are especially important for little blue heron, and snowy egret. Therefore, refuge utilization in late fall and summer should also be recorded.

Strategies:

- Develop a baseline colonial waterbird inventory through systematic surveys.
- Continue to monitor great blue heron heronries.
- Conduct bi-weekly surveys of great blue heron heronries through the nesting season to document number of active nests, number of successfully fledged birds, and presence of other heron/egret species nesting in the area.
- Collect and file incidental staff and visitor observation information on colonial waterbird numbers, potential nesting observations, and habitat use.

Objective 1-8: Landbirds – Conduct baseline inventory of relative abundance, species richness, and distribution of landbirds. Also, develop additional partnerships with other agencies, non-governmental organizations, and the public in efforts to inventory landbirds and possibly in certain habitat management activities.

Discussion: Landbirds include upland forest birds, bottomland forest birds, scrub-shrub birds, and grassland bird species. Staff the refuge does not have at present is needed to conduct the surveys recommended below.

Bird species of concern in mature upland forests at Cross Creeks NWR include the cerulean warbler, worm-eating warbler, wood thrush, Kentucky warbler, Louisiana waterthrush, whip-poor will, yellow-throated vireo, Acadian flycatcher, yellow-billed cuckoo, great crested flycatcher, and eastern wood-pewee.

The top species of conservation concern that breeds in the bottomland hardwoods at Cross Creeks NWR is the prothonotary warbler. Other species of concern that utilize bottomland systems for foraging and perching include the belted kingfisher and green heron. The Swainson's warbler, though not identified on the refuge's bird list for Cross Creeks NWR, could be a rare breeding bird.

Bird species of concern nesting in scrub-shrub at Cross Creeks NWR include blue-winged warbler, prairie warbler, field sparrow, white-eyed vireo, yellow-breasted chat, brown thrasher, and eastern towhee.

Bird species of concern that nest in grasslands at Cross Creeks NWR include the eastern meadowlark, field sparrow, and northern bobwhite. Other species of high conservation concern rarely occurring at Cross Creeks NWR include Henslow's sparrow and grasshopper sparrow.

Barn owls are an uncommon species that commonly nests and roosts in manmade structures. The Partners in Flight plan has recognized the barn owl as a species of concern due to its scattered distribution, unknown population status, and rarity. Wooden boxes are often erected to attract barn owls and such efforts have been successful in areas with high rodent populations.

The American woodcock is migratory. In Tennessee, fall migration peaks in late November and December and spring migration in mid-to-late February. Woodcock numbers have declined across the species' range. The principle limiting factor appears to be a lack of high-quality habitats (early successional scrub-shrub wetlands sites and high density stands of saplings).

Strategies:

- Work with Tennessee Ornithological Society and birding clubs to develop monitoring to assess forest bird abundance and distribution on the refuge.
- Develop a route to adequately survey nightjars (i.e., whip-poor-wills), and conduct such surveys. Possible methodology includes ten roadside surveys (5 minutes in length) separated by 0.5 mile starting 30 minutes after sunset. Also consider surveys during a full moon when nightjars sing later into the night.
- Provide an updated and current bird species list by assessing current bird occurrence and abundance information of bird species and closely critiquing and scrutinizing the existing species list and seasonal abundance codes.
- Assess logistics needed to erect barn owl boxes across the refuge, assess potential locations for boxes, and determine minimum distance between boxes to maximize potential for barn owls.
- Contact local Tennessee Ornithological Society, Audubon chapter, local birding club, lumber company, hardware store, etc., which may be willing to donate supplies and/or time to build and erect owl boxes following established designs for barn owl boxes. Possibilities include gathering suitable scrap wood from Home Depot, Lowe's, and other lumber yards.
- Conduct woodcock peening survey to determine status on the refuge.

Objective 1-9: <u>Game Species</u> – Continue to allow managed, limited hunting for deer, turkey, squirrel, and resident Canada geese.

Discussion: Species hunted on Cross Creeks NWR are white-tailed deer, wild turkey, gray and fox squirrels, and resident Canada geese. All hunts occur within the seasons established by the TWRA, with the exception of the quota deer hunts. The hunting program is limited by the November 15 – March 16 closure period that is designed to reduce disturbance to wintering waterfowl populations. This closure requires most deer gun hunts to occur outside the state seasons.

Strategies:

- Maximize hunter participation by increasing the number of quota gun hunt permits to approximately one permit /40 acres when populations are capable of providing a quality hunt including increasing antlerless harvest quota, creating additional zones to better disperse hunters.
- Continue with small game and turkey hunts within guidelines of TWRA and without access during critical periods (waterfowl migration periods).
- Use volunteers and/or students to operate refuge check stations during the quota hunts to collect data on 30-50 percent of the harvested deer including collection of Age-Weight-Antler data, determination of EHD, CWD, and other diseases of concern.
- Continue with current small game and turkey hunts.
- Continue to limit fall/winter hunt periods, so no activity occurs from November 14 to March 16 in key waterfowl areas.
- As state turkey seasons and bag limits become more liberal, the refuge should consider adopting the changes if they are compatible.

Objective 1-10: <u>Non-Game Species</u> – Within 10 years of the date of the CCP, develop and implement baseline inventories for non-game mammals, reptiles, amphibians, and invertebrates. Also, develop partnerships with other agencies, non-governmental organizations, and the public in efforts to inventory non-game species and possibly in certain habitat management activities.

Discussion: The number of non-game wildlife species at Cross Creeks NWR greatly exceeds the number of game species, waterfowl, and threatened and endangered species. This comparative abundance and the lack of any special status mean that learning about these species has not been a high priority in the face of more pressing needs. Recognizing this information gap, refuge staff recently developed species lists for mammals, reptiles, amphibians, mussels, and fish based largely on the input of local experts. This list contains species of 42 mammals, 41 reptiles, 29 amphibians, and 80 fishes. Overall, general baseline information for "other" wildlife continues to be almost non-existent. Therefore, the Biological Review Team agreed that a high priority is to obtain resources to conduct priority baseline inventories for priority wildlife and their habitats, and to build hypothesis-driven monitoring programs for the highest priority wildlife and habitats.

Strategies:

- Increase efforts to enlist partners, including non-governmental organizations, schools, universities, and local citizens in developing baseline inventories for non-game species.
- Focus a portion of new biologist position's (see Objective 5-1) time on prioritizing non-game species inventories and conducting these inventories.
- Utilize university or U.S. Geological Survey personnel to conduct a baseline amphibian/reptile survey(s) of the refuge, using accepted scientific census and inventory techniques.
- Review the National Partners for Reptiles/Amphibians Plan for species-of-concern and focus on refuge sites potentially harboring those groups.
- Study the North American Amphibian Monitoring Program developed by U.S. Geological Survey to monitor amphibians via calling surveys.

Objective 1-11: <u>Threatened and Endangered Species</u> – Continue to protect all federally listed species under the Endangered Species Act. Also, use partners and volunteers to help determine the distribution and abundance of all listed species.

Discussion: Cross Creeks NWR's diverse habitat support populations of federally listed species. Protection of these species and their habitats is a priority of the refuge. Federally listed species occurring or known to have historically occurred on the refuge are the Indiana bat (*Myotis sodalis*), gray bat (*M. grisescens*), least tern (*Sterna antillarum athalassos*), piping plover (*Charadrius melodus*), orangefoot pimpleback (*Plethobasus cooperianus*), and pink mucket (*Lampsilis abrupta*). Some of these species, such as the wood stork, are rare and are best observed during post-breeding dispersal.

Strategies:

<u>Indiana and gray bats</u>

- Collect baseline inventory data for these species to determine abundance and distribution.
- Management activities scheduled for the refuge should enhance habitat for Indiana and gray bats.

Least tern, piping plover

- Collect baseline inventory data for these species to identify abundance and distribution.
- Collect baseline inventory data for the piping plover to determine abundance and distribution by continuing to partner with TVA in an ongoing shorebird survey throughout the Tennessee Valley.
- Management activities scheduled for the refuge should enhance habitat for the least tern, piping plover, and wood stork.

Orangefoot pimpleback and pink mucket mussels

- Determine the distribution and abundance of orangefoot pimpleback and pink mucket mussels on the refuge.
- Collect baseline inventory data for this species to determine abundance and distribution.

Objective 1-12: Invasive Animal Control – When necessary, control invasive animal species using approved techniques to help achieve refuge conservation goals and objectives.

Discussion: Animal control is a management tool that addresses issues such as infrastructure damage, habitat damage, and invasive exotic species. The animals that require control can be either native or non-native. Methods can range from relocation using means such as live capture, harassment, and habitat modification, to removal using methods such as capture and euthanasia, shooting, and lethal trapping. Existing problems necessitating animal control on the refuge involve beaver, muskrat, and raccoons at banding sites. Potential problems in the near future may occur from the anticipated arrival of exotic nutria, feral hogs, and snakehead fish on the refuge's land and waters.

Strategies:

- When necessary, control certain wildlife species using approved techniques to help achieve refuge conservation goals and objectives.
- Reduce the impact that beavers and muskrats are having on the habitat and water management capabilities.
- Modify the water control structures to reduce the impacts beavers are having on water management.
- Consider using screw gates instead of risers in the larger impoundments to minimize the time period the structure is susceptible to beaver activity.
- Evaluate other structure types and modifications that may reduce beaver problems.
- Control problem beavers and muskrats using a combination of trapping and/or shooting.
- Explore opportunities to utilize qualified volunteers and/or contracted services to provide control.
- Control problem wildlife individuals that have become imprinted on banding sites and other areas where wildlife may be concentrated and made vulnerable by active management.
- Eradicate feral hogs and nutria as they are encountered on refuge property.

HABITAT MANAGEMENT

Goal 2: Conserve, restore, and enhance diverse habitats to provide favorable conditions for migratory and native wildlife species representative of the lower Cumberland River ecosystem.

Discussion: Cross Creeks NWR was established in 1962, specifically for the purpose of mitigating the loss of waterfowl habitat at the former Kentucky Woodlands NWR from construction of Lake Barkley Reservoir. The refuge was intended "…to build, operate and maintain sub-impoundment structures; to produce food crops or cover for wildlife; to regulate and restrict hunting, trapping, and fishing; and to otherwise manage said lands and impoundment areas for the protection and production of wildlife and fish populations." More than 40 years later, the refuge is still guided by these purposes.

Objective 2-1: <u>Flooded Habitat</u> – Focus water management within the impoundments on migratory birds by providing adequate and reliable flooded habitat throughout the refuge, and assuring that water management capability can distribute water in a timely manner. Make a concerted effort to accommodate sport fishing opportunities where and when circumstances allow.

Discussion: Flooded habitats are crucial to fulfilling the refuge's purpose of meeting the needs of wintering waterfowl. There are 16 impoundments and 2 deep water reservoirs on the refuge, with varying water management capabilities. Some of the impoundments on the south side of the refuge have very good drainage and flooding potential. The 2 reservoirs serve to flood most of the impoundments on the south side during the fall and winter. Flooding of the impoundments on the north side of the refuge is primarily rainfall-dependent. On the other hand, the water management capabilities relative to dewatering are somewhat hindered in most impoundments by the operation schedule of Lake Barkley.

Strategies:

- Establish at least three fixed station pumps (final number of pumps to be determined by refuge staff). Potential locations are Pool 4, Pool 8, and Pool 12.
- Experiment with screw gates (or other structures) to reduce beaver and plant problems. Expand beaver control efforts via trapping with volunteer or contract labor.
- Utilize refuge road rehabilitation through Federal program T-21 to assist in improvements to structures.

Objective 2-2: <u>Lake Barkley Water Levels</u> – Continue to work with the Corps and other agencies and groups to assure the needs of the refuge and trust species are considered in lake operations.

Discussion: As noted in Chapter II, and above in Objective 2-1, drainage and habitat management over much of the refuge bottomlands depend on the water levels of Lake Barkley, and to a smaller extent, Kentucky Lake. Under normal water flows, the Corps has sole control over the water management of Lake Barkley and the TVA has sole control over the water management of Kentucky Lake for the primary objectives of flood control and hydroelectric power production. Wildlife needs on Cross Creeks and Tennessee NWRs are an important but secondary consideration for these agencies, and it is important for the Service to assert the needs of waterfowl and other trust species on the two refuges.

Strategy:

- Maintain a positive working relationship and good communication with the Corps and TVA while proactively representing the refuge's interest.

Objective 2-3: <u>Moist-soil Management</u> – Expand efforts to improve the moist-soil management program on at least 300 acres by expanding the invasive plant control program, water management capabilities, and the use of management techniques that set back plant succession.

Discussion: Current estimates are that around 170 acres are actively managed for moist-soil production. During the biological review at Cross Creeks NWR, there were differing viewpoints among the team members as to the need for more moist-soil habitats. Nonetheless, the team agreed that some large percentage of the woody vegetation (e.g., greater than 50 percent) should be removed from the shores of the impoundments on a case-by-case basis.

Once these areas are reclaimed, the resulting habitat type will likely be determined by water management capabilities. If row crop farming under the cooperative farming program is possible, these areas may provide a location for flooded corn in some years. On wetter sites, moist-soil management may be the most practical strategy. It was recommended that the refuge incorporate the millet that is annually planted into maintaining the reclaimed sites that are not suitable to row crop farming. Moist-soil sites need to have soil disturbance periodically to set back plant succession and the disking associated with planting millet will provide this disturbance. Using this strategy, at least 300 acres of moist-soil habitat could be managed on a 3-year rotation without any additional strain on the small staff.

Figures 6 and 7 depict proposed wildlife and habitat enhancements, including moist-soil units.

Strategies:

- Monitor and document the use and value of moist-soil crops each year comparing data on waterfowl use in moist-soil fields' verses agriculture fields for both seed and invertebrate production.
- Adjust agriculture field management within lower portions of fields to enable active moist-soil management on at least 300 acres of fields capable of producing 400-800 pounds per year and/or plant communities exceeding 50-60 percent desirable.
- Soil disturbance should occur in these units on a 2- to 3-year rotation to set back plant succession. This can be accomplished by adjusting the locations where millet is planted each year.
- Provide some flooded habitat in at least one moist-soil unit during the August - October period for early arriving waterfowl.
- Conduct moist-soil plant composition surveys and incorporate models to predict seed and aquatic invertebrate production.
- Increase efforts toward monitoring and controlling invasive or undesirable aquatic plants (i.e., alligatorweed, parrotfeather, and spatterdock) and woody vegetation that impact the productivity of moist-soil habitats.
- Initiate a combination of a complete drawdown and herbicide treatment as a means of controlling invasive or undesirable aquatic plants, and where heavy woody vegetation has encroached, use mechanical methods.
- Keep detailed records of control activities and the results of those efforts. This will assist future management efforts in judging the best control methods.
- Maintain at least 50 percent of the plant composition in each moist-soil unit in plant species considered to be of good to fair food value for waterfowl.

Figure 6. Proposed wildlife and habitat enhancement areas, Segment 1

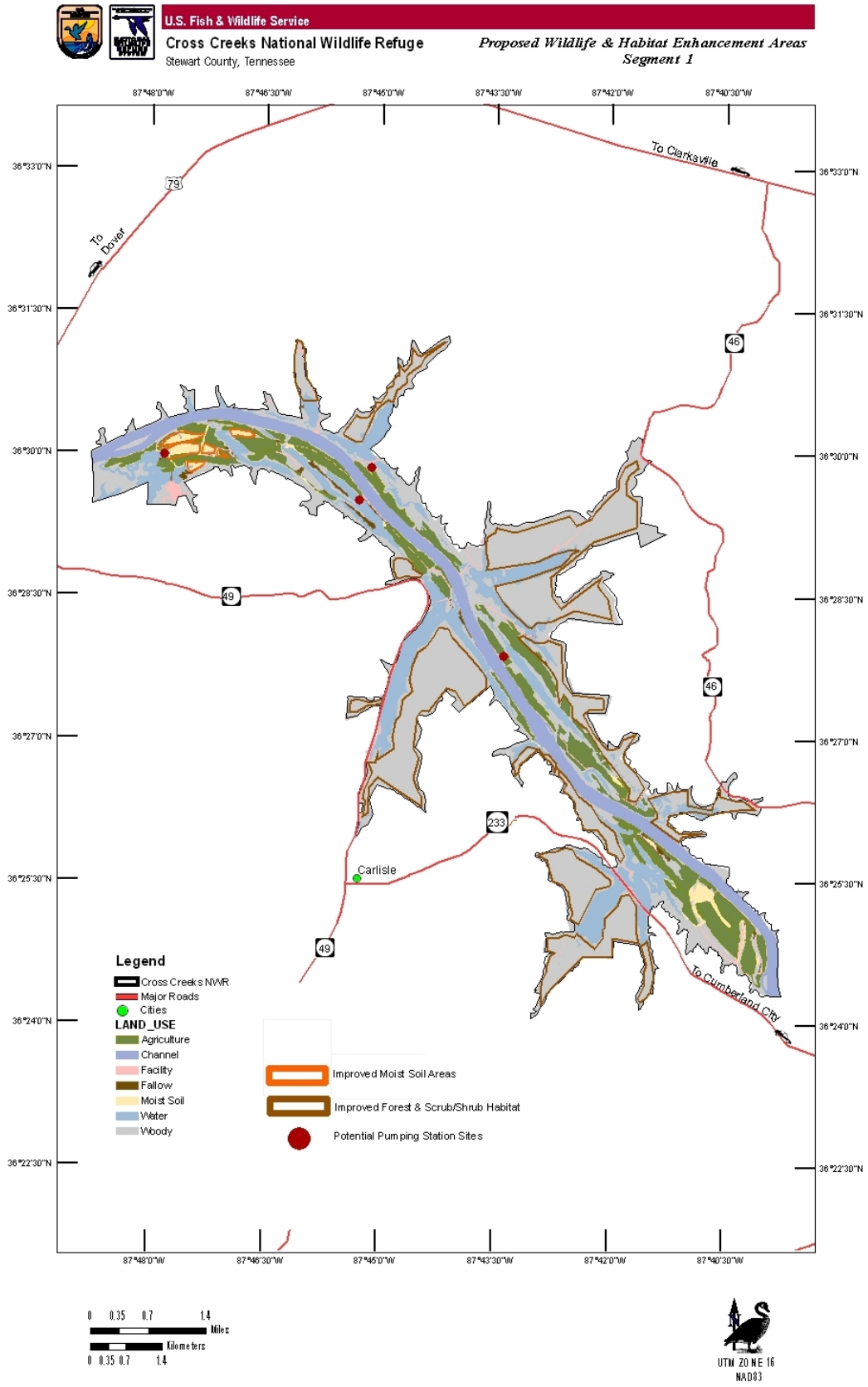
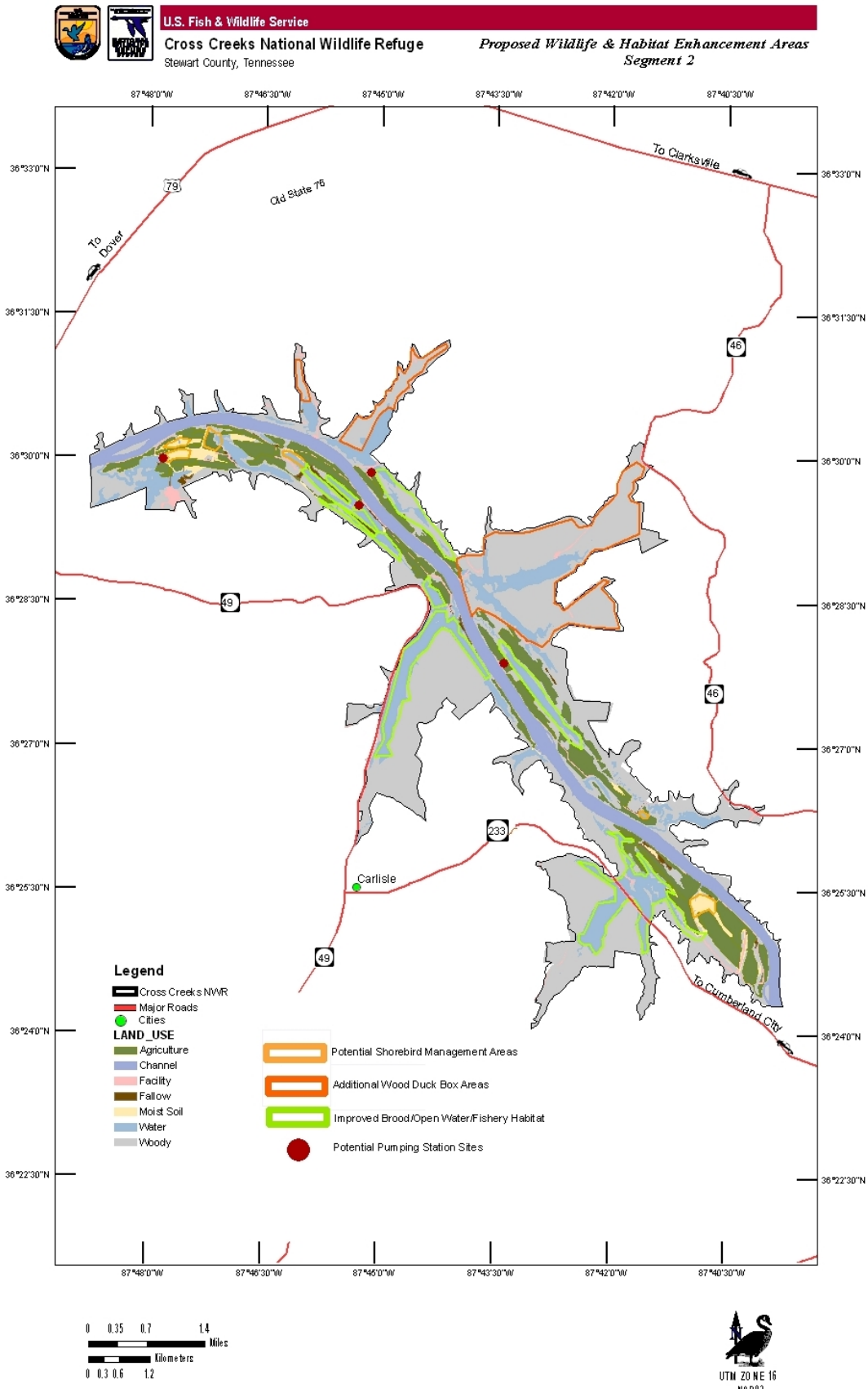


Figure 7. Proposed wildlife and habitat enhancement areas, Segment 2



- Conduct moist-soil plant composition surveys to assist in judging when moist-soil units should be disked or disturbed by other methods. Incorporate the use of models to predict seed and aquatic invertebrate production in conjunction with the composition surveys.
- Soil disturbance activities designed to keep moist-soil units in early successional stages should have a rotational management scheme so a mix of habitats is available (a mosaic of moist-soil habitats for late summer/fall, winter periods, etc.). Normally most moist-soil units will need to be shallow-disked every 3-5 years to increase the percentage of plants considered to be of good food value for waterfowl.
- Where feasible, utilize cooperative farming on a rotational basis with moist-soil habitat to aid in maintaining early successional stages.
- Continue to incorporate the annual planting of 100 acres of millet into the moist-soil units, and disturb the sites on a 3-year rotation.
- In areas where mechanical disturbance is impractical due to soil moisture, access, etc., the use of herbicides should be considered to remove undesirable vegetation. During drought conditions, priority will be given to disking these areas as allowed.
- Stagger drawdowns within and among impoundments throughout the late spring and summer to create a more diverse plant composition.
- Improve water management capabilities within moist-soil units by installing at least three fixed station pumps and increasing the use of portable pumps.
- Monitor plant responses within the first 30 days of drawdowns or water manipulations and, if possible, respond/change water management as needed.
- Document environmental conditions and activities for each moist-soil management unit.
- Water level manipulation is an effective tool for managing moist-soil units, therefore, installing gauges and monitoring water levels in each moist-soil management unit is recommended. Gauge readings should be recorded at least twice a month and should coincide with waterfowl/shorebird surveys, etc., as much as possible.
- Record all water manipulation activities by date for each unit.
- Make written records of all moist-soil management activities in an effort to better understand and predict the results of each activity.

Objective 2-4: <u>Wetland Habitat Diversification</u> – Increase acreage of other habitats, such as mudflats, native submerged and emergent aquatic vegetation, flooded woodlands, and open water that provide food resources, as well as habitats for loafing, resting, roosting, and molting.

Discussion: A diversity of habitats is found on the refuge and many of them serve to meet the foraging needs of waterfowl. The managed foraging habitat primarily consists of agricultural grains and browse, with some moist-soil areas available. Natural unmanaged habitats also provide important foraging, loafing, pair-bonding, and roosting areas. These natural areas include aquatic plant colonies, mudflats, flooded woodlands, open waters, and scrub-shrub wetlands. The key to sound wildlife management is habitat diversity. No one habitat type can meet all the needs of the wintering waterfowl populations utilizing Cross Creeks NWR.

Strategies:

- Continue to work with the Corps to ensure that the mudflats on Lake Barkley are exposed in a timely manner to produce the desired habitat.
- Evaluate the importance of flooded woodland habitats and explore opportunities to enhance and potentially increase these habitats.

- Protect open water habitats on the reservoirs and impoundments that have high waterfowl use from human disturbance.
- Continue closures from November 15-March 16.

Objective 2-5: <u>Forest Management</u> – Within 5 years of the date of the CCP, develop and begin to implement a Forest Management Plan that would aim to benefit nesting and migratory birds.

Discussion: Historically, upland forests on what is now the refuge consisted of mature, mesic deciduous forests on rolling hills and rocky, limestone bluffs. These bluffs comprise the majority of the refuge boundary on the north and south side of the Cumberland River. Currently, upland forest cover consists of various age stands, ranging from young natural regeneration (under 10 years old) to mature stands of deciduous trees (more than 60 years old). These forests provide habitat for numerous species of upland forest birds, including many listed as species of concern.

The Forest Management Plan will provide appropriate management of upland forests for nesting and migratory birds in order to contribute to the population goals of the PIF Plan. The silviculture plan will address issues such as closed and "stagnant" stands, reducing canopy closure to approximately 70 percent, increasing forest canopy and mid-story diversity, and promoting growth of large, dominant canopy trees, that is, those that are greater than 50 centimeters – or about 20 inches – in diameter at breast height (DBH). The Forest Management Plan will develop a timeline for assessing upland forests on Cross Creeks NWR; it will also develop desired forest conditions for upland forests in the Central Hardwoods BCR.

Bottomland hardwood forests historically comprised the floodplain of the Cumberland River. A majority of these forests on Cross Creeks NWR has been converted to agriculture and waterfowl impoundments. Currently, the refuge has only one small tract (under 10 acres) of mature bottomland hardwood forest, which consists of large, flood tolerant trees; however, a majority of river bottoms is reverted agricultural fields comprised of box elder, gum, and maple.
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Bottomland hardwood forests provide habitat for numerous species of breeding birds, including several listed as species of concern by the Central Hardwoods Joint Venture (CHJV) and the PIF North American Landbird Conservation Plan. The 2005 PIF Plan has population goals for bottomland hardwood species, which still need to be stepped down to the level of the Central Hardwoods BCR and the refuge. The global population goals for many species on the list range from doubling global populations of swallow-tailed kite, to a 50 percent increase in prothonotary warbler populations, and maintaining current population levels for Swainson's warbler and others. Species of highest conservation concern require specific attention at the local scale.

Trained staff is needed to conduct standardized forest assessment across approximately 4,000 acres, as well as for database development, a clear description of "desired forest conditions," and a ranking or categorical standard for assessing current and potential habitat within stands.

Strategies:

<u>Upland Forests</u>

- Assess existing forest stands on the refuge using standardized vegetation sampling techniques. Use sampling protocol to categorize stands by age, physical structure, and current and potential habitat for breeding birds. This and other information should be used to establish forest compartments for management.

- Develop standardized protocol for forest assessment. Determine needed measurements, [i.e., basal area, species and number of woody species (in canopy and understory), canopy cover, midstory cover, understory cover, ground cover, and stem density] among other parameters. Determine sampling protocol (i.e., the number of points per stand/compartment and conduct surveys).
- Establish a ranking or category system for forest stands (compartments) in terms of current and potential habitat for breeding birds. Determine which stands would provide the most benefit for upland forest breeding birds if management (timber harvest) was conducted. Assess forest stands in terms of economically harvested logging to attain desired forest conditions.
- Develop document of desired forest conditions for upland forests in the Central Hardwoods BCR.
- Discuss conditions needed for forest birds in upland forests with regional experts, assess results of studies of silviculture techniques on bird abundance and nesting success, and develop a list of management techniques needed to ultimately create "desired forest conditions."
- Obtain and modify the Bottomland Hardwood Resources Working Group's "Desired Forest Conditions" document for upland forest birds.
- Develop a plan for improving forest quality in closed and "stagnant" stands, including potential for a research project on the invasive plant, Microstegium, to determine impact to forest regeneration, tree stress, and understory development.
- Locate forest stands that have a high density of small diameter (generally under 10 centimeters or 4 inches) approximately the same height and little or no understory growth. These stands are likely experiencing high levels of competition among trees, resulting in reduced tree growth, poor forest structure, and lower quality wildlife habitat.
- Reduce stem density to approximately 50 percent across 80 percent of those stands with some small areas [i.e., 0.4-1.2 hectares (1-3 acres)] to release competition, which will promote rapid vertical growth, understory development, and a heterogeneous forest. Develop a funding source to secure the capacity to thin forest stands if suggested practices are not economically viable.
- Develop a document proposing partnerships and a landscape plan for managing for large forest blocks in the Lake Barkley area. Include contact information for public and private landowners who maintain large tracts of forest in the region.
- Produce a map showing forest cover and identifying type of ownership on lands adjacent to the refuge and in the Lake Barkley vicinity.
- Assure consistency between this partnership area and CHJV focal areas and LTCE priorities.
- Conduct analysis of forest cover on public and private lands adjacent to the refuge and in the Lake Barkley vicinity.
- Compile list of owners and managers of large tracts of forested land (i.e., Service, NPS, TWRA, Corps, and others) and their contact information.
- Identify which forest blocks could be combined to form one larger block for forest interior breeding birds (PIF Plan). In addition, identify forest blocks that could be connected either through purchase, partners, and/or management via reforestation and made into corridors for wildlife.
- In coordination with the CHJV, organize a meeting of local partners and develop a larger plan for developing and managing forest for interior forest birds and establishing new corridors.
- Identify a list of properties that, if purchased, would best provide habitat for forest nesting birds and further buffer the waterfowl sanctuary from adjacent hunt clubs.
- Identify land ownership and current land cover for properties adjacent to the refuge.
- Develop a map of current land cover on the refuge and adjacent land.
- Develop a ranking or categorical system that can be used to identify the highest priority sites for purchase.

- Determine which sites could be purchased if funds were to become available, taking into account who owns the land, probability of the landowner selling the property, benefit to forest birds, and potential buffer for the waterfowl sanctuary.

Bottomland Forests

- With the upcoming Forest Management Plan, provide a detailed plan and timeframe for assessing bottomland hardwood forests.
- Assess existing forest using standardized vegetation sampling techniques across compartments. Use sampling protocol to categorize stands by age, physical structure, and current and potential habitat for breeding birds.
- Use standardized protocol for forest assessment developed for upland forest assessment. Determine sampling protocol (i.e., number of points per stand/compartment and conduct surveys).
- Use ranking or categorical system established for upland forest stands. Determine which stands, if any, are in need of management (i.e., those with closed canopy and little understory component, and which would also provide the most benefit for forest breeding birds if timber management was conducted). Assess forest stands in terms of economically harvested logging to attain desired forest conditions.
- Designate the one 10-acre mature bottomland stand on the south side of the refuge as a demonstration area and develop a plan for its management. The stand has large trees, natural disturbance with tree falls and natural mortality, and diverse canopy and understory.
- Make a designation and design and purchase a sign about bottomland hardwood management for display.
- Provide a management plan with maps of areas where fields are infrequently visited by waterfowl and geese (least-used sites) and/or where deer browse is excessive.
- Produce a map which identifies sites where: (1) Deer browse is excessive; (2) usage by waterfowl and geese is low; (3) managing for bottomland hardwood forests would benefit early successional songbirds in the short term and ultimately mature forest species; and (4) forest fragmentation could be reduced but not impact high visitation waterfowl impoundments.
- Identify the highest priority sites and either reforest those sites with tree plantings (on sites greater than 200 yards from a natural seed source) or allow natural succession to occur (on sites less than 200 yards from a natural seed source). Natural succession is likely suitable at most sites.

Objective 2-6: Scrub-shrub Habitat – For the duration of the CCP, explore possibilities of managing for scrub-shrub habitat to benefit certain bird species in suitable locations on the refuge.

Discussion: Historically, Cross Creeks NWR maintained approximately 3,000 acres, about one-third of the refuge, in forest cover. Natural succession and abandonment of agricultural fields has contributed to the addition of nearly 2,200 additional acres of forest cover, the majority currently in scrub-shrub or early successional forest. The presence of more early successional forests has likely increased the abundance of species that were likely uncommon when the area was primarily mature forest and agriculture. Managing for scrub-shrub near mature forests decreases forest fragmentation in the landscape and may increase habitat quality for mature forest nesting species by providing foraging opportunities for fledglings, as well as a buffer from nest predators and parasites (i.e., brown-headed cowbirds).

Scrub-shrub provides habitat for numerous species of early successional forest birds, including many listed as species of concern by the CHJV and the PIF North American Landbird Conservation Plan.

The 2005 PIF Plan has population goals for scrub-shrub species, which still need to be stepped down to the level of the Central Hardwoods BCR and the refuge. The global population goals for many species on the list range from increasing populations 50 percent for blue-winged and prairie warblers to maintaining current population levels for white-eyed vireo, brown thrasher, and eastern towhee. Species of highest conservation concern require specific attention at the local scale. Northern bobwhite is also a high-priority species at the refuge and occupies scrub-shrub habitats.

The appropriate placement of scrub-shrub habitat in the refuge landscape also contributes to other refuge goals and objectives. By increasing scrub-shrub near mature forests, in areas of low crop production, and where crops cannot be manipulated, we may provide direct and indirect benefits to multiple groups of wildlife simultaneously. An open landscape around high visitation waterfowl impoundments may be more attractive to feeding, resting, and molting waterfowl as there would be greater protection from predators. Some reduction in black willow thickets and other small woodlots and hedgerows around impoundments will reduce some nesting habitat for scrub-shrub birds; however, retaining a percentage of these edge habitats in more heavily forested areas will provide high-quality insect-producing habitat for migrating birds and possibly nesting orchard orioles and prothonotary warblers. Reduction of tree lines and isolated woodlots could also reduce hiding spots for the large deer population and may result in small reductions in crop damage.

Strategies:

- Consider increasing the openness of the landscape around impoundments for waterfowl and geese and reducing forest edges which may be “sink” habitats for scrub-shrub birds (i.e., cause a net loss in the numbers of birds from predation, nest parasitism, or other factors).
- Remove some portion of existing hedgerows and isolated woodlots. Problems may include manpower to cut and remove trees and identification of places for disposing of woody debris. One possible solution is to pile downed trees (or fell them accurately) where they are currently standing, which would provide habitat for potentially nesting Bewick’s wrens, as well as snakes and amphibians.
- Develop a map of the refuge showing land in the floodplain of the Cumberland River (i.e., impoundments, riverfront property, and forest cover).
- In Shaw Hill field, develop a site-specific plan to manage for approximately 20 percent scrub-shrub in combination with native warm season grass management.
- Assess existing hedgerows and small isolated woodlots with respect to their location relative to the highest quality waterfowl impoundments, and distance from large forest stands and the Cumberland River.
- Determine which hedgerows and small woodlots could be readily removed and remove those trees to open the landscape for waterfowl and also effectively reduce the quantity of forest edges.
- Explore possibilities of managing for scrub-shrub in areas where no crop manipulation is possible due to restrictions in crop manipulation opportunities.
- Provide a management plan with maps of areas where crop manipulation is not possible and where managing for scrub-shrub would benefit forest birds.
- Produce a map which identifies sites where: (1) No crop manipulation is possible; (2) deer browse is excessive; (3) usage by waterfowl and geese is low; (4) managing for scrub-shrub would benefit early successional songbirds and reduce forest fragmentation; and (5) scrub-shrub would increase the buffer between the refuge and hunt clubs.
- Identify the highest priority sites as per the criteria in the previous strategy and either reforest those sites with tree plantings (on sites greater than 200 meters from a natural seed source) or allow natural succession to occur (on sites less than 200 meters from a natural seed source). Natural succession is likely suitable at most sites.

Objective 2-7: <u>Native Warm Season Grasses</u> – Explore potential benefits of planting and managing native warm season grasses on formerly farmed fields.

Discussion: Historically, grassland was not a component of the habitats found at what is now Cross Creeks NWR. Rather, the landscape was dominated by forest and agriculture. However, as noted earlier, grasslands provide habitat for a number of species of breeding birds, including many species of concern by the CHJV, the PIF North American Landbird Conservation Plan, and the Northern Bobwhite Initiative. Bird species of concern that nest in grasslands at Cross Creeks NWR include the eastern meadowlark, field sparrow, and northern bobwhite. Grasslands provide nesting, foraging, and roosting areas for these species, but they are commonly found along hedgerows and in scrub-shrub habitat. Some other species of high conservation concern rarely occurring at Cross Creeks NWR include Henslow's sparrow and grasshopper sparrow. The Henslow's sparrow is not identified on the Cross Creeks NWR species list, although the largest breeding population in Tennessee occurs at Ft. Campbell, less than 20 miles away.

Strategies:

- Upon completion of Habitat Management Plan, identify and consider potential benefits of planting native grass on selected fields and/or field edges.
- Plant a small demonstration site below Office/Visitor Center for interpretation purposes.

Objective 2-8: <u>Farming</u> – Over the life of the CCP, gradually phase out cooperative farming in favor of force-account or contract farming of wheat, corn, milo, and millet on 600 acres to meet wildlife foraging objectives.

Discussion: The refuge's farm program exists to provide forage opportunities for waterfowl. When the refuge was established in the 1960s, around 3,100 acres were in the farming programs and supported by agreements with the original landowners who retained various cooperative agreements. In the 1970s, there were approximately 20 cooperative farming agreements in place.

Currently, refuge cropland acreage varies each year between 1,200 and 1,300 acres, with over 1,000 of those acres covered under two Cooperative Farming agreements. The refuge's share of the crops – corn, soybeans, and winter wheat – is 25 percent. This quantity of food available on the refuge appears to be adequate to meet or exceed the intake requirements of the waterfowl numbers in Cross Creeks NWR objectives. In addition, the staff plants millet each year, and manages about 170 acres of moist-soil units annually.

The Biological Review Team discussed the refuge's farming strategies and limitations as to the locations where the share of corn was taken and the methods by which this food is made available to waterfowl. The refuge should plan to have as high a percentage of the corn as possible on flooded ground. Current water management capabilities, which are largely influenced by Lake Barkley Reservoir operations, significantly limit the area that can be planted in corn and then flooded. The remainder of the refuge corn that cannot be flooded to the proper depth has to be mechanically manipulated to make the grain available to waterfowl. The Biological Review Team supported the practice of crop manipulation – knocking down corn stalks – and encouraged the use of this practice on all areas that could not be flooded sufficiently to make the grain available to ducks. Another practice that was discussed was the strip-harvest method that has been practiced by the refuge in recent years. The team recommends that the refuge explore retaining its share in blocks, where possible, to concentrate the food in or at least closer to the water's edge.

Since the farming program appears to be providing a sufficient quantity of food, factors such as proximity to other habitats, disturbance, and availability of water and water management may be issues of more immediate concern.

Strategies:

- Utilize the farming program to help meet the waterfowl foraging objectives identified on the refuge.
- Evaluate the refuge farm program to sustain forage availability for refuge waterfowl objectives.
- Integrate force account or contract farming over time; move away from cooperative farming as much as possible on an extended timeframe. Use land base to diversify waterfowl foraging habitats (e.g., increase moist soil, bottomland hardwoods).
- The refuge crop share should be concentrated in areas that can flood or close to flooding capability.
- Consider draining and planting corn in pools that can be dried and re-flooded (e.g., Pool 7 and others).
- Place water gauges at appropriate locations; take readings with every waterfowl/shorebird survey.
- Lack of water management appears to be a limiting factor in getting the most out of the farming program. Consider these possible techniques:
    a. Management independent of Lake Barkley water levels
    b. Pumping capabilities.
        i. Use portable pumps on smaller jobs.
        ii. Establish fixed pump stations at major locations.
    c. Infrastructure rehabilitation:
        i. Dry/draw down selected units to clear woody vegetation in better agricultural areas.
        ii. Replace stoplog structures with screw gates/stop logs to prevent beaver problems .
        iii. Place water gauges at appropriate locations; take readings with bird surveys.
    d. Invasive and undesirable species control:
        i. Complete drawdown and/or increase fluctuation of water in all pools to discourage spatterdock, alligator weed, lotus, and other aquatic invasives.
        ii. During any drawdown, be prepared to clean ditches and clear some percentage of vegetation.
        iii. Investigate use of the Region's "strike force" for invasive plant removal.
- Analyze flight patterns of waterfowl to position habitats and crops in areas less likely to be impacted by encroaching hunters; do not leave crops in areas that cannot be manipulated or flooded, take refuge shares in or near areas that can be flooded, consider draining and planting corn in pools that can be dried and re-flooded (such as Pool 7).
- Refuge logistics (north and south of the river) make it difficult to manage the land base using two cooperative farmers. Consider use of force account farming to meet objectives, free up land base, and consider contract farming in lieu of cooperative farming.
- Upon completion of habitat management plan use land base to diversify waterfowl foraging habitats to include additional moist soil, and bottomland hardwood forest with similar components to early Cumberland River Region.

Objective 2-9: <u>Invasive and Undesirable Plants</u> – Achieve control of invasive and undesirable species through active methods of removal. These methods will work towards reducing infestations and eliminating populations whenever feasible. Extend control efforts to Eurasian water milfoil and develop additional partnerships with other agencies, non-governmental organizations, and the public.

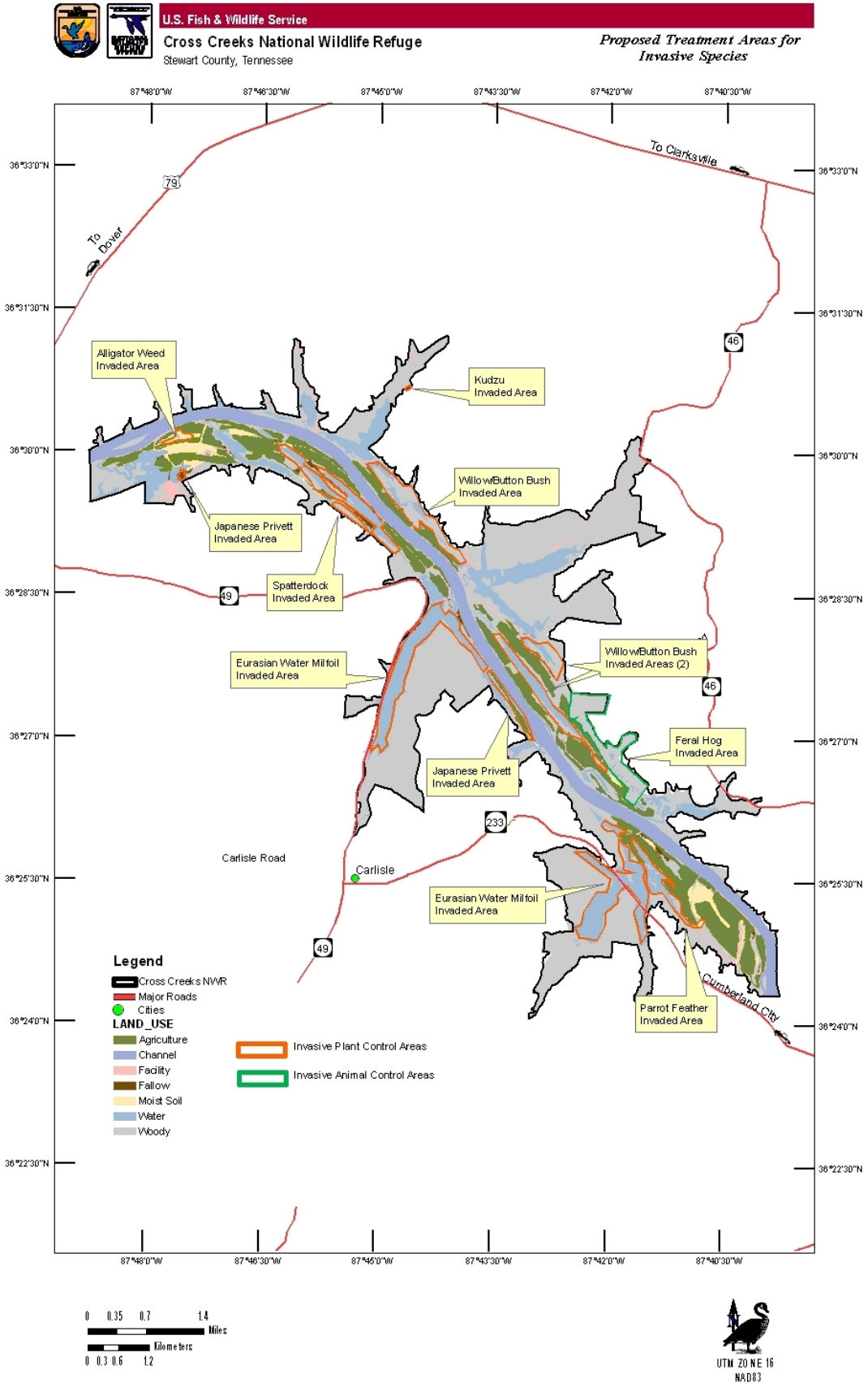
Discussion: Invasive and undesirable species of vegetation, both aquatic and terrestrial, are currently found on Cross Creeks NWR. However, the exact locations and the extent of infestation are largely unknown. Determining this information is crucial to the development of strategies to

remove these unwanted species from refuge lands and to sustain long-term control of these infestations. The refuge should first inventory existing invasive and undesirable species populations and mark locations for a refuge GIS database. Work should include species identification, size of area affected, and significance of threat from each invasive. Figure 8 shows proposed treatment areas for invasive and undesirable plant species.

Strategies:

- Provide adequate information and funding for staff, contract employees, partners and volunteers in gaining control of existing invasive species as well as new invasive threats; this will include providing minimum tools, equipment, and adequate training.
- Assure that the refuge is thoroughly inventoried, using updated mapping procedures, to assess existing invasive species on refuge land including: moist soil impoundment, water impoundments, agriculture fields, roadsides, open areas, forested bottomland/uplands, and the office/visitor center complex.
- Use accepted management techniques for removing known species of invasive plants from the refuge including fluctuating water depths, complete drawdowns, herbicide application, and disking,
- Evaluate and document impacts from Lake Barkley water management program on invasive response on refuge lands.
- Current management should focus on: spatterdock, alligator weed, kudzu, caster bean, parrotfeather, Japanese Stilt Plant, Sericia Lespedeza, and native plants including black willow.
- Request use of Region 4's invasive species "strike force" for relatively small jobs. This may be an opportunity in the area covered in kudzu – where it can be eliminated at one observed location in upland forest (estimated to be one acre).
- To control apple of Peru and castor bean, continue to monitor results of 2005 eradication efforts and respond accordingly.
- To control parrotfeather, eliminate existing location immediately with approved herbicide; monitor (as possible) any new locations.
- To control willows, use herbicide where possible to retain dead and dying snags for passerine forage and nest sites. Use mechanical means of removal where agriculture or moist-soil management is best management option, and leave some percentage of willows for use as habitat by various species.
- To control Japanese stilt plant, *Microstegium* spp., develop research plot in upland forest to determine extent of its impact on natural regeneration, tree stress, and nesting habitat for priority bird species.
- Establish protocols for monitoring existing infestations of invasive species. Include the assessment of "minimum tools" needed to successfully implement an invasive control program and provide a funding source to achieve the goal.
- Provide adequate training, standard operating procedures, and funding sources to ensure that impacted areas are monitored for spread of invasive species and/or success in elimination from targeted areas.

Figure 8. Proposed treatment areas for invasive and undesirable species



- Assure staff, volunteers, partners, and others involved in the project are provided the resources which are needed to adequately combat the problem of invasive species on refuges.
- Secure annual funding for targeted invasive species control via established grant opportunities or other funding sources.
- Provide training opportunities via NCTC, local workshops, web-based sites, etc., to ensure the most recent information is available to those involved with invasive species monitoring and control.
- Provide necessary equipment to ensure successful monitoring and control. Items may include, but not be limited to: GPS equipment, software, personal protective equipment, spray rigs, all-terrain vehicles to haul equipment, materials, hand tools, etc.

CULTURAL AND HISTORIC RESOURCES

Goal 3: Identify and protect cultural resources in accordance with federal and state historic preservation laws and regulations.

Discussion: The area within and surrounding Cross Creeks NWR is rich in history and prehistory. Archaeological investigations indicate that the earliest known presence of human beings may have occurred about 8,000 years ago during the Paleoindian/Early Archaic period. Evidence uncovered by research archaeologists indicates that early inhabitants were hunters and gatherers along the watercourses and within the forests of the area. The Service is required to abide by federal laws protecting historic, cultural, and archaeological resources, among them the American Antiquities Act of 1906, Archaeological Resources Protection Act of 1979, as amended, National Historic Preservation Act of 1966, as amended, and the Native American Graves Protection and Repatriation Act of 1990.

Objective 3-1: <u>Cultural and Historic Resources</u> – Continue to manage cultural resources consistent with Section 106 of the National Historic Preservation Act. Within 15 years of the date of the CCP, develop and begin to implement a Cultural Resources Management Plan (CRMP).

Discussion: Limestone, timber, and deposits of iron ore were all locally abundant. In addition, plentiful streams furnished power and rivers systems provided transportation to markets. The confluence of these factors spurred the development of an iron industry in the Stewart County, Tennessee, area. This industry reached its peak during the 1850s. This area contains several iron ore pits and remains of other iron operations. The remains of one of the many iron furnace stacks – Bellwood Furnace – is located on refuge property. This site is listed on the National Register of Historic Places (USFWS 2005a). Bellwood Furnace was attacked by federal gunboats. The owner of Bellwood Furnace (John Bell) also was a U.S. senator and presidential candidate in 1860, running against Lincoln as an independent. The foundation of the Bell home is still on the refuge.

The local area is also extremely rich in Civil War history. Nearby Fort Donelson National Battlefield, just downstream from the refuge on the Cumberland River, preserves the battlefield at which in early 1862 a then relatively unknown Union general – Ulysses S. Grant – claimed his first major victory in the war. If Grant had not won at Fort Donelson, there may have been no Shiloh, Vicksburg, Appomattox Court House, or White House in his or the nation's future.

Cross Creeks NWR follows standard procedures under Section 106 of the National Historic Preservation Act to protect the public's interest in preserving its cultural/historic legacy that may potentially occur on the refuge. Whenever construction work is undertaken that involves any excavation outside of existing disturbed areas like roadbeds with heavy earth-moving equipment,

such as tractors, graders and bulldozers, as in the development of new moist-soil units or levees, or the construction of new facilities, structures, and infrastructure, the refuge contracts with a qualified archaeologist/cultural resources expert to conduct an archaeological survey of the subject property.

The results of this survey are submitted to the Service's Regional Historic Preservation Officer (RHPO) as well as the State Historic Preservation Office (SHPO), which in Tennessee is the Tennessee Historical Commission within the Department of Environment and Conservation. The SHPO reviews the surveys and determines whether cultural resources will be impacted, that is, whether any properties listed in or eligible for listing in the National Register of Historic Places (NRHP) will be affected. If cultural resources are actually encountered during construction activities, the refuge is to notify the SHPO immediately.

Extensive pre-historic archaeological surveys have already been completed at Cross Creeks NWR. The strategies listed below attempt to systematize further cultural resources surveys and management.

Strategies:

- Provide immediate protection from looting for Bellwood Furnace.
- Provide interpretation of old Cumberland City Road (iron) Bridge for public viewing.
- Within 15 years of the date of the CCP, complete Phase I archaeological surveys of the non-flooded areas of the refuge, by qualified personnel, as a necessary first step in cultural resources management.
- Conduct a Phase II investigation if archaeological resources are identified during the Phase I survey. In this, the eligibility of identified resources for listing on the NRHP is evaluated prior to any disturbance.
- Conduct a Phase III data recovery if resources identified in Phases I and II are determined to be eligible. This will recover data and mitigate adverse effects of any undertaking.
- Within 15 years of the date of the CCP, prepare a Cultural Resources Management Plan (CRMP) for the refuge.
- Follow procedures outlined in CRMP for consultation with RHPO, SHPO, and potentially interested American Indian tribes.
- Follow procedures detailed in CRMP for inadvertent discoveries of human remains.
- Ensure that archaeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings.
- Develop a step-down plan for surveying lands to identify archaeological resources and for developing a preservation program.

VISITOR SERVICES

Goal 4: Provide the public with quality wildlife-dependent recreation and environmental education and interpretation that lead to greater understanding and enjoyment of wildlife and habitat and an interest in conserving them.

Discussion: Cross Creeks NWR offers visitors opportunities to participate in all of the priority public uses of the Improvement Act: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The refuge has an average annual visitation of 35,000 users. Fishing and other water-related recreation comprise the majority of uses. Wildlife observation, wildlife photography, hunting, and environmental education are also popular.

Refuge bottomlands used to provide winter waterfowl habitat are closed to the public from November 15 to March 14 to protect these trust species from human disturbance. Areas around occupied bald eagle nests are closed to public entry during the nesting season to promote successful fledging of eaglets. When the refuge waterfowl management units are closed to public entry, several of the units can still be viewed from the refuge visitor center.

The refuge has an active volunteer program, and a fledgling Friends group is in the early stages of development. Volunteers assist with a variety of tasks, including bird surveys, maintenance, and environmental education. A visitor center located at the main headquarters entrance houses wildlife displays and an auditorium for educational and interpretive programs. A viewing window with spotting scope and the area around the outdoor kiosk display offer visitors a panoramic view of typical refuge habitats. Figure 9 shows proposed public use facilities at Cross Creeks NWR.

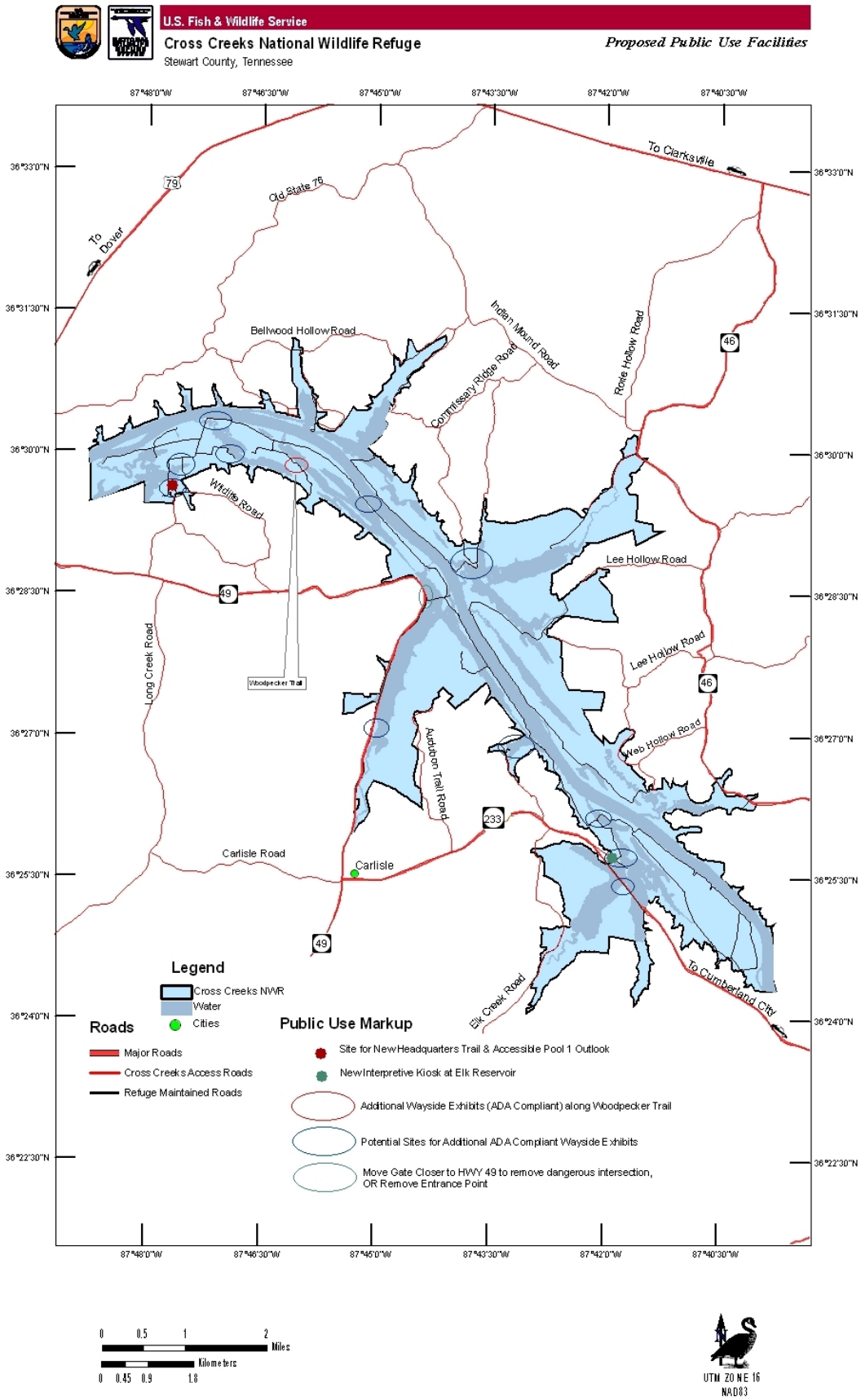
Cross Creeks NWR is divided into two distinct management units (north side and south side), with Lake Barkley and the Cumberland River bisecting the refuge in the middle. As a result, the refuge can be accessed by water from a variety of locations along the river shoreline. The administrative site and maintenance yard are located on the lower end of the south side; the north side is more remote and isolated. Most of the refuge is less than 1/2-half mile wide. Outside the refuge boundary are neighboring residences and small homesteads. Because of the proximity to the refuge, some neighbors are concerned about their safety during refuge hunts.

On the north side, trampling and litter occur along the river banks and several refuge public boat ramps. On the south side, there is constant littering and fishing off the bridge, which is prohibited. The refuge is constantly maintaining these sites. The refuge lacks law enforcement personnel. The north side of the refuge can be reached by numerous gravel county roads, many of which have no road signs due to theft and vandalism. As a result, the casual visitor may have difficulty orienting and finding this part of the refuge. This section is also remote and probably more difficult to patrol.

Objective 4-1: <u>Visitor Services</u> – Within 5 years of the date of this CCP, draft, approve, and begin to implement a new Visitor Services Plan using the current format for such documents.

Discussion: Cross Creeks NWR does not have a current Visitor Services Plan. Issues related to refuge management will be addressed in the step-down plan. Current and future staffing needs to implement the recommendations within the plan will also be addressed. The plan will include budgetary needs and will explore opportunities for funding and partnerships to help the refuge accomplish the recommendations within the plan. The plan will include a system for monitoring and evaluating the effectiveness of the visitor services program annually. Careful planning provides the visiting public with opportunities to enjoy and appreciate fish, wildlife, plants, and other resources. As a result, the visiting public will develop an understanding and will build an appreciation of their role in the environment today and into the future.

Figure 9. Proposed public use facilities at Cross Creeks NWR



Strategies:

- The Visitor Services Plan should reflect current legislation, director's orders, initiatives, policy, and the mission of Cross Creeks NWR, the Refuge System, and the Service.
- The plan should address the current and future visitor services and recreation needs of refuge visitors.
- The plan will include information and recommendations on the welcoming and orienting visitors.
- Place directional signs to the refuge from County Road 233, County Road 46, and major refuge boat ramps.
- Ensure that refuge signs are placed in advance from both directions at major entrances off Highway 79, Highway 49, and County Road 46.
- Remove boundary signs from trees and attach boundary signs to posts at the north unit.
- Coordinate sign production and additions with Regional Office sign coordinator.
- Depict Woodpecker Trail on future editions of brochures and maps. Delete extraneous roads on future editions of the refuge's publication maps, etc.
- Determine visitation of the lower unit over the weekend and based on findings determine whether the visitor center should be open on Saturday.
- Where appropriate, place temporary "Road Closed" signs along Wildlife Touring road (i.e., "Road Temporarily Closed – Eagle Nesting Area."
- Add interpretive and "no hunting " signs and trail name sign to Woodpecker Trail.
- Add interpretive panel(s) on the main refuge road describing management (i.e., farming and impoundment management and water control).
- On the general brochure and bird list, ensure that people know that the main refuge road is a wildlife touring route also.

Objective 4-2: <u>Hunting</u> – Continue to allow managed, limited hunting for deer, turkey, squirrel, and resident Canada goose.

Discussion: White-tailed deer, squirrels, turkeys, and resident Canada geese are hunted on the refuge. Hunting information is publicized through news releases, visitor contact at the refuge office and visitor center, and distribution of hunting brochures. During scoping for this CCP, refuge neighbors and landowners expressed concerns regarding safety and the use of firearms on the refuge during the weekend quota hunts.

Strategies:

- Develop well-defined maps of refuge hunting areas particularly on the North Unit where boundary signs are routinely vandalized.
- Continue to monitor the gun quota hunts.
- Update the hunting brochure; train staff to ensure they are familiar with accounting, reporting, and other procedures, and provide outreach to the local community.
- To ensure accounting consistency, coordinate with Tennessee NWR on fee accounting, reporting, and collection process.
- Ensure that adequate and advanced notification reaches media and refuge neighbors concerning control and regulation of hunting (e.g., newspapers, radio stations, and cable stations).
- Ensure that refuge boundary is adequately posted on the north side and cooperate with neighbors to control and minimize trespass and potentially hazardous safety situations.
- Use available law enforcement officers to patrol north side during hunting openings.
- Continue to work closely with local law enforcement.
- Work with local hunt clubs, news media, and schools on hunter education and ethics.

Objective 4-3: <u>Fishing</u> – Provide quality fishing and compatible water-related recreation programs on 3,260 acres of the refuge by furnishing adequate launching facilities, bank fishing areas, and (within 5 years of the date of this CCP and contingent on funding) provide at least one ADA-compliant pier to accommodate anglers of all abilities.

Discussion: Fishing is the most popular recreation activity on the refuge. Bank fishermen tend to concentrate at bridges and impoundments. During times of peak use, these areas tend to be degraded by littering and trampling of vegetation. As a result, maintenance and law enforcement focus must be intensified (i.e., erecting "no parking" signs and litter pickup). The carrying capacity to support such activities as bank fishing is unknown, as are the limits of recreation impacts to wildlife and other natural resources. About 3,260 acres are open for access to fishing at the refuge. However, fishing access in some areas may be closed to the public because of flooding, management purposes, or to minimize disturbance to nesting bald eagles or waterfowl.

Strategies:

- Coordinate annual youth fishing rodeo (weekend prior to refuge opening).
- Paint "No Fishing" on concrete abutments and place a chain and "Dangerous, Stay Off" along the grated metal runways on all new bridges located on the south side of the refuge.
- Continue to maintain signs and remove litter at all designated boat ramps and bank fishing areas that receive high use (Bellwood Road) and limit impacts to these areas.
- Ensure fishing brochure and general brochures have consistent information and graphics. Eliminate extraneous information on fishing brochure (i.e., unmarked roads).
- Coordinate with Fort Campbell to develop an annual fishing clinic to be held at the refuge.

Objective 4-4: <u>Wildlife Observation and Wildlife Photography</u> – Continue to offer opportunities for wildlife observation and photography throughout the refuge, accessible from March 16 – November 14. Add wildlife observation deck next to visitor center. Within five years of the date of this CCP, explore feasibility of building wildlife observation tower near Pool 1.

Discussion: When compatible, wildlife observation and wildlife photography are appropriate wildlife-dependent recreational uses of Refuge System lands. Visitors of all ages and abilities have opportunities to observe and photograph key wildlife and habitat resources at Cross Creeks NWR. These opportunities foster a connection between visitors and nature, which is one of the aims of the Refuge System. The main refuge road, the waterfowl impoundments, Woodpecker Trail, and Lake Barkley offer excellent wildlife viewing opportunities. Visitors can observe wildlife without ever leaving their vehicles, as well as on foot or from watercraft. When waterfowl impoundments are closed to the public, there is still excellent viewing from the visitor center and adjacent areas. The visitor center has a viewing scope and visitors are well served to carry their own binoculars and cameras with telephoto or zoom lenses.

Strategies:

- Provide a special map for birders, or possibly add a map to the bird list brochure in the next edition.
- Conduct a birding class in conjunction with the Christmas bird count.
- Consider using volunteers or a Friends group to maintain or extend the Woodpecker Trail to its original length (Figure 9).

- Consider the proper placement of one or more trails, observation platforms and decks, boardwalks, and blinds on the south side of Lake Barkley. Consult with other refuges supporting substantial wintering waterfowl populations on their experiences with allowing different wildlife observation facilities such as wildlife drives, trails, observation platforms and decks, boardwalks, and blinds.

Objective 4-5: Environmental Education – Continue to provide limited environmental education services to the public. Also, expand refuge's role as an outdoor classroom, including limited visits to schools, environmental workshops, and on- and off-site environmental education programs.

Discussion: Environmental education allows the Service to advance public awareness, understanding, appreciation, and knowledge of key fish, wildlife, plant, and resource management issues. The refuge supports environmental education through the use of facilities, equipment, educational materials, teacher workshops, and study sites that are safe and conducive to learning. The refuge is already working with local schools to develop curriculum related to wildlife conservation, and, as requested, refuge staff present programs to local schools and civic groups.

Strategies:

- Incorporate state educational standards in our programs with an emphasis on wildlife conservation.
- Periodically provide a "uniformed presence" to interact with fishermen with the goal to minimize conflicts, such as littering.
- Incorporate the potential impacts of climate change/global warming into the environmental education program.

Objective 4-6: Interpretation – Continue to maintain exhibits in visitor center, kiosk outside visitor center, and Woodpecker Interpretive Trail. Within 5 years of the date of this CCP, increase number of wayside signs and add wildlife-dependent signs along Woodpecker Interpretive Trail. Also develop interpretive kiosk at Elk Reservoir.

Discussion: Interpretation is the effort to communicate the most important fish, wildlife, habitat, and other resource issues to visitors of all ages and abilities. Heightened awareness enables and inspires visitors to take positive actions supporting refuge goals and the Refuge System mission. At Cross Creeks NWR, wildlife exhibits, audio-visual presentations, an observation window, amphitheatre style stairway, and 3-panel, outdoor kiosk are located at the visitor center. The refuge has a 3-panel kiosk located between the administrative office and the visitor center. The refuge also houses interpretive panels and displays in the visitor center.

Strategies:

- Ensure that all educational programs conducted include core messages.
- Develop interpretive signs along Woodpecker Trail, describing wildlife found in the area.
- Develop an interpretive kiosk and locate at the Elk Reservoir area boat ramp or parking area (Figure 9).
- Provide a panel along the main south side refuge road and at one of the beginning impoundments; develop interpretive themes describing management viewed from that location.
- Provide interpretive signs or brochures emphasizing wildlife (e.g., endangered species) along Woodpecker Trail.

REFUGE OPERATIONS

Goal 5: Provide personnel, partners, funding, and facilities needed to ensure that the goals and objectives identified in this CCP can be achieved.

Discussion: A small and declining staff has constrained the refuge from pursuing a number of programs, projects, and activities that would optimize its value to wildlife and visitors. There has been limited capability to fully conduct habitat and wildlife management, provide visitor services, and maintain or expand visitor facilities and opportunities on the refuge. For example, the one interpretive trail on the refuge, the Woodpecker Trail, is a loop trail that is now only about one-half its original length because the refuge has lacked the capability to maintain its outer portion, and it has grown over. Inability to effectively manage water on the refuge's impoundments compromises their value to waterfowl, shorebirds, wading birds, and others. Lack of law enforcement personnel has been a problem not only for protection of resources, but for the safety of visitors and neighbors as well.

Objective 5-1: Staffing – Maintain existing staff of 4-5 FTEs, including refuge manager, office assistant, maintenance mechanic, and equipment operator. Add the following FTEs: assistant refuge manager, law enforcement officer, refuge ranger (public use), tractor operator, and biologist.

Discussion: The refuge lacks law enforcement personnel. The north side of the refuge can be reached by numerous gravel county roads, many of which have no road signs due to theft and vandalism. As a result, the casual visitor may have difficulty orienting and finding this part of the refuge. This section is also remote and probably more difficult to patrol. There is some evidence of littering, missing signs, and dumping trash along the county roadsides and refuge shoreline at Commissary Hollow Road. In addition, the assistant refuge manager and refuge ranger positions need to be restored if the refuge is to be able to realize the vision, goals, and objectives outlined in this CCP. The biologist position will enable the refuge to more thoroughly manage wildlife populations, both game and non-game.

Strategies:

- Restoring the assistant refuge manager position will enable the refuge manager to focus efforts on long-term decision-making and tasks.
- The biologist will further work to improve water management capability and enhance habitats on impoundments and moist-soil units, in addition to conducting and facilitating wildlife inventories, censuses, and studies and helping to manage refuge hunts.
- The presence of a law enforcement officer on the refuge will deter criminal and illegal activity, ranging from littering and dumping to poaching. And, it will improve relations with neighbors concerned by issues such as trespass and threats to safety and property from hunting and hunters.
- Until a fulltime law enforcement officer can be hired for the refuge, management will continue to depend on part-time support from Service law enforcement officers shared with nearby Tennessee NWR. The refuge will also continue to cooperate with county sheriff departments and Tennessee state officers.
- Staff members will be provided a safe and healthy working environment.

Objective 5-2: Volunteer Programs and Partnerships – Strengthen the refuge's volunteer programs and partnerships by investing an increased portion of staff time into nurturing these promising relationships.

Discussion: Volunteers and refuge support groups fortify refuge staffs with their gift of time, skills, and energy. They are integral to the future of the Refuge System. The staff needs to initiate and nourish relationships with volunteers and support groups, and continually support, monitor, and evaluate these groups with the goal of fortifying important refuge activities. The National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998 strengthens the Refuge System's role in developing effective partnerships with various community groups.

Because of the proximity to Fort Campbell, Land between the Lakes, and other public land management, there are excellent opportunities for recruiting volunteers and building a stronger volunteer program. The refuge staff has made an effort to start a Friends group, but at this time there is little interest from the community to do so.

Strategies:

Volunteers

- Coordinate with Fort Campbell and other local land management agencies to network, recruit, and share volunteer assignments.
- Develop and prioritize projects and specific position descriptions.
- Explore recruiting volunteers from Fort Campbell.
- Post volunteer opportunities in Vol.Gov/Gov website and advertise in local newspapers.
- Work with staff to identify places in the community to recruit these and other volunteers. Possible areas to recruit include local churches, civic groups, Boy Scouts and Girl Scouts, schools, The Nature Conservancy, Wild Turkey Federation, Ducks Unlimited, garden clubs, and historical societies.
- Investigate the need for developing a work-camper site (possibly near the shop area).
- Assist refuge volunteers to attain the knowledge, skills, and abilities to support environmental education.

Friends Group

- Explore opportunities for a cooperating association. If there is interest from a group, develop a Friends group for the refuge.

Objective 5-3: Facilities, Infrastructure, and Equipment – Maintain existing facilities including headquarters, visitor center, maintenance building and yard, roads, gates, and equipment such as road grader, tractors, dozers, and backhoe. Replace visitor center and headquarters with one common building. Maintain existing equipment fleet, replacing obsolete equipment as needed. Add three portable toilets along road system. Install three pumps and add farm and fire management equipment such as corn planter, all-terrain vehicles, and a pumper truck.

Discussion: The refuge maintains a number of existing facilities, which range from its office, visitor center, and maintenance building and yard to outlying access and habitat infrastructure such as roads and levees. Most of this upkeep and maintenance can be performed by the maintenance mechanic and equipment operator, but some repairs and construction must be carried out by contractors. Portable toilets should be furnished along the road system for the convenience of visitors. Pumps are needed at certain impoundments and moist-soil units to improve water management and habitat values. Adding farm and fire management equipment, such as a corn planter, all-terrain vehicles, and a pumper truck, will increase the refuge's habitat and fire management capabilities.

Strategies:

- It is essential to maintain the refuge's existing maintenance mechanic and equipment operator positions to be able to operate and utilize the refuge's facilities and infrastructure.
- Keep machinery and equipment well-maintained and in good working order.
- Continually explore funding possibilities for repairing and upgrading infrastructure such as roads, culverts, water control structures, and levees.
- When purchasing and installing pumps, investigate and select best combination of price, capacity, and durability in conjunction with specific pumping needs at each site.
- Portable toilets should be well dispersed on the road system. They should be in readily accessible locations and need to be cleaned periodically, and emptied or replaced in a timely manner. To reduce the risk of vandalism or misuse, attach signs requesting the assistance of users in keeping them clean and hygienic.

V. Plan Implementation

INTRODUCTION

Refuge lands are managed as defined under the Improvement Act. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges. National wildlife refuges, unlike other public lands, are dedicated to the conservation of the nation's fish and wildlife resources and wildlife-dependent recreational uses. Priority projects emphasize the protection and enhancement of fish and wildlife species first and foremost, but considerable emphasis is placed on balancing the needs and demands for wildlife-dependent recreation and environmental education.

To accomplish the purpose, vision, goals, and objectives contained in this CCP for Cross Creeks NWR, this section identifies projects, funding and personnel needs, volunteers, partnership opportunities, step-down management plans, a monitoring and adaptive management plan, and plan review and revision.

PROPOSED PROJECTS

Listed below are the proposed project summaries and their associated costs for fish and wildlife population management, habitat management, resource protection visitor services and refuge administration over the next 15 years. This proposed project list reflects the priority needs identified by the public, planning team, and refuge staff based upon available information. These projects were generated for the purpose of achieving the refuge's objectives and strategies. The primary linkages of these projects to those planning elements are identified in each summary.

After the summary descriptions below, Table 5 lists each of the proposed projects.

FISH AND WILDLIFE POPULATION MANAGEMENT

Science-based inventorying and monitoring of plant and animal populations

Science-based inventorying and monitoring of plant and animal populations are critical to ensuring the biological integrity of the refuge. The information collected through a systematic inventorying and monitoring program forms the basis for developing, implementing, revising, and evaluating management actions; enables informed decisions; and guides all refuge management activities. To date, baseline inventories have not been completed for upland birds, colonial nesting water birds, marsh birds, shorebirds, non-game species, reptiles, amphibians, mammals, and all threatened and endangered species historically found in Stewart County near the refuge, and only a few of the refuge's important trust species are adequately monitored. Information on these species is needed to determine relative abundance and habitat use on the refuge.

This project will address this shortfall by expanding the inventorying and monitoring of species of concern through the addition of biological staffing and the funding of several important surveys. As a result, Cross Creeks NWR will improve management and provide valuable long-term contributions to national and regional objectives for endangered and imperiled species, shorebirds, wading birds, neotropical migratory birds, upland birds, mollusks, mammals, reptiles, amphibians, and insects.

The project consists of employing a biological technician (RONS 00002, GS-09: $146,000 first year and $71,000 annual recurring costs). Operational expenses (e.g., field supplies and data analysis software) are estimated at an annual cost of $10,000. Contractual studies for priority or imperiled species will be used to supplement refuge efforts at an annual cost of $76,000. Installation and maintenance of additional nesting boxes for wood ducks and blue birds (RONS 98011: $50,000 first year and $10,000 annual recurring costs) is planned, as well.

The total first year cost of this project is $282,000, with an annual recurring cost of $167,000. (Linkages: Goal 1, Objectives 5 through 8, and 10; Goal 5, Objective 1)

Population status and management impacts on reptiles and amphibians

Although the prospective herpetofauna of the refuge is large, at least 70 species, the presence of relatively few of these species has been confirmed and associated with particular habitats on Cross Creeks NWR. When confronted with a lack of knowledge concerning the species actually residing on refuge lands, data must be gathered on their presence, and to the extent possible, determining how forest, wetland, marsh, and upland habitat management activities (or the lack, thereof) are impacting their populations. Collection of these types of data within 10 years of the date of this CCP is crucial to furthering the refuge's conservation efforts for reptiles and amphibians.

As part of this project, the refuge will partner with a university or organization to design and implement protocols to gather information for better species management. Also, the refuge will collaborate with the U.S. Geological Survey, Biological Resources Division (USGS-BRD), for cooperative funding possibilities through the Amphibian and Reptile Monitoring Initiative (new RONS: $30,000 first-year cost, $15,000 annual recurring cost). The project will share a biological technician position (RONS 00002) identified in the science-based inventorying and monitoring project.

The total first-year cost of this project is $30,000, with an annual recurring cost of $15,000. (Linkages: Goal 1, Objective 10; Goal 2, Objective 1, 4, 5)

Fisheries within refuge reservoirs and sub-impoundments

Little fisheries data have been collected on the refuge since its establishment in 1962. In order to make effective management decisions, the refuge needs a current inventory of fish populations for abundance, a determination of the presence of exotic and invasive aquatic species, and periodic monitoring of contaminant levels in refuge waters. These data will help management objectives be established which maintain self-sustaining fish populations, especially sport fish, and reduce impacts by exotic species which have not yet (2008) reached the Cumberland River ecosystem. Two invasive exotic species of concern are the snakehead fish and the zebra mussel.

This project will include collaboration with TWRA, USGS-BRD, and nearby universities to establish a research project for defining the aquatic resources of Cross Creeks NWR and effects of cyclical flooding from the Cumberland River, relative to flood regime, contaminants, movement of potential invasive species into the area, search for threatened or endangered species, and explore opportunities to enhance habitat for fish in refuge waters.

Fish will be inventoried with electroshocking gear, gill nets, and angler surveys. A sample of darters, madtoms, and minnows will be conducted in the shallow areas to identify the presence of endangered species (new RONS: $30,000 first-year cost, $15,000 annual recurring cost). The project will share a biological technician position (RONS 00002) identified in the science-based inventorying and monitoring project and a seasonal biotech (RONS 99007) identified in the invasive species control project.

The total first-year cost of this project is $30,000, with an annual recurring cost of $15,000. (Linkages: Goal 2, Objective 3; Goal 4, Objective 3)

Bat use of bottomland hardwood forest

Two endangered bats, the Indiana bat and the gray bat, have historical ranges in Stewart County where the refuge is located. However, no sightings or use of the refuge have been documented to date (2008). Information is needed to determine presence, habitat use, reproductive success, and roost habits/locations of these species on the refuge.

This project will conduct research to provide the information needed above to determine best management practices for each of these species. The refuge will cooperate with U.S. Geological Survey and area universities to establish the research project (new RONS: $60,000 first-year cost, $15,000 annual recurring cost). The project will share a biological technician position (RONS 00002) identified in the science-based inventorying and monitoring project.

The total first-year cost of this project is $60,000, with an annual recurring cost of $15,000. (Linkages: Goal 1, Objectives 10 and 11; Goal 2, Objective 5)

HABITAT MANAGEMENT

Control invasive and exotic plants and animals

Agricultural fields, forested areas, roadsides, and impoundments have become infested with populations of exotic or invasive plant and animal species. In order to eliminate or control these populations, more emphasis must be placed on detecting and monitoring the presence, spread, and damage caused by these species, especially to native plants and wildlife, including their habitats.

This project includes a seasonal biological technician and equipment purchase (RONS 99007, 0.5 FTE, GS-06: $153,000 first-year and $33,000 annual recurring costs), and funding for invasive plant control, native plant restoration, and feral animal control (RONS 98010 and 99001: $117,000 first-year cost and $45,000 recurring cost).

The total first-year cost of this project is $270,000, with an annual recurring cost of $78,000 per year. (Linkages: Goal 1, Objective 12; Goal 2, Objective 9; Goal 5, Objective 1)

Initiate fire management program

Seasonal fires are a natural part of pine forest and grassland habitat. A fire management program is needed to effectively maintain existing pine forest habitats and proposed native warm season grass plots along field edges, to reduce fuels in the under story, reduce competition among saplings, reduce “sink” habitats for scrub-shrub birds and promote healthy grasslands. Both of these habitat types are either under-represented or non-existent on the refuge due to historical agricultural activities (pre-establishment of the refuge). Incorporating management programs for upland habitats would support the diversification goals presented in the CCP to benefit a majority of species found on the refuge, but not actively managed for at the present time.

This project includes a seasonal maintenance worker/equipment operator and purchase of equipment to support a fire management program (RONS 98009: $208,000 first-year cost and an annual recurring cost of $58,000). Additionally, the project shares a biologist position (RONS 00001), and benefits from proposed objectives for habitat diversification on the refuge (RONS 00001, 00002, 98007, and 99003).

The total first-year cost of this project is $208,000, with a total annual recurring cost of $58,000. (Linkages: Goal 1, Objectives 8, 10 and 12; Goal 2, Objective 5, 7 and 9; Goal 5, Objective 1)

Enhance habitat management for diverse species

Under current (2008) management objectives, the refuge has focused on efforts to produce habitat for trust species only. However, additional study and development of habitats for non-trust species are needed to ensure reproductive success for a wide variety of species currently using the refuge. These lesser managed habitats include marsh areas, exposed mudflats for shorebirds, diversified wetland habitats, forested uplands, scrub-shrub areas, and native warm season grass plots along field edges. These new habitat diversification objectives complement the current farming activities which produce foraging habitat for waterfowl, such as moist-soil, flooded areas, and brood rearing habitat.

The project consists of employing a biologist (RONS 00001, GS-09: $146,000 first-year and $71,000 annual recurring costs) and sharing the two seasonal biological technician GS-06 (RONS 00002, 98007) positions. Operational expenses (e.g., field supplies and data analysis software) are estimated at an annual cost of $10,000. The project also gleans information obtained through science-based inventories (RONS 99003) to determine habitat management objectives.

The total first-year cost of this project is $156,000, with a total annual recurring cost of $81,000. (Linkages: Goal 1, Objectives 1, 2, 4, and 6; Goal 2, Objectives 1 through 8; Goal 5, Objective 1)

Wintering habitat for grassland bird species

A research project is needed to determine how to provide the range of habitat conditions required for grassland species wintering on Cross Creeks NWR, with emphasis on Henslow's sparrow, grasshopper sparrow, sedge wren, and LeConte's sparrow within two years of the date of this CCP. Many grassland birds have been demonstrating a decline and are a high priority for refuges to monitor for presence, abundance, and nesting productivity. Little data are available for these species and to what extent they forage and nest on the refuge. Data are needed to establish a baseline that can then be compared to future monitoring efforts to watch for changes in trends.

This project will conduct literature searches, contact experts in the field, and partner with universities to define habitat requirements of grassland species of concern that may winter on the refuge. Additionally, Project Prairie Bird (or similar) surveys will be implemented to better understand habitat use by wintering species (new RONS: $30,000 first-year cost, $15,000 annual recurring cost). Additionally, this project will share a biological technician (RONS 00002), as identified in the science based inventorying and monitoring project.

The total first-year cost of this project is $30,000, with a total annual recurring cost of $15,000. (Linkages: Goal 1, Objective 8; Goal 2, Objective 7, Goal 5, Objective 1)

Obtain reliable water management capability

The refuge's water management program is heavily influenced by annual rainfall and water management activity on the adjacent Barkley Reservoir. Seasonal droughts, flooding, and the annual water schedule of Barkley are opposite of refuge management activities, preventing optimal moist-soil production and water management. Both fixed and mobile pumping units are needed to improve the efficiency of refuge water management for trust species.

This project includes the purchase of two 16-inch centrifugal pumps and a utility type vehicle to support pumping operations within refuge impoundments (RONS 98003: $120,000 first-year cost and $30,000 annual recurring cost). Two new pumping facilities will house two new pumps with engine units and will be constructed to reduce impacts of Barkley water management activities (new RONS: $625,000 first-year cost and $25,000 recurring annual cost). Cost estimates include anticipated annual fuel costs to run pumping units. Additionally, a seasonal biologist (RONS 99002, 0.5 FTE, GS-06: $70,000 first-year cost and $33,000 annual recurring cost) is needed to monitor water management activities to oversee and develop habitat management activities for moist-soil within refuge impoundments.

The total first-year cost of this project is $815,000, with a total annual recurring cost of $88,000. (Linkages: Goal 1, Objectives 1, 2 and 6; Goal 2, Objectives 1, 2, 3, 4 and 7; Goal 5, Objective 1)

CULTURAL AND HISTORIC RESOURCES

Cultural resource overview of the refuge

Using available scientific and historical information, the selected contractor will author an interdisciplinary cultural resources overview of the refuge's cultural landscape as it has changed over the past 15-20,000 years. The final technical report will include, at a minimum, sections about the area's geomorphology and hydrological regime, paleoenvironmental reconstruction, the area's cultural history, the scope and scale of past archaeological investigations on and near the refuge, a detailed list of the refuge's historic properties, and future research questions. Submission of the overview report satisfies the cultural resources objectives listed in this CCP, as well as those listed in the Region's GPRA and RAPP.

The project will include development and printing of a full color brochure. The total cost of this project is a one-time expense of $20,000, with no annual recurring cost. (Linkage: Goal 3, Objective 1)

Cultural resources interpretive brochure

Develop a brochure that describes the Native-American, Euro-American, and African-American cultures present on and near the refuge. The brochure will include significant historic events and land use patterns.

The project will include development and printing of a full color brochure. The total first-year cost of this project is $3,000, with an annual recurring cost of $500. (Linkage: Goal 3, Objective 1)

VISITOR SERVICES

Provide undisturbed winter sanctuary for trust species

Winter sanctuary is provided for trust species from November 15 to March 16, each year. In support of this management objective, compatible alternatives for public use are needed to allow for year-round wildlife observation. Currently, only the visitor center is open year-round for visitors.

As part of this project, other facilities or activities which would allow access to winter wildlife, without entry into closed areas, include construction of a raised overlook with fixed scopes to view birds and other animals near the visitor center ($102,000 first-year cost, $0 annual recurring cost). Another alternative is to allow special, controlled access to limited areas within the closed portion of the refuge in conjunction with a special event. This would include a one-way "Waterfowl Drive" along the main refuge road, with support from law enforcement and other staff knowledgeable about wintering waterfowl. This project shares the biologist and biological technician (RONS 00001, 00002) identified in previous projects, as well as the law enforcement officer identified in the visitor and resource protection project (new RONS Project).

The total first-year cost of this project is $102,000, with an annual recurring cost of $0. (Linkage: Goal 1, Objective 3)

Provide quality hunting opportunities

A need has been identified through public scoping that the refuge should manage game populations to provide quality hunting opportunities, while maintaining habitat for trust species. As part of this project, the refuge will link wildlife inventorying and population monitoring to assess and modify management strategies to benefit both trust species and game species. This strategy will allow for real-time adaptive management of habitats, based on changing wildlife needs.

Monitoring and inventorying data management and synthesis of data for development of management recommendations are needed at Cross Creeks NWR. This will be achieved through the purchase of equipment (new RONS: $ 30,000 first-year cost; $0 annual recurring cost) to collect data. Additionally, this project shares the science-based inventorying protocols previously identified, and biologist, biological technician (RONS 00001, 00002), and law enforcement officer positions identified in several other CCP projects (New RONS Project).

This total first year-cost of this project is $30,000, with an annual recurring cost of $0. (Linkages: Goal 1, Objective 9; Goal 4, Objective 2)

Connecting visitors with nature

The current (2008) public use program can be enhanced by placing directional and interpretive signs along refuge roads and boat ramp parking lots to guide visitors. Public use, understanding of management objectives, awareness of available facilities (e.g., trails, overlooks, boat ramps, secondary entrances) and wildlife interpretation will be improved through the increased signage and boat ramp upgrades provided by this project.

This project will include new ADA-compliant wayside exhibits along the public access roads, and interpretive panels at boat ramp parking lots (new RONS: $34,000 first-year cost; $5,000 annual recurring cost). Additionally, improving three gravel boat ramps west Bellwood, Bull Pasture, and Lower Pool 4 by replacing them with concrete (New SAMMS: $547,000 first-year cost; $0 annual recurring cost; New RONS: $80,000 first-year cost; $0 annual recurring cost) will enhance self-service type visitor amenities.

The total first-year cost of this project is $661,000, with an annual recurring cost of $5,000. (Linkages: Goal 4, Objectives 1, 3 through 5)

Provide quality opportunities for compatible wildlife dependent recreation

The refuge (2008) does not have many public use facilities which are ADA-compliant. Structures such as accessible fishing piers and raised overlooks are needed in addition to designated areas for hunting, wildlife observation, wildlife photography, and environmental education and interpretation to reach visitors that may need wheelchair access or sight assistance.

This project will provide a fishing pier and hunting/photo “blinds,” which are accessible by wheelchair and provide informational signs/brochures with Braille (new RONS: $150,000 first-year cost; $3,000 annual recurring cost). The addition of these types of facilities to the refuge public use program will benefit visitors with disabilities or special needs. A seasonal maintenance worker/equipment operator is needed to maintain aging facilities, support refuge management activities, and enable a safe, pleasurable experience for refuge visitors (RONS 00003: $63,500 first-year cost; $31,000 annual recurring cost).

The total first-year cost of this project is $213,500, with an annual recurring cost of $34,000. (Linkages: Goal 4, Objectives 3 through 6)

REFUGE OPERATIONS

Visitor and resource protection

Adequate protection of the refuge boundary, visitors, and cultural and natural resources is not available with current resources. A refuge officer with law enforcement duties is needed to ensure adequate protection.

This project will include 10 miles of boundary survey and marking (SAMMS 2007752731: $75,000 first-year cost, $0 annual recurring cost) to prevent refuge boundary line encroachment. A security system will be installed in the administrative, visitor center, and shop buildings (RONS 98015: $23,000 first-year cost, $4,000 annual recurring cost). Additionally, a fulltime park ranger with law enforcement duties will be hired, along with purchase of necessary equipment, to protect visitors, resources, and facilities (RONS 03001, GS-07: $139,000 first-year cost; $74,000 annual recurring cost).

The total first-year cost for this project is $237,000, with an annual recurring cost of $78,000. (Linkages: Goal 3, Objective 1; Goal 4, Objectives 1 through 6; Goal 5, Objective 1)

Restore administrative function of refuge

An assistant manager position was lost through attrition at Cross Creeks NWR. This project will restore the manager-assistant manager chain by providing funding for a refuge operations specialist (new RONS, 1 FTE, GS-07/09/11: $139,000 first-year cost; $71,000 recurring annual cost). The refuge operations specialist will support across-the-board refuge programs, especially public use activities, and habitat management. The refuge (2008) has only four full-time staff, and none of these positions is dedicated to public use. This project is essential in meeting the needs of a growing number of refuge visitors, and will also enhance the refuge's overall resource management programs for the wide variety of fish and wildlife species.

The total first-year cost of this project is $139,000, with an annual recurring cost of $71,000. (Linkages: Goal 4, Objectives 1 through 5; Goal 5, Objective 1)

Table 5 below summarizes all of the projects described above.

Table 5. Summary of projects for Cross Creeks NWR

42515 Cross Creeks NWR

FY08-2856
SR: 1
RS:
RR:

One-Time:
RecurBase: $94,588
Tot. 1st Year: $94,588

	Num	Cost
Permanent Staff:	1	$94,588
Temporary Staff:		

Title: Restore management capabilities at Cross Creeks NWR

Description: Restore refuge management capabilities by providing an assistant refuge manager. This position is a high priority in the CCP. The assistant manager would provide oversight and support to the public use program, farming program, maintenance program, and invasive species control. The position would support facilities management by keeping the appropriate property records current and up to date. The assistant manager would also maintain the appropriate databases related to facilities maintenance for the refuge. This will permit the maintenance staff to commit more time to habitat and public use related projects.

42515 Cross Creeks NWR

FY08-2869
SR: 2
RS:
RR:

One-Time:
RecurBase: $97,292
Tot. 1st Year: $97,292

	Num	Cost
Permanent Staff:	1	$97,292
Temporary Staff:		

Title: Provide a full-time law enforcement officer at Cross Creeks NWR

Description: Provide one fulltime law enforcement officer to protect wildlife, lands, facilities, employees and the general public on Cross Creeks NWR. The Directors Order #155 requires the Service to reduce dependency on dual-function refuge officers and progress towards a fulltime officer workforce. This officer will assist in fulfilling these needs by placing an officer in the field full time to protect wildlife resources. The refuge currently has no permanent law enforcement staff. The officer would provide adequate protection for the refuge's 70,000 annual visitors. The refuge is home to approximately 480 species. The refuge also provides a home to two of the most productive bald eagle nests in the State of Tennessee. Protection is the most basic form of wildlife management and this project will dedicate a fulltime law enforcement officer to conserve and protect wildlife and wildlife habitats.

42515 Cross Creeks NWR

FY08-2915
SR: 3
RS:
RR:

One-Time:
RecurBase: $94,588
Tot. 1st Year: $94,588

	Num	Cost
Permanent Staff:	1	$94,588
Temporary Staff:		

Title: Provide biological assistance for refuge management direction

Description: Provide biological assistance for making future management decisions on the Refuge. Science based inventory and monitoring of plant and animal populations is critical to providing an understanding of where the refuge is today and providing management direction in the future based on climate change and future poulation trends. The work performed by a refuge biologist will guide the refuge manager in making informed decisions. The project will improve management and provide valuable long term contributions to national and regional objectives for endangered species, shorebirds, wading birds, neo-tropical migrants, and waterfowl.

42515 Cross Creeks NWR

FY08-3170	**One-Time:**	$75,000	**Title: Provide water management strategies for Cross Creeks NWR**
SR: 4	**RecurBase:**		**Description:** Develop a digital elevation model that covers 3,000 acres of bottomlands within the refuge to aid in improving water management capabilities. The digital elevation model will be produced by a contractor employing Light Detection and Ranging technology that produces elevation data with an accuracy of 10-15 cm. The topographic map produced from the Light Detection and Ranging technology data will be used in the planning and decision-making processes to determine the best water management strategies for providing wetland habitats for a wide variety of migratory bird species. The refuge annually provides habitats for 60,000 waterfowl.
RS:	**Tot. 1st Year:**	$75,000	
RR:			
	Num	Cost	
Permanent Staff:			
Temporary Staff:			

42515 Cross Creeks NWR

FY08-3177	**One-Time:**	$25,000	**Title: Control nuissance species on Cross Creeks NWR**
SR: 5	**RecurBase:**	$10,000	**Description:** Eradicate the feral hog and beaver population on Cross Creeks NWR by contracting with USDA Wildlife Services to provide personnel and equipment to accomplish this task. Trapping and removal techniques will be utilized to eliminate these nuisaance and destructive species before populations becomes well established. Feral hogs have been observed on the north side of the refuge. Hogs cause extensive damage to habitats and compete with native wildlife for food resources. Beaver are aslo a major problem on the north side of the Refuge and frequently dam canals and obstruct water control structures. Cross Creeks NWR manages wetland and agricultural habitats for in excess of 60,000 waterfowl and a wide variety of migratory birds and resident wildlife.
RS:	**Tot. 1st Year:**	$35,000	
RR:			
	Num	Cost	
Permanent Staff:			
Temporary Staff:			

42515 Cross Creeks NWR

FY08-3182	**One-Time:**	$15,400	**Title: Develop Auto Tour Interpretive Signs**
SR: 6	**RecurBase:**		**Description:** Develop auto tour with interpretive signs. The refuge provides a wonderful visitor experience with much to see and do at the refuge. However, after the visitor leaves the visitor center and administrative office area, it is confusing as to where you can go and there is no interpretation along the main road that runs along the Cumberland River. A well signed and interpreted auto tour along the main road leading into the center of the refuge would help provide visitors some understanding of the refuge's mission and management practices.
RS:	**Tot. 1st Year:**	$15,400	
RR:			
	Num	Cost	
Permanent Staff:			
Temporary Staff:			

42515 Cross Creeks NWR

FY08-3325	**One-Time:**	$35,000	**Title: Develop Refuge Interpretive Video**
SR: 7	**RecurBase:**		**Description:** Develop refuge interpretive video. The refuge's visitor center does some interpretation through exhibits and interpretive signs, but many are quite dated and not current. To connect with today's audience, a short video can go a long way
RS:	**Tot. 1st Year:**	$35,000	

RR:

	Num	Cost
Permanent Staff:		
Temporary Staff:		

in starting the visitor off on the right understanding of the refuge's creation, history and management emphasis. This project would hire NCTC to create a short 15-minute video to show to the public at the visitor center and during interpretive programs.

42515 Cross Creeks NWR

FY08-3330
SR: 12
RS:
RR:

One-Time:	$120,000
RecurBase:	
Tot. 1st Year:	$120,000

	Num	Cost
Permanent Staff:		
Temporary Staff:		

Title: Vegetation Mapping

Description: Develop detailed vegetative cover maps of the refuge following standards outlined by the National Vegetation Classification System. This will be accomplished by using Geographic Information System (GIS) to classify vegetation from satellite imagery and color infrared aerial photography. The aerial photography is currently unavailable and will need to be contracted. These photos are to be at a scale of 1:8000 to aid in developing detailed vegetation coverage data. Flight lines for the refuge have already been established by USGS through a Research Partnership Project. Detailed vegetation maps are essential to progressive habitat management planning and monitoring. These maps will also provide a baseline to monitor potential impacts on vegetation communities by climate change.

42515 Cross Creeks NWR

FY08-3357
SR: 8
RS:
RR:

One-Time:	
RecurBase:	$67,129
Tot. 1st Year:	$67,129

	Num	Cost
Permanent Staff:	1	$67,129
Temporary Staff:		

Title: Maintain public use facilities and increase habitat management

Description: Provide a permanent tractor operator at Cross Creeks NWR. This project would ensure that the lawn and landscaping surrounding the headquarters and visitors center are kept in a neat well-manicured manner. The project would provide assistance with mowing roadsides, parking areas, and boat ramps. This will prevent invasive and other noxious plants from growing over water control structures, gates, signs, wood duck boxes, and refuge roads. This will also provide a permanent source for maintaining rattlesnake trail and its associated infrastructure. The project will provide for additional food that will be available for wildlife by planting winter wheat, millet, corn, or other crops as needed.

42515 Cross Creeks NWR

FY08-3362
SR: 9
RS:
RR:

One-Time:	
RecurBase:	$77,321
Tot. 1st Year:	$77,321

	Num	Cost

Title: Provide visitor services program for Cross Creeks NWR

Description: Develop and implement the visitor services program at Cross Creeks NWR. Responsibilities include planning and implementation of the environmental education program, planning and conducting special events, and overall visitor services program planning and visitor center staffing. Responsibilities will also

Permanent Staff:	1	$77,321	include coordination of the following programs: volunteers, friends groups, cooperating associations, and the recreation fee program.
Temporary Staff:			

42515 Cross Creeks NWR

FY08-3397
SR: 10
RS:
RR:

One-Time:
RecurBase: $69,584
Tot. 1st Year: $69,584

	Num	Cost
Permanent Staff:	1	$69,584
Temporary Staff:		

Title: Control Invasive and Exotic Plants and Animals

Description: Agricultural fields, forested areas, roadsides, and impoundments have become infested with populations of exotic or invasive plant and animal species. In order to eliminate or control these populations more emphasis will be placed on early detection and monitoring the presence, spread, and damage caused by these species to native plants and wildlife and their habitat.

42515 Cross Creeks NWR

FY08-3927
SR: 11
RS:
RR:

One-Time:
RecurBase: $94,588
Tot. 1st Year: $94,588

	Num	Cost
Permanent Staff:	1	$94,588
Temporary Staff:		

Title: Implement forest management program

Description: Refuge forestlands will be inventoried and assessed; subsequent prescriptions and management will be driven by habitat needs. Currently, refuge forest land is unmanaged. Additional personnel are critical to long-term inventory, analysis, and field implementation of the Forest Management Plan. Forest inventory and analysis determine the necessary prescriptions ((harvest), planting, invasive exotic eradication, prescribed burning, and monitoring) as defined by needs of the priority bird species. Additional refuge forestry responsibilities include shoreline restoration partnerships with residential refuge neighbors. The forester will also asses the need for and identifies sites suitable for carbon sequestration projects.

FUNDING AND PERSONNEL

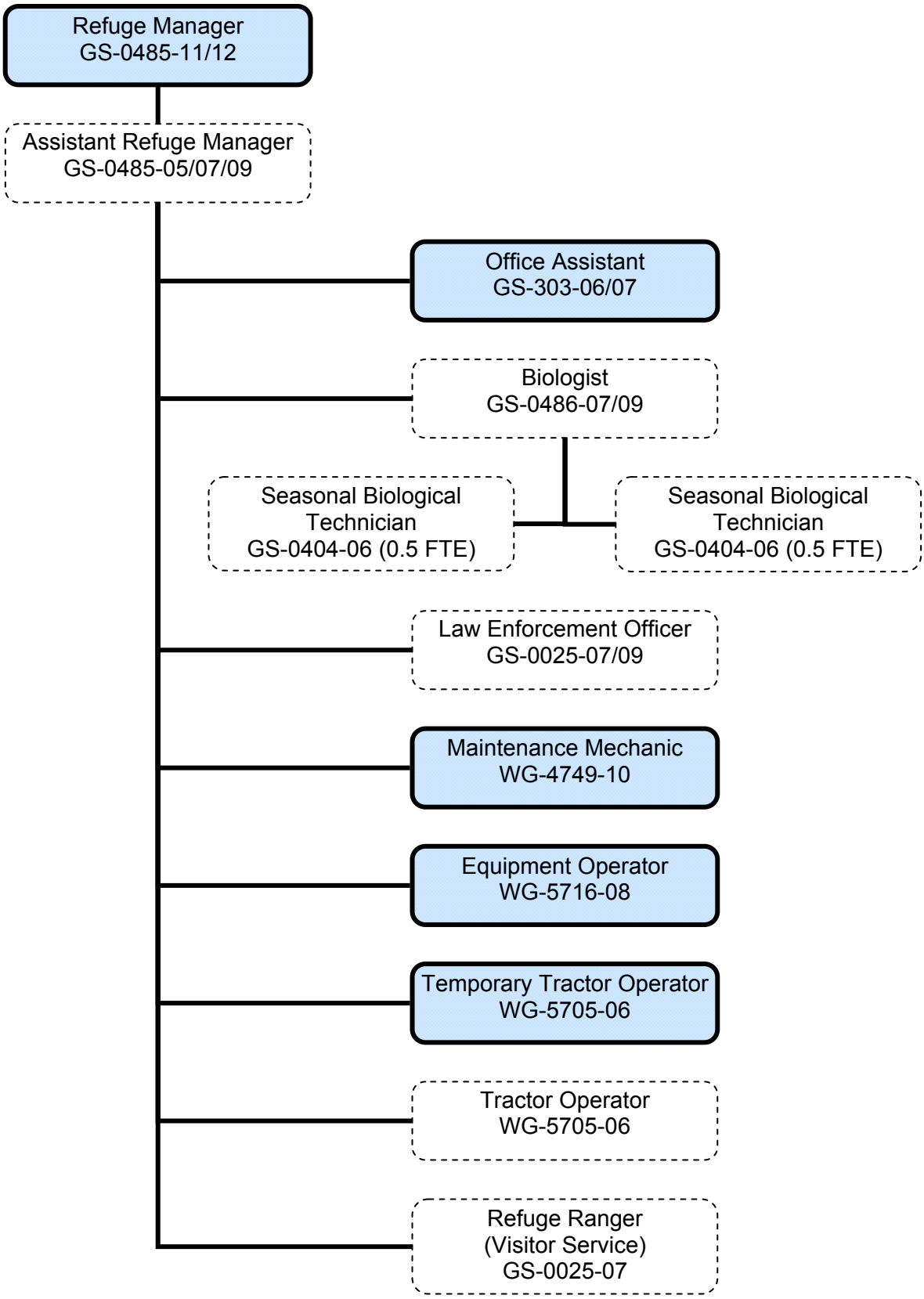
The refuge (2008) is managed by four permanent and one temporary positions. The staff needed to implement the proposed management actions include five new fulltime positions and four seasonal (0.5 FTE) new positions as follows: one assistant refuge manager, one biologist, one refuge ranger, one park ranger (law enforcement officer), and one tractor operator, and two seasonal biological technicians. See Figure 10 for an organization chart of current and proposed staff. Table 6 lists each of the proposed new positions and provides relevant information.

Table 6. Approximate annual costs of proposed new staff positions in 2008 dollars

TITLE	RESPONSIBILITY	RONS PROJECT NUMBER	GRADE	ANNUAL COST ($)
Assistant Refuge Manager	Refuge Administration and Resource Protection	New	GS-05/07/09	71,000
Biologist	Habitat Management, Inventorying, and Monitoring	00001	GS-07/09	71,000
Seasonal Biological Technician (0.5 FTE)	Control Invasive Species	98007	GS-06	33,000
Seasonal Biological Technician (0.5 FTE)	Water and Habitat Management	99002	GS-06	33,000
Park Ranger (LE)	Visitor Services and Safety	03001	GS-07	74,000
Refuge Ranger	Visitor Services	New	GS-07	74,000
Tractor Operator	Road and Facilities Maintenance	New	WG-6	45,000

Note: These figures have been incorporated into the project descriptions and their associated costs in Table 5 – Summary of Projects for Cross Creeks NWR. These figures are not additional costs.

Figure 10. Current and proposed staffing chart with proposed staffing shown in dashed outline



PARTNERSHIP/VOLUNTEER OPPORTUNITIES

A volunteer program exists on the refuge and will be continued for the life of this CCP. The refuge will continue to recruit volunteers to assist with the following: wood duck and blue bird nest box management, bird feeding station pilot project, native plant demonstration plots, waterfowl surveys, grounds maintenance, interpretive material development, visitor center docents, photography, lead trail walks, make presentations, and assist with administrative functions.

In addition, the potential exists to develop a local friends group to enhance refuge activities, with the assistance of the Friends of Tennessee National Wildlife Refuge as a mentoring group.

A key element of this CCP is to establish partnerships with local volunteers, landowners, private organizations, and state and federal natural resource agencies. In the immediate vicinity of the refuge, opportunities exist to establish partnerships with the organizations and agencies such as the Stewart County Mayor's Office, Dover Chamber of Commerce, Stewart County Sheriff's Office, Austin Peay University, Montgomery County Master Gardener's Club, Stewart County School System, Stewart County Arts and Heritage Counsel, Stewart County Historical Society, and University of Tennessee-Martin.

At regional and state levels, partnerships may be established or enhanced with organizations such as Land Between the Lakes (USDA Forest Service), Stewart State Forest (Tennessee Department of Agriculture), Fort Donelson (National Park Service), Cumberland City Power Plant (Tennessee Valley Authority), Lake Barkley (U.S. Army Corps of Engineers), Natural Resources Conservation Service, U.S. Geological Survey, Tennessee Wildlife Resources Agency, and Tennessee Department of Environmental Quality. Other potential partnerships may be established with Partners In Flight, Partners in Amphibian and Reptile Conservation, the National Fish and Wildlife Foundation, Southeastern Association of Fish and Wildlife Agencies, National Turkey Federation, and Ducks Unlimited.

STEP-DOWN MANAGEMENT PLANS

A CCP is a strategic plan that guides the future direction of the refuge. A step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services management. These plans (Table 7) are also developed in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

Some of the step-down management plans listed above would be better combined with other plans when revisions are made. These include the Soil and Moisture Plan and the Marsh and Water Management becoming a part of a comprehensive Wetlands Management Plan for the refuge. In a similar manner, the Crowd Control Plan and the Law Enforcement Plan should each become a section of the new comprehensive Visitor Services Plan. The Duck Virus Enteritis Plan, if needed, could become a part of a larger Wildlife Disease Monitoring Plan to include more recent wildlife outbreaks of concern.

MONITORING AND ADAPTIVE MANAGEMENT

Adaptive management is a flexible approach to long-term management of biotic resources that is directed over time by the results of ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

Table 7. Refuge step-down management plans related to the goals and objectives of the CCP

Step-down Plan (Year Written)	Completion Date
Station Safety Plan – Revise (2007)	Annually
Marsh and Water Management Plan – Revise (1967)	2010
Forest Management Plan – Develop (new)	2011
Croplands Management Plan – Revise (1995)	2010
Fire Management Plan – Revise (2001)	2011
Soil and Moisture Plan – Revise (no date, circa 1970's)	2010
Animal Control Plan – Revise (1985)	2010
Fishery Management Plan – Revise (1987)	2012
Wildlife Inventory Plan – Revise (1969)	2012
Refuge Hunting Plan – Current (2007)	2013
Sport Fishing Plan – Revise (1992)	2013
Sign Plan – Revise (1989)	2012
Visitor Services Plan – Revise (1985)	2011
Law Enforcement Plan – Revise (1988)	2011
Crowd Control Plan – Revise with Law Enforcement Plan (1988)	2011
Duck Virus Enteritis Plan – Revise (1973)	2013
Hazardous Communications Plan – Current (2007)	Annually
Oil and Hazardous Materials Plan – Current (2007)	2014

To apply adaptive management, specific surveying, inventorying, and monitoring protocols will be adopted for the refuge. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations will include ecosystem team and other appropriate partner participation. If monitoring and evaluation indicate undesirable effects for target and non-target species and/or communities, then alterations to the management projects will be made. Subsequently, the refuge's CCP will be revised. Specific monitoring and evaluation activities will be described in the step-down management plans.

PLAN REVIEW AND REVISION

The CCP will be reviewed annually in development of the refuge's annual work plans and budget. It will also be reviewed to determine the need for revision. A revision will occur if and when conditions change or significant information becomes available, such as a change in ecological conditions or a major refuge expansion. Further, the final CCP will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the refuge's goals and objectives. Revisions to the final CCP and the step-down management plans will be subject to public review and NEPA compliance.

APPENDIX A. Glossary

Adaptive Management: Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alluvial: Sediment transported and deposited in a delta or riverbed by flowing water.

Alternative: 1. A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2). 2. Alternatives are different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1.6B).

Anadromous: Migratory fishes that spend most of their lives in the sea and migrate to fresh water to breed.

Biological Diversity: The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (USFWS Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as Biodiversity.

Carrying Capacity: The maximum population of a species able to be supported by a habitat or area.

Categorical Exclusion (CE,CX, CATEX, CATX): A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

CFR: Code of Federal Regulations.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge (50 CFR 25.12 (a)). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

Comprehensive Conservation Plan (CCP):	A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (Service Manual 602 FW 1.6 E).
Concern:	See Issue
Cover Type:	The present vegetation of an area.
Cultural Resource Inventory:	A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).
Cultural Resource Overview:	A comprehensive document prepared for a field office that discusses, among other things, it's prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field offices background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).
Cultural Resources:	The remains of sites, structures, or objects used by people in the past.
Designated Wilderness Area:	An area designated by the United States Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).
Disturbance:	Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).
Ecosystem:	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
Ecosystem Management:	Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and basic ecosystem processes are perpetuated indefinitely.

Endangered Species (Federal):	A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
Endangered Species (State):	A plant or animal species in danger of becoming extinct or extirpated in the state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.
Environmental Assessment (EA):	A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).
Environmental Impact Statement (EIS):	A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).
Estuary:	The wide lower course of a river into which the tides flow. The area where the tide meets a river current.
Finding of No Significant Impact (FONSI):	A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).
Goal:	Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Service Manual 620 FW 1.6J).
Habitat:	Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.
Habitat Restoration:	Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.
Habitat Type:	See Vegetation Type.
Improvement Act.:	The National Wildlife Refuge System Improvement Act of 1997.
Informed Consent:	The grudging willingness of opponents to “to along” with a course of action that they actually oppose (Bleiker).

Issue:	Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or other presence of an undesirable resource condition (Service Manual 602 FW 1.6K).
Management Alternative:	See Alternative
Management Concern:	See Issue
Management Opportunity:	See Issue
Migration:	The seasonal movement from one area to another and back.
Mission Statement:	Succinct statement of the unit's purpose and reason for being.
Monitoring:	The process of collecting information to track changes of selected parameters over time.
National Environmental Policy Act of 1969 (NEPA):	Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (40 CFR 1500).
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57):	Under the Refuge Improvement Act, the U.S. Fish and Wildlife Service is required to develop 15-year Comprehensive Conservation Plans for all National Wildlife Refuges outside Alaska. The Act also describes the six public uses given priority status within the NWRS (i.e., hunting, fishing, wildlife observation, photography, environmental education, and interpretation).
National Wildlife Refuge System Mission:	The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
National Wildlife Refuge System:	Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; games ranges; wildlife management areas; or waterfowl production areas.

National Wildlife Refuge: A designated area of land, water, or an interest in land or water within the System.

Native Species: Species that normally live and thrive in a particular ecosystem.

Notice of Intent (NOI): A notice that an environmental impact statement will be prepared and considered (40 CFR 1508.22). Published in the Federal Register.

Noxious Weed: A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the Untied States and to the public health.

Objective: A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).

Plant Association: A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.

Plant Community: An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.

Preferred Alternative: This is the alternative determined [by the decision maker] to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.

Prescribed Fire: The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May be from natural ignition or intentional ignition.

Priority Species: Fish and wildlife species that the Service believes require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) state-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.

Public Involvement Plan:	Broad long-term guidance for involving the public in the comprehensive planning process.
Public Involvement:	A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.
Public:	Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.
Purposes of the Refuge:	"The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit." For refuges that encompass Congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (Service Manual 602 FW 106 S).
Recommended Wilderness:	Areas studied and found suitable for wilderness designation by both the Director and Secretary, and recommended for designation by the President to Congress. These areas await only legislative action by congress in order to become part of the Wilderness System. Such areas are also referred to as "pending in Congress" (Draft Service Manual 610 FW 1.5).
Record of Decision (ROD):	A concise public record of decision prepared by the Federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).
Refuge Goal:	See Goal.
Refuge Purposes:	See Purposes of the Refuge
Songbirds: (Also Passerines)	A category of birds that are medium to small, perching landbirds. Most are territorial singers and migratory.
Step-down Management Plan:	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).

Strategy:	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).
Study Area:	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP/EIS the study area includes the lands within the currently approved Refuge boundary and potential Refuge expansion areas.
Threatened Species (Federal):	Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Threatened Species (State):	A plant or animal species likely to become endangered in the state within the near future if factors contributing to population decline or habitat degradation or loss continue.
Tiering:	The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).
U.S. Fish and Wildlife Service Mission:	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.
Unit Objective:	See Objective
Vegetation Type, Habitat Type, Forest Cover Type:	A land classification system based upon the concept of distinct plant associations.
Vision Statement:	A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System Mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 602 FW 1.6 Z).

Wilderness Study Areas: Lands and waters identified through inventory as meeting the definition of wilderness and undergoing evaluation for recommendation for inclusion in the Wilderness System. A study area must meet the following criteria:

- Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable
- Has outstanding opportunities for solitude or a primitive and unconfined type of recreation
- Has at least 5,000 contiguous roadless acres or is sufficient in size as to make practicable its preservation and use in an unimpaired condition (Draft Service Manual 610 FW 1.5)

Wilderness: See Designated Wilderness

Wildfire: A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildland Fire: Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3

ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
APHIS	Animal and Plant Health Inspection Service
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BRT	Biological Review Team
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
CHJV	Central Hardwoods Joint Venture
CRMP	Cultural Resources Management Plan
cfs	cubic feet per second
DBH	diameter at breast height
DOI	Department of the Interior
DU	Ducks Unlimited
EA	Environmental Assessment
EE	environmental education
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
FTE	full-time equivalent
FY	Fiscal Year
GIS	Global Information System
LTCE	Lower Tennessee-Cumberland River Ecosystem
NEPA	National Environmental Policy Act
NPS	National Park Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
NWSG	native warm season grasses
PFT	Permanent Full Time
PIF	Partners in Flight
RM	Refuge Manual
RNA	Research Natural Area
ROD	Record of Decision
RONS	Refuge Operating Needs System
ROS	Refuge Operations Specialist
RRP	Refuge Roads Program
SAMMS	Service Asset Maintenance Management System
Service	U.S. Fish and Wildlife Service (also, FWS or USFWS)
TWRA	Tennessee Wildlife Resources Agency
TFT	Temporary Full Time
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

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APPENDIX C. Relevant Legal Mandates and Executive Orders

STATUTE	DESCRIPTION
Administrative Procedures Act (1946)	Outlines administrative procedures to be followed by Federal agencies with respect to identification of information to be made public; publication of material in the Federal Register; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.
American Antiquities Act of 1906	Provides penalties for unauthorized collection, excavation, or destruction of historic or prehistoric ruins, monuments or objects of antiquity on lands owned or controlled by the United States. The Act authorizes the President to designate as national monuments objects or areas of historic or scientific interest on lands owned or controlled by the Unites States.
American Indian Religious Freedom Act of 1978	Protects the inherent right of Native Americans to believe, express, and exercise their traditional religions, including access to important sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.
Americans With Disabilities Act of 1990	Intended to prevent discrimination of and make American Society more accessible to people with disabilities. The Act requires reasonable accommodations to be made in employment, public services, public accommodations, and telecommunications for persons with disabilities.
Anadromous Fish Conservation Act of 1965, as amended	Authorizes the Secretary of the Interior and Commerce to enter into cooperative agreements with states and other non-Federal interest for conservation, development, and enhancement of anadromous fish and contribute up to 50 percent as the Federal share of the cost of carrying out such agreements. Reclamation construction programs for water resource projects needed solely for such fish are also authorized.
Archaeological Resources Protection Act of 1979, as amended.	Strengthens and expands the protective provisions of the Antiquities Act of 1906 regarding archaeological resources. It also revised the permitting process for archaeological research.
Architectural Barriers Act of 1968	Requires that buildings and facilities designed, constructed, or altered with Federal funds, or leased by a Federal agency, must comply with standards for physical accessibility.
Bald and Golden Eagle Protection Act of 1940, as amended	Prohibits the possession, sale or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes, or for the religious purposes of Indians.

STATUTE	DESCRIPTION
Bankhead-Jones Farm Tenant Act of 1937	Directs the Secretary of Agriculture to develop a program of land conservation and utilization in order to correct maladjustments in land use and thus assist in such things as control of soil erosion, reforestation, preservation of natural resources and protection of fish and wildlife. Some early refuges and hatcheries were established under authority of this Act.
Cave Resources Protection Act of 1988	Established requirements for the management and protection of caves and their resources on Federal lands, including allowing the land managing agencies to withhold the location of caves from the public, and requiring permits for any removal or collecting activities in caves on Federal lands.
Clean Air Act of 1970	Regulates air emissions from area, stationary, and mobile sources. This Act and its amendments charge Federal land managers with direct responsibility to protect the “sir quality and related values” of land under their control. These values include fish, wildlife, and their habitats.
Clean Water Act of 1974, as amended	This Act and its amendments have as its objective the restoration and maintenance of the chemical, physical, and biological integrity of the Nation’s waters. Section 401 of the Act requires that Federally permitted activities comply with the Clean Water Act standards, state water quality laws, and any other appropriate state laws. Section 404 charges the U.S. Army Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands.
Coastal Barrier Resources Act of 1982 (CBRA)	Identifies undeveloped coastal barriers along the Atlantic and Gulf coasts and included them in the John H. Chafee Coastal Barrier Resources System (CBRS). The objectives of the act are to minimize loss of human life, reduce wasteful Federal expenditures, and minimize the damage to natural resources by restricting most Federal expenditures that encourage development within the CBRS.
Coastal Barrier Improvement Act of 1990	Reauthorized the CBRA, expanded the CBRS to include undeveloped coastal barriers along the Great Lakes and in the Caribbean, and established “Otherwise Protected Areas (OPAs)”. The Service is responsible for maintaining official maps, consulting with Federal agencies that propose spending Federal funds within the CBRS and OPAs, and making recommendations to Congress about proposed boundary revisions.
Coastal Wetlands Planning, Protection, and Restoration (1990)	Authorizes the Director of the Fish and Wildlife Service to participate in the development of a Louisiana coastal wetlands restoration program, participate in the development and oversight of a coastal wetlands conservation program, and lead in the implementation and administration of a National coastal wetlands grant program.

STATUTE	DESCRIPTION
Coastal Zone Management Act of 1972, as amended	Established a voluntary national program within the Department of Commerce to encourage coastal States to develop and implement coastal zone management plans and requires that “any Federal activity within or outside of the coastal zone that affects any land or water use or natural resource of the coastal zone” shall be “consistent to the maximum extent practicable with the enforceable policies” of a State’s coastal zone management plan. The law includes an Enhancement Grants Program for protecting, restoring or enhancing existing coastal wetlands or creating new coastal wetlands. It also established the National Estuarine Reserve Research System, guidelines for estuarine research, and financial assistance for land acquisition.
Emergency Wetlands Resources Act of 1986	This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act requires the Secretary to establish a National Wetlands Priority Conservation Plan, required the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It also established entrance fees at National Wildlife Refuges.
Endangered Species Act of 1973, as amended	Provides for the conservation of threatened and endangered species of fish, wildlife, and plants by Federal action and by encouraging the establishment of state programs. It provides for the determination and listing of endangered and threatened species and the designation of critical habitats. Section 7 requires refuge managers to perform internal consultation before initiating projects that affect or may affect endangered species.
Environmental Education Act of 1990	This Act established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a Federal environmental education program in consultation with other Federal natural resource management agencies, including the Fish and Wildlife Service.
Estuary Protection Act of 1968	Authorized the Secretary of the Interior, in cooperation with other Federal agencies and the States, to study and inventory estuaries of the United States, including land and water of the Great Lakes, and to determine whether such areas should be acquired for protection. The Secretary is also required to encourage State and local governments to consider the importance of estuaries in their planning activities relates to Federal natural resource grants. In approving any state grants for acquisition of estuaries, the Secretary was required to establish conditions to ensure the permanent protection of estuaries.

STATUTE	DESCRIPTION
Estuaries and Clean Waters Act of 2000	This law creates a Federal interagency council that includes the Director of the Fish and Wildlife Service, the Secretary of the Army for Civil Works, the Secretary of Agriculture, the Administrator of the Environmental Protection Agency and the Administrator for the National Oceanic and Atmospheric Administration. The Council is charged with developing a national estuary habitat restoration strategy and providing grants to entities to restore and protect estuary habitat to promote the strategy.
Food Security Act of 1985, as amended (Farm Bill)	The Act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farmer program subsidies. It also established the Wetland Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.
Farmland Protection Policy Act of 1981, as amended	The purpose of this law is to minimize the extent to which Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.
Federal Advisory Committee Act (1972), as amended	Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.
Federal Coal Leasing Amendment Act of 1976	Provided that nothing in the Mining Act, the Mineral Leasing Act, or the Mineral Leasing Act for Acquired Lands authorized mining coal on refuges.
Federal-Aid Highways Act of 1968	Established requirements for approval of Federal highways through wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other Federal agencies before approving any program or project requiring the use of land under their jurisdiction.
Federal Noxious Weed Act of 1990, as amended	The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other Federal, State and local agencies, farmers associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each Federal land-managing agency including the Fish and Wildlife Service to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the States including integrated management systems to control undesirable plants.

STATUTE	DESCRIPTION
Fish and Wildlife Act of 1956	Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also includes the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. Among other things, it authorizes the Secretary of the Interior to take such steps as may be required for the development, advancement, management, conservation and protection of fish and wildlife resources including, but not limited to, research, development of existing facilities, and acquisition by purchase or exchange of land and water or interests therein.
Fish and Wildlife Conservation Act of 1980, as amended	Requires the Service to monitor non-gamebird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act.
Fish and Wildlife Coordination Act of 1958	Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the Fish and Wildlife Service and the state fish and wildlife agencies where the “waters of a stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted…or otherwise controlled or modified” by any agency under Federal permit or license.
Improvement Act of 1978	This Act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.
Fishery (Magnuson) Conservation and Management Act of 1976	Established Regional Fishery Management Councils comprised of Federal and State officials including the Fish and Wildlife Service. It provides for regulation of foreign fishing and vessel fishing permits.
Freedom of Information Act, 1966	Requires all Federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions, official, published and unpublished policy statements, final orders deciding case adjudication, and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.
Geothermal Steam Act of 1970, as amended	Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15 c of the Act prohibits issuing geothermal leases on virtually all Service-administrative lands.

STATUTE	DESCRIPTION
Lacey Act of 1900, as amended	Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species. This Act prohibits interstate and international transport and commerce of fish, wildlife or plant taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species into new locations.
Land and Water Conservation Fund Act of 1948	This Act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies including the Fish and Wildlife Service.
Marine Mammal Protection Act of 1972, as amended	The 1972 Marine Mammal Protection Act established a Federal responsibility to conserve marine mammals with management vested in the Department of Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds, other than the walrus. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals as well as products taken from them.
Migratory Bird Conservation Act of 1929	Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The role of the Commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.
Migratory Bird Hunting and Conservation Stamp Act of 1934	Also commonly referred to as the Duck Stamp Act, the Act requires waterfowl hunters 16 years of age or older to possess a valid Federal hunting stamp. Receipts from the sale of the stamp are deposited into the Migratory Bird Conservation Fund for the acquisition of migratory bird refuges.
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export or import any migratory bird, part, nest, egg or product.
Mineral Leasing Act for Acquired Lands (1947), as amended	Authorizes and governs mineral leasing on acquired public lands.

STATUTE	DESCRIPTION
Minerals Leasing Act of 1920, as amended	Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas and other hydrocarbons, sulphur, phosphate, potassium and sodium. Section 185 of this title contains provisions relating to granting rights-of-ways over Federal lands for pipelines.
Mining Act of 1872, as amended	Authorizes and governs prospecting and mining for the so-called “hardrock” minerals (such as gold and silver) on public lands.
National and Community Service Act of 1990	Authorizes several programs to engage citizens of the U.S. in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law establishes the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on Federal or Indian lands.
National Environmental Policy Act of 1969	Requires analysis, public comment, and reporting for environmental impacts of Federal actions. It stipulates the factors to be considered in environmental impact statements, and requires that Federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unqualified environmental values are given appropriate consideration, along with economic and technical considerations.
National Historic Preservation Act of 1966, as amended	It establishes a National Register of Historic Places and a program of matching grants for preservation of significant historical features. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.
National Trails System Act (1968), as amended	Established the National Trails System to protect the recreational, scenic and historic values of some important trails. National Recreation Trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved State(s), and other land managing agencies, if any. National Scenic and National Historic Trails may only be designated by an Act of Congress. Several National Trails cross units of the National Wildlife Refuge System.
National Wildlife Refuge System Administration Act of 1966	Prior to 1966, there was no single Federal Law that governed the administration of the various wildlife refuges that had been established. This Act defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of an area provided such use is compatible with the major purposes(s) for which the area was established.

STATUTE	DESCRIPTION
National Wildlife Refuge System Improvement Act of 1997	This Act amends the National Wildlife Refuge System Administration Act of 1966. This Act defines the mission of the National Wildlife Refuge System, establishes the legitimacy and appropriateness of six priority 'wildlife-dependent' public uses, establishes a formal process for determining 'compatible uses' of System lands, identifies the Secretary of the Interior as responsible for managing and protecting the System, and requires the development of a comprehensive conservation plan for all refuges outside of Alaska.
Native American Graves Protection and Repatriation Act of 1990	Requires Federal agencies and museums to inventory, determine ownership of, and repatriate certain cultural items and human remains under their control or possession. The Act also addresses the repatriation of cultural items inadvertently discovered by construction activities on lands managed by the agency.
Neotropical Migratory Bird Conservation Act of 2000	Establishes a matching grants program to fund projects that promote the conservation of neotropical migratory birds in the united States, Latin America and the Caribbean.
North American Wetlands Conservation Act of 1989	Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico. North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on Federal lands).
Refuge Recreation Act of 1962, as amended	This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging fees for public uses.
Partnerships for Wildlife Act of 1992	Establishes a Wildlife Conservation and Appreciation Fund, to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the State fish and game agencies in carrying out their responsibilities for conservation of non-game species. The funding formula is no more that 1/3 Federal funds, at least 1/3 Foundation funds, and at least 1/3 State funds.

STATUTE	DESCRIPTION
Refuge Revenue Sharing Act of 1935, as amended	Provided for payments to counties in lieu of taxes from areas administered by the Fish and Wildlife Service. Counties are required to pass payments along to other units of local government within the county, which suffer losses in tax revenues due to the establishment of Service areas.
Rehabilitation Act of 1973	Requires nondiscrimination in the employment practices of Federal agencies of the executive branch and contractors. It also requires all federally assisted programs, services, and activities to be available to people with disabilities.
Rivers and Harbors Appropriations Act of 1899, as amended	Requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States. The Fish and Wildlife Coordination Act provides authority for the Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the Corps of Engineers. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.
Sikes Act (1960), as amended	Provides for the cooperation by the Department of the Interior and Defense with State agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the U.S. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires Federal and State fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.
Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948	This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a Federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a State agency for other wildlife conservation purposes.
Transportation Equity Act for the 21st Century (1998)	Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations and bicycle/pedestrian facilities.
Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended	Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.

STATUTE	DESCRIPTION
Water Resources Planning Act of 1965	Established Water Resources Council to be composed of Cabinet representatives including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational and fish and wildlife needs. The act also established a grant program to assist States in participating in the development of related comprehensive water and land use plans.
Wild and Scenic Rivers Act of 1968, as amended	This act selects certain rivers of the nation possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values; preserves them in a free-flowing condition; and protects their local environments.
Wilderness Act of 1964, as amended	The Wilderness Act of 1964 directs the Secretary of the Interior to review every roadless area of 5,000 acres or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated Wilderness Areas that do not alter natural processes. Wilderness values are preserved through a “minimum tool” management approach, which requires refuge managers to use the least intrusive methods, equipment and facilities necessary for administering the areas.
Youth Conservation Corps Act of 1970	Established a permanent Youth Conservation Corps (YCC) programs within the Department of Interior and Agriculture. Within the Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 11593, Protection and Enhancement of the Cultural Environment (1971)	States that if the Service proposes any development activities that may affect the archaeological or historic sites, the Service will consult with Federal and State Historic Preservation Officers to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.
EO 11644, Use of Off-road Vehicles on Public Land (1972)	Established policies and procedures to ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.
EO 11988, Floodplain Management (1977)	The purpose of this Executive Order is to prevent Federal agencies from contributing to the “adverse impacts associated with occupancy and modification of floodplains” and the “direct or indirect support of floodplain development.” In the course of fulfilling their respective authorities, Federal agencies “shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
EO 11989 (1977), Amends Section 2 of EO 11644	Directs agencies to close areas negatively impacted by off-road vehicles.
EO 11990, Protection of Wetlands (1977)	Federal agencies are directed to provide leadership and take action to minimize the destruction, loss of degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.
EO 12372, Intergovernmental Review of Federal Programs (1982)	Seeks to foster intergovernmental partnerships by requiring Federal agencies to use the State process to determine and address concerns of State and local elected officials with proposed Federal assistance and development programs.
EO 12898, Environmental Justice (1994)	Requires federal agencies to identify and address disproportionately high and adverse effects of its programs, policies, and activities on minority and low-income populations.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 12906, Coordinating Geographical Data Acquisition and Access (1994), Amended by EO 13286 (2003). Amendment of EO's & other actions in connection w/ transfer of certain functions to Secretary of DHS.	Recommended that the executive branch develop, in cooperation with State, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data. Of particular importance to CCP planning is the National Vegetation Classification System (NVCS), which is adopted, standard for vegetation mapping. Using NVCT facilitates the compilation of regional and national summaries, which in turn, can provide an ecosystem context for individual refuges.
EO 12962, Recreational Fisheries (1995)	Federal agencies are directed to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities in cooperation with States and Tribes.
EO 13007, Native American Religious Practices (1996)	Provides for access to, and ceremonial use of, Indian sacred sites on federal lands used by Indian religious practitioners and direction to avoid adversely affecting the physical integrity of such sites.
EO 13061, Federal Support of Community Efforts Along American Heritage Rivers (1997)	Established the American Heritage Rivers initiative for the purpose of natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The Act directs Federal agencies to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage.
EO 13084, Consultation and Coordination With Indian Tribal Governments (2000)	Provides a mechanism for establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.
EO 13112, Invasive Species (1999)	Federal agencies are directed to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and habitat conditions, conduct research to prevent introductions and to control invasive species, and promote public education on invasive species and the means to address them. This EO replaces and rescinds EO 11987, Exotic Organisms (1977).

EXECUTIVE ORDERS	DESCRIPTIONS
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. (2001)	Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

APPENDIX D. Consultation and Coordination

INTRODUCTION

The comprehensive planning process for Cross Creeks NWR involved a wide range of participants from federal, state, and local governments; universities and other researchers; private nonprofit groups; friends of the refuge; and a wide variety of local residents, local businesses, concerned citizens, local schools, universities, and state and national organizations. Outreach efforts by the refuge and news coverage by the media publicized the planning process. The list of participants, beyond those individuals and organizations providing comments during the public scoping process, includes the Core Planning Team, the Interdisciplinary Planning Team, the Biological Review Team, the Visitor Use Review Team, and other parties.

CORE PLANNING TEAM MEMBERS

The core planning team consisted of the listed individuals.

Karen Pacheco – Project Leader
John Taylor – Refuge Manager (Tennessee NWR)

Troy Littrell – Deputy Refuge Manager (Tennessee NWR)
Leon Kolankiewicz – Consultant, Mangi Environmental Group
Mike Dawson – Consultant, CCite

INTERDISCIPLINARY PLANNING TEAM MEMBERS

Several individuals supported the planning process with participation on the Biological Review Team, Visitor Services Review Team, and additional special topic discussions. Their information provided additional biological support for developing objectives found in this plan. Some members are internal to the Service and provide additional policy guidance and support for objective development as well.

BIOLOGICAL REVIEW TEAM

Wally Brines	U.S. Fish and Wildlife Service
Dwight Cooley	U.S. Fish and Wildlife Service
Robert Ford	U.S. Fish and Wildlife Service
Karen Pacheco	U.S. Fish and Wildlife Service
Alan Shriver	U.S. Fish and Wildlife Service
Robert Wheat	U.S. Fish and Wildlife Service
Jeff Hancock	U.S. Army, Corps of Engineers
Scott Somershoe	Tennessee Wildlife Resources Agency

VISITOR SERVICES REVIEW TEAM

Deborah Jerome	U.S. Fish and Wildlife Service
Frank Podriznik	U.S. Fish and Wildlife Service
Sarah Welker	U.S. Fish and Wildlife Service

OTHER CONTRIBUTORS

In addition to the above listed core and extended planning team members, a number of individuals and groups contributed to this CCP. These included local citizens and agencies and non-governmental organizations, as well as Richard Kanaski, the Service's Regional Archaeologist. These contributors participated in the scoping meeting or provided input at various stages of the planning process.

APPENDIX E. Public Involvement

SUMMARY OF PUBLIC SCOPING COMMENTS

Following the initial gathering of information, the Service published a notice of intent to prepare a Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Cross Creeks NWR in the *Federal Register* on January 3, 2007.

The following meetings, contacts, and presentations were undertaken by the Service during the preparation of the Draft CCP/EA.

Prior to public scoping in 2007, the Service carried out a Visitor Services Review in 2004 and a Biological Review in 2006. The Visitor Services Review was conducted by Service public use and outreach specialists. The review team toured the refuge and identified and discussed the current status of public use programs. The team made short-term, medium-term, and long-term recommendations for enhancing and improving these programs.

In the Biological Review, a diverse team of federal and state personnel undertook a holistic examination of habitat and wildlife management programs at the refuge. The team then considered how the refuge might fit into accomplishing a number of relevant system-wide and landscape conservation needs. The Biological Review team included staff from the refuge, as well as Service fish and wildlife biologists from the Division of Ecological Services and Division of Migratory Birds. In addition, wildlife biologists from the TWRA and the Corps participated.

TWRA was invited in January 2007 to participate on the planning team tasked with preparing the CCP. At an intensive 2-day workshop held in July 2007, the planning team drafted the goals, objectives, and strategies that are the heart of this CCP, which will guide refuge management in the coming 15 years.

The refuge held one open house and public scoping meeting at the Stewart County Public Library in Dover, Tennessee, on February 27, 2007. The Service placed advertisements in local newspapers, posted information on the refuge's website regarding this public meeting and how to submit comments, posted meeting information in the local community (at local shops, at the refuge's visitor center, and at local libraries), and sent out flyers announcing the public meetings. Approximately 35 people attended. Presentations about the refuge and the CCP process followed an open house. Afterwards, meeting participants had the opportunity to publicly express their concerns about the refuge and ideas and suggestions for its future management. In addition, a comment form was distributed for attendees and other interested parties to submit their written comments. Written comments could be submitted right at the meeting, mailed subsequently, or sent via email. A total of 12 comment forms and letters were received during the scoping process for Cross Creeks NWR. Some of the letters included multiple names, and one person sent two different letters.

The Service then began the task of reviewing all the issues raised, including internally and from the public, organizations, businesses, local and state government agencies, and other federal agencies. The Draft CCP was then developed based on those issues determined to be of the highest priority for the refuge to address.

DRAFT PLAN COMMENTS AND SERVICE RESPONSES

The Draft CCP/EA for Cross Creeks NWR was made available for public review and comment for a period of 30 days, beginning on April 30, 2009, and closing on June 1, 2009. A few comments were received after the deadline. The Service received written or telephone comments from four members of the general public and one organization.

In accordance with the requirements of NEPA, the Service responded to substantive comments. For the purposes of this CCP, a substantive comment is one that was submitted during the public review and comment period which is within the scope of the proposed action (and the other alternatives outlined in the EA), is specific to the proposed action, has a direct relationship to the proposed action, and includes reasons for the Service to consider it. (For example, a substantive comment might be that the document referenced 500 individuals of a particular species, but that current research found 600. In such a case, the Service would likely update the plan to reflect the 600, citing the current research. On the other hand, a comment such as "We love the refuge" would not be considered substantive.)

The comments received during the public review and comment period were evaluated, summarized, and grouped into several categories: Wildlife and Habitat Management; Resource Protection; Visitor Services; Refuge Administration; Alternatives; References; Notification of Public Review and Comment Period; and Minor Corrections. Comments on like topics were grouped together. The Service's responses to the comments are provided by category. The page numbers referenced relate to the original page numbers in the Draft CCP/EA that was released for public review and comment.

VISITOR SERVICES

Hunting

Comment – The Humane Society of the United States (HSUS) is opposed to the expansion of sport hunting on the refuge and believes that the proposed hunting is not compatible with the purposes of the refuge.

Service Response – Hunting is one of the six priority public uses identified in the Improvement Act, and has been found to be compatible with the purposes for which Cross Creeks NWR was established. The CCP does not include an expansion of the current hunting program.

Comment – HSUS also believes that the Service is in violation of federal law because an EIS was not prepared on the national wildlife refuge sport-hunting program.

Service Response – This comment is outside the scope of this CCP.

Comment – Two citizens are concerned about refuge hunting zones adjacent to Rattlesnake Hollow (Woodpecker Interpretive Trail). Problems have occurred with refuge hunters crossing over onto private property.

Service Response – The Woodpecker Trail area is a "no hunt" zone and the CCP has been updated to emphasize this. "No Hunt" zones are marked with the appropriate signs and are identified in the Cross Creeks NWR hunting regulations. Additional boundary marking is a strategy listed under the "Hunting" objective on page 74.

Comment – One citizen inquired if strategies in the CCP addressed the issues of hunting and neighbors and also littering. This commenter also asked why there was no mention of climate change/global warming in the CCP.

Service Response – Strategies concerning littering can be found under Objective 4-5 on page 76 and under Objective 5-1 on page 77. Strategies designed to lessen trespass issues with adjacent landowners during refuge hunts are found under Objective 4-2 on page 74 and Objective 5-1 on page 77. As indicated in the CCP, the problem with both of these issues is a lack of law enforcement presence on the refuge. The CCP includes the addition of a law enforcement officer to the refuge staff. The presence of a law enforcement officer on the refuge will deter criminal and illegal activity, ranging from littering and dumping to poaching, as well as improving relations with neighbors concerned by issues such as trespass and threats to safety and property from hunting and hunters.

References to climate change/global warming have been added to the CCP.

Comment – A noted professor correctly pointed out that the "Biological Resources" section does not include information on the diverse flora on the refuge and the "Refuge Biota" does not include plants. Some of the invasive plant species are native species. Their "invasiveness" is due to their moving into available habitat.

Service response – The "Biological Resources" section has been updated to reference the diverse flora on the refuge as documented in an early 1990s detailed floristic inventory conducted by Austin Peay University. Since over 600 vascular taxa have been documented on the refuge, we have added a reference to a list rather than include such a lengthy list as an appendix. The CCP has been revised to refer to species such as spatterdock, willow, and buttonbush as "undesirable."

Comment – The Tennessee Ornithological Society supports the CCP and suggests that planning for new visitor facilities seek to incorporate "green design."

Service Response – Concur.

Comment – One citizen believes Alternative C is the best direction for the refuge because the refuge was created to replace vital migratory bird habitat that was lost when Lake Barkley was established. Wildlife-dependent recreation is secondary to the primary goal of sustaining wintering waterfowl.

Service Response – Concur that wildlife-dependent public use on the refuge is secondary to the primary purposes for which the refuge was established. The public use program on the refuge is carefully planned to be compatible with these refuge purposes, such as sustaining wintering waterfowl populations.

APPENDIX F. Appropriate Use Determinations

Cross Creeks National Wildlife Refuge Appropriate Use Determinations

An appropriate use determination is the initial decision process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find that a use is appropriate before undertaking a compatibility review of the use. This process clarifies and expands on the compatibility determination process by describing when refuge managers should deny a proposed use without determining compatibility. If a proposed use is not appropriate, it will not be allowed and a compatibility determination will not be undertaken.

Except for the uses noted below, the refuge manager must decide if a new or existing use is an appropriate refuge use. If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. Uses that have been administratively determined to be appropriate are:

- Six wildlife-dependent recreational uses - As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.

- Take of fish and wildlife under state regulations - States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

Statutory Authorities for this policy:

National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee. This law provides the authority for establishing policies and regulations governing refuge uses, including the authority to prohibit certain harmful activities. The Act does not authorize any particular use, but rather authorizes the Secretary of the Interior to allow uses only when they are compatible and “under such regulations as he may prescribe.” This law specifically identifies certain public uses that, when compatible, are legitimate and appropriate uses within the Refuge System. The law states “. . . it is the policy of the United States that . . .compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System . . .compatible wildlife-dependent recreational uses are the priority general public uses of the System and shall receive priority consideration in refuge planning and management; and . . . when the Secretary determines that a proposed wildlife-dependent recreational use is a compatible use within a refuge, that activity should be facilitated . . . the Secretary shall . . . ensure that priority general public uses of the System receive enhanced consideration over other general public uses in planning and management within the System . . . .” The law also states “in administering the System, the Secretary is authorized to take the following actions: . . . issue regulations to carry out this Act.” This policy implements the standards set in the Act by providing enhanced consideration of priority general public uses and ensuring other public uses do not interfere with our ability to provide quality, wildlife-dependent recreational uses.

Refuge Recreation Act of 1962, 16 U.S.C. 460k. The Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Other Statutes that Establish Refuges, including the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) (16 U.S.C. 410hh - 410hh-5, 460 mm - 460mm-4, 539-539e, and 3101 - 3233; 43 U.S.C. 1631 et seq.).

Executive Orders. The Service must comply with Executive Order 11644 when allowing use of off-highway vehicles on refuges. This order requires the Service to designate areas as open or closed to off-highway vehicles in order to protect refuge resources, promote safety, and minimize conflict among the various refuge users; monitor the effects of these uses once they are allowed; and amend or rescind any area designation as necessary based on the information gathered. Furthermore, Executive Order 11989 requires the Service to close areas to off-highway vehicles when it is determined that the use causes or will cause considerable adverse effects on the soil, vegetation, wildlife, habitat, or cultural or historic resources. Statutes, such as ANILCA, take precedence over executive orders.

Definitions:

Appropriate Use
A proposed or existing use on a refuge that meets at least one of the following four conditions.

1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.
2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
3) The use involves the take of fish and wildlife under state regulations.
4) The use has been found to be appropriate as specified in section 1.11.

Native American. American Indians in the conterminous United States and Alaska Natives (including Aleuts, Eskimos, and Indians) who are members of federally recognized tribes.

Priority General Public Use. A compatible wildlife-dependent recreational use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Quality. The criteria used to determine a quality recreational experience include:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and the Service's role in managing and protecting these resources.
- Provides reliable/reasonable opportunities to experience wildlife.

- Uses facilities that are accessible and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

Wildlife-Dependent Recreational Use. As defined by the Improvement Act, a use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: **Cross Creeks NWR**

Use: **Cooperative Farming**

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	x	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		x
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes** __X__ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** __x__

Refuge Manager: Rick E. Hain Date: 8/21/2009

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Date: 8/25/2009

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: **Cross Creeks NWR**

Use: **Boating: Motorized and Non-motorized (Non-commercial)**

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	x	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		x
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes** __x__ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** __x__

Refuge Manager: _____ Date: 8/21/2009

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: 8/25/2009

A compatibility determination is required before the use may be allowed.

APPENDIX G. Compatibility Determinations

Cross Creeks National Wildlife Refuge Compatibility Determination

Uses: The following uses were considered for compatibility determination reviews: Recreational Fishing, Hunting, Environmental Education and Interpretation, Wildlife Observation, Wildlife Photography, Boating, and Farming. A description and anticipated biological impacts for each use are addressed separately in this Compatibility Determination.

Refuge Name: Cross Creeks National Wildlife Refuge

Date Established: January 31, 1967

Establishing and Acquisition Authority: Cross Creeks NWR, in Stewart County, Tennessee, was established as mitigation for the loss of Kentucky Woodland NWR, Golden Pond, Kentucky. The loss was due to the U.S. Army Corps of Engineers' Lake Barkley Project, Public Law 780, Senate Document #81, September 3, 1954. The Memorandum of Understanding between the Fish and Wildlife Service and the Corps of Engineers, dated November 9, 1962, authorized the development of Cross Creeks NWR and administration was delegated to the Fish and Wildlife Service. Public Land Order 4560, dated January 31, 1967, transferred all lands from the Corps of Engineers to the Fish and Wildlife Service.

Refuge Purposes: For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. 715 – 715r), as amended, the purpose of the acquisition is: "…for the purpose as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d)

"…shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements …and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife resources thereof, and its habitat thereon…" (Fish and Wildlife Coordination Act, 16 U.S.C. 661 – 667e, as amended)

National Wildlife Refuge System Mission:

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

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

Other Applicable Laws, Regulations, and Policies:

Antiquities Act of 1906 (34 Stat. 225)
Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)
Criminal Code Provisions of 1940 (18 U.S.C. 41)
Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; 54 Stat. 250)
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat.1119)

Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd, 668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq; 83 Stat. 852)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 10989)
Endangered Species Act of 1973 (16 U.S.C. 1531 et seq; 87 Stat. 884)
Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)
National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)
Emergency Wetlands Resources Act of 1986 (S.B. 740)
North American Wetlands Conservation Act of 1990
Food Security Act (Farm Bill) of 1990 as amended (HR 2100)
The Property Clause of The U.S. Constitution Article IV 3, Clause 2
The Commerce Clause of The U.S. Constitution Article 1, Section 8
The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, USC668dd)
Executive Order 12996, Management and General public Use of the National Wildlife Refuge System. March 25, 1996
Title 50, Code of Federal Regulations, Parts 25-33
Archaeological Resources Protection Act of 1979
Native American Graves Protection and Repatriation Act of 1990

Public Review and Comment

Methods used to solicit public review and comment included posted notices at refuge headquarters and area locations; copies of the draft comprehensive conservation plan distributed to adjacent landowners, the public, and local, state, and federal agencies; and public meetings. News releases announcing the availability of the draft comprehensive conservation plan for public review and comment were furnished to the following newspapers: Clarksville Leaf Chronicle, Stewart-Houston County Times, Paris Post Intelligencer, McKenzie Banner, Camden Chronicle, News Democrat, Decatur Chronicle, The News Leader, Buffalo River Review, Henry Countian, The Benton Countian, Dyersburg State Gazette, Knoxville News Sentinel, The Jackson Sun, The Tennessean, and Memphis Commercial Appeal. Also, news releases were furnished to the following radio stations: WKJQ-Parsons, WTPR-Paris, WMUF-Paris, WRJB-Camden, WVRY-Waverly, and all six Clarksville stations.

Compatibility determinations for each description listed were considered separately. Although for brevity, the preceding sections from “Uses” through ”Public Review and Comment” are only written once within the CCP, they are part of each descriptive use and become part of that compatibility determination if considered outside of the CCP.

Description of Use: Recreational Fishing

Recreational fishing has been identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority public use as long as it is compatible with the purpose for which the refuge was established. Fishing in reservoirs and waterfowl impoundments managed through the refuge’s water management structures will be permitted March 16 to November 14. Fishing in boats in the waters of Lake Barkley/Cumberland River will be permitted year-round, 24 hours per day. Bank fishing in refuge-controlled waters will be permitted during daylight hours only.

Where will the use be conducted?

Recreational fishing will be permitted in the two refuge reservoirs (Elk and South Cross Creek), refuge waterfowl impoundments, and waters of Lake Barkley/Cumberland River.

When will the use be conducted?

Fishing on the refuge will be permitted during daylight hours only from March 16 to November 14. Fishing from a boat in the waters of Lake Barkley/Cumberland River will be permitted 24 hours a day, year-round.

How will the use be conducted?

Recreational fishing will be permitted along waterfowl impoundments, reservoir, and river shorelines while fishing from the bank, and from a boat in those waters where access is provided by a boat launching ramp. The open season for Elk and South Cross Creek Reservoirs and all refuge waterfowl impoundments will be from March 16 through November 14 during daylight hours. However, recreational fishing from a boat will be permitted year-round, 24 hours a day, in the waters of Lake Barkley/Cumberland River. Boats will be restricted to "slow speed/minimum wake" on all refuge pools. Cross Creeks NWR maintains twelve boat launching ramps to provide boat access to refuge waterfowl impoundments, reservoirs, and the waters of Lake Barkley/Cumberland River.

Visitors will be permitted to fish using rod and reel tackle. Trotlines, limblines, jugs, and slat baskets will not be permitted in refuge waterfowl impoundments and reservoirs. The refuge will not allow the taking of frogs and turtles.

Why is this use permitted?

Fishing is compatible with the refuge's objective of providing wildlife-dependent recreation. Approximately 3,260 acres of the refuge's 8,862 acres are suitable for fishing seasonally. Fishing is an activity that allows people of all ages to enjoy the outdoors and appreciate our natural resources. The fishing season is set to avoid conflict between this user group and the refuge's wintering migratory waterfowl responsibilities.

Availability of Resources:

Resources involved in the administration and management of the use:

The refuge currently has the staff and funds necessary to maintain boat launching ramps, bank fishing areas, and parking facilities. Law enforcement is needed to ensure compliance with safe boating regulations and curtail illegal activities.

Special equipment, facilities, or improvements necessary to support the use:

Refuge gravel roads, boat launching ramps, and parking facilities are required to support this use.

Maintenance costs:

Estimated staff time and materials costs directly attributable to boating are the funds expended to maintain boat launching ramps and parking facilities provided for vehicles trailering boats. Costs associated with annual maintenance work and materials include the following:

Estimated staff time:	
Mowing facilities to control encroaching vegetation	5 staff days
Grading gravel parking facilities	5 staff days
Various maintenance tasks: (i.e., sign, gate repairs, or replacement	2 staff day
Rehabilitating gravel parking facilities with new gravel	5 staff days
	17 total staff days

Estimated materials costs:	
Fuel and routine maintenance costs to operate equipment	$ 800.00
Replacement gravel	$4,000.00
	$4,800.00

Monitoring costs:

Monitoring and compliance will be conducted within existing programs and with existing staff. Fishing will be monitored primarily while conducting fishing regulations compliance checks by law enforcement officers and, as such, will not create an exclusive monitoring cost.

Offsetting revenues:

Some revenue is collected during the year from hunting permit sales and is used to maintain boat launch facilities.

Anticipated Impacts of the Use:

Short-term impacts:

Human activity associated with sport recreational fishing can have adverse impacts on wildlife, plants, habitats, and facilities which support this use. Bald eagles have nested in and around the refuge since the 1980s. The refuge strives to protect their nests during the nesting season from human disturbance until eaglets have fledged. Although nests are generally a substantial distance from popular fishing spots, public use has the potential to adversely affect eagle reproductive success. Based on past observation, vehicles sometimes injure or kill wildlife crossing refuge roads. Bank fishing is the most popular method of fishing. Repeated trampling of vegetation along impoundment banks has the potential to accelerate soil erosion. Litter accumulates at popular fishing locations and boat launching ramps.

Sport recreational fishing supports the refuge objectives and mission of the National Wildlife Refuge System by providing wildlife-dependent public use opportunities. As long as the number of visitors does not significantly increase, public use impacts will not pose significant problems and can be handled with existing staff.

Long-term impacts:

Recreational fishing makes readily observable, direct long-term impacts on existing refuge infrastructure. Without the refuge's 30-mile gravel road system, recreational fishing could not be conducted at its present level. While this road system does not exclusively serve the fishing program, the fishing public does account for a significant portion of the road maintenance cost. The refuge maintains twelve boat launching ramps in support of recreational fishing. Although fishermen have a direct impact on the refuge's maintained facilities, it is not foreseen that the fishing public will have long-term negative impacts on wildlife habitat.

Cumulative impacts:

The refuge does not anticipate direct or indirect cumulative impacts in conjunction with other existing refuge uses.

Determination:

Fishing (general)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

- The refuge will maintain an active law enforcement presence; use law enforcement officers assigned to work on Tennessee NWR Complex. Tennessee Wildlife Resources Agency wildlife officers will also intermittently perform law enforcement patrols. The presence of these law enforcement officers will ensure regulatory compliance
- Daylight use only regulations will be maintained.
- River bottom lands and impoundments under the exclusive control of the refuge will be closed to public use from November 15 through March 16 to protect wintering waterfowl from human disturbance. If significant disturbances are noted at other locations in the future, these areas may need to be closed to the public as well.
- No expansion of sport recreational fishing opportunities beyond the current level is planned.
- Roads, parking areas, and boat launching ramps need to be maintained to provide safe access to refuge resources.

Justification:

The refuge is located at the headwaters of the Corps of Engineers' Lake Barkley project, stretching 12 miles along both sides of the Cumberland River. Visitor facilities include a visitor center, gravel access roads, and numerous boat launching ramps and parking lots. Cross Creeks NWR provides boat access to the Cumberland River, with the nearest alternative access points being 6 miles upstream and downstream. The refuge manages sixteen shallow water migratory bird impoundments, which provide seasonal fishing opportunities. Two deeper bodies of water, Elk and South Cross Creeks Reservoir, provide fishing opportunities for people who like to fish in a reservoir smaller than the larger Tennessee Valley Authority and Corps of Engineers lakes. With the abundance of water on the refuge and infrastructure providing access, the refuge can provide quality fishing opportunities.

Access to the fishery resource in refuge managed impoundments is controlled by gates at major refuge entrances. These gates are opened from March 16 to November 14, thus disturbance to wintering waterfowl is not a factor.

Nesting bald eagles are afforded protection by establishing closed areas when necessary. From egg incubation to when eaglets fledge, any eagle nest considered at risk from human disturbance is protected through posting.

Recreational fishing managed in accordance with the stipulations stated herein will make this public use compatible with the refuge purposes and the Refuge System mission.

NEPA Compliance for Refuge Use Decision *Place an X in appropriate space*

____Categorical Exclusion without Environmental Action Statement
____Categorical Exclusion and Environmental Action Statement
_X_Environmental Assessment and Finding of No Significant Impact
____Environmental Impact Statement and Record of Decision

Mandatory 15-year Re-Evaluation Date: 08/28/2024

Description of Use:

Migratory Bird Hunting - resident Canada geese
Big Game Hunting - deer, feral hog, and turkey
Upland Game Hunting - squirrel

Allow the general public access to the refuge during designated times of the year for the purpose of hunting deer, feral hog, turkey, resident Canada goose, and squirrel. The entire refuge will be open to big game and upland game hunting. Only 40 percent of the refuge will be open to migratory bird hunting. Hunting will be allowed for the above mentioned species during state hunting seasons between March 16 and November 14. Between November 15 and March 16, the refuge will be closed to all public use to minimize the disturbance to wintering migratory waterfowl. The spring squirrel season will be closed on the refuge. Allowable forms of access to the refuge will include motorized vehicles, boats, and bicycles. Motorized vehicle access will be limited to designated maintained roads and vehicles will be parked so as not to interfere with other traffic. Hunting is a priority public use on the National Wildlife Refuge System lands as identified in the Improvement Act of 1997.

When will the use be conducted?

Hunters will have access to the refuge two hours before legal sunrise to two hours after legal sunset. Hunters will possess and carry a valid refuge permit while hunting on the refuge. Only portable blinds and tree stands will be used. All blinds, tree stands, and all other personal equipment will be removed from the refuge at the end of each day's hunt.

How will the use be conducted?

Hunting is used as a management tool to maintain the health of animal populations that occur on the refuge and to reduce depredation on refuge croplands. For example, reducing the number of deer and feral hogs using the refuge throughout the year will increase the food produced by the refuge's cooperative farming program for wintering waterfowl.

Availability of Resources:

Hunting is expected to require minimal additional resources. Hunting has occurred on this refuge since before 1984. Current refuge staff maintain the roads, gates, parking areas, boat launching ramps, and boundary posting needed to manage and inform visiting hunters. Tennessee NWR Complex law enforcement staff will be available to monitor and enforce Service regulations. The refuge office and visitor

center provide additional opportunities to educate and inform hunters. Currently, existing facilities and infrastructure support all wildlife management and public use programs and therefore will be maintained with or without a public hunt program.

Resources involved in the administration and management of the use:

Refuge manager to administer the program and coordinate with the state agency - $15,000.
Office assistant to answer hunter inquiries and issue permits - $10,000.

Special equipment, facilities, or improvements necessary to support the use:

Refuge roads and parking areas are sufficient to support this use.

Maintenance costs:

The following are estimated annual maintenance costs to maintain the current program level.

Parking lot maintenance:	$ 1,000
Sign maintenance and replacement:	$ 2,000
Road maintenance:	$ 5,000
Brochures/public information:	$ 3,000

Monitoring costs:

Monitoring and compliance will be conducted within existing programs and staff. Hunting will be monitored primarily while conducting hunting regulations compliance checks by law enforcement officers and, as such, will not create an exclusive monitoring cost.

Law Enforcement:	$10,000

Offsetting revenues:

Some revenue is collected during the year from hunting permit sales, which is used to maintain roads and signs as well as cover the cost of printing annual hunting regulations. Cross Creeks NWR takes in an estimated $5,000 annually through the sale of hunting permits.

Anticipated Impacts of the Use:

Hunting is not expected to have any significant impacts on refuge lands nor on the species being hunted. In few instances, hunters will park their vehicles in ways that will interfere with other traffic or in places where parking is not permitted. These parking violations will be resolved through hunter education and regulatory enforcement. Damage to habitat by vehicles and by hunters walking to and from hunting sites will be minimal and temporary. The use of temporary blinds will cause trampling of vegetation in the immediate area of their use, but will not cause significant long-term damage. The use of temporary tree stands will cause some superficial damage to the trees on which they are used.

Cross Creeks NWR extends along 12.5 miles on both sides of the Cumberland River between Dover and Cumberland City, Tennessee. Refuge lands are generally limited elevations below the 378 feet above mean sea level, causing the refuge to be very narrow throughout most of its length. Due to its long narrow configuration, observed population densities fluctuate dramatically in response to food availability and

outside hunting pressure. Hunting on the refuge will equalize the hunting pressure between the refuge and surrounding private lands, thus reducing the refuge's artificially high deer and turkey population.

Determination:

Hunting	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

- Squirrel, turkey, resident Canada goose, and archery deer and hog hunting will be non-quota, but the annual refuge hunting permit will be required.
- Three-day firearm deer hunts will require a refuge quota permit. Quota firearm deer hunts limit the number of hunters that can use the refuge for this specific activity, promote hunter safety, and maintain a quality hunting environment.
- Hunt dates and types will be coordinated on an annual basis with the Tennessee Wildlife Resources Agency and will be administratively approved/disapproved through the Tennessee NWR Complex headquarters.
- An active law enforcement presence will provide for regulatory compliance.
- No portable blinds, tree stands, or any other personal equipment will be left on the refuge over night.

Justification:

Hunting is a priority wildlife-dependent public use listed in Improvement Act of 1997. Development of hunting opportunities fulfills both the Refuge System mission, as well as the goals for Cross Creeks NWR.

Controlled limited hunting is compatible with specific refuge objectives, sound wildlife management, and the public's interest on Cross Creeks NWR. The removal of surplus deer and feral hogs prevents overpopulation, which can be detrimental to herd health and negatively impact the resource. Hunting provides the public with an opportunity to utilize a renewable resource. Hunting is a traditional use on Cross Creeks NWR and in Stewart County, Tennessee.

NEPA Compliance for Refuge Use Decision: Place an X in appropriate space.

____ Categorical Exclusion without Environmental Action Statement
____ Categorical Exclusion and Environmental Action Statement
_X__ Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 15-year Re-Evaluation Date: 08/28/2024

Description of Use: Environmental Education and Interpretation

Environmental education and interpretation have been identified in the National Wildlife Refuge System Improvement Act of 1997 as priority wildlife-dependent recreational uses provided they are compatible with the purpose for which the refuge was established. Environmental education includes activities which seek to increase public knowledge and understanding of wildlife and the importance of habitat protection and management. Activities will include teacher- or staff-guided on-refuge field trips, off-refuge programs in classrooms, teacher and student workshops and curriculum-structured instruction, and interpretation of wildlife resources. Interpretation includes those activities and support facilities that help explain management activities, fish and wildlife resources, and ecological processes to name just a few. Facilities that support interpretation include the refuge headquarters, visitor center, kiosk, and interpretive trail.

Where will the use be conducted?

Environmental education and interpretation will be conducted on and off the refuge. On-site education and interpretation will be conducted throughout the refuge, depending on the needs of the groups being instructed. The most formal instructional setting will typically occur in and around the visitor center. Off-refuge programs will generally occur in local school classrooms or other local community facilities.

When will the use be conducted?

Environmental education and interpretation will be available year-round during daylight hours. Staff-guided tours are available upon request. The refuge strives to host one large public use event during the year, such as activities for National Wildlife Refuge Week or International Migratory Bird Day.

How will the use be conducted?

Environmental education will include on-refuge and off-refuge instruction, lectures, and other forms of assistance. On-refuge activities will include teacher- or staff-guided refuge tours and presentations given in the visitor center or along the wildlife drive. Off-refuge activities will include setting up displays at local events and giving presentations at schools, organizations, and local community facilities.

Refuge interpretation will be accomplished through giving programs at the visitor center, providing staff guided tours, brochures, and interpretive panels in the refuge kiosk.

Why is this use being conducted?

Environmental education and interpretation are non-consumptive wildlife-dependent public uses that do not interfere with or detract from the refuge's purposes. Environmental education and interpretation activities promote public understanding and appreciation of the role of the National Wildlife Refuge System and the primary purpose of this refuge, in the conservation of its natural resources. These programs provide an opportunity to share the missions of the Service and the National Wildlife Refuge System. Another important goal of these activities is to teach young people how to take personal responsibility for environmental stewardship throughout their lives.

Availability of Resources:

To conduct environmental education and interpretation at its current level will require no additional resources. The program will be supported by public use staff from Tennessee NWR, along with Cross Creeks NWR staff. Environmental education and interpretation are supported by infrastructure, such as the refuge visitor center, refuge office, kiosk, interpretive trail, and the refuge road system.

Resources involved in the administration and management of the use:

Refuge staff days	15 days
Tennessee NWR staff days	5-10 days as needed

Maintenance costs:

The following are estimated annual maintenance costs needed to maintain the current program level.

Sign maintenance and replacement:	$2,000
Road maintenance:	$5,000
Brochures/public information:	$6,000
Visitor Center/Kiosk maintenance:	$2,500
Trail maintenance	$2,000

Monitoring cost:

Law Enforcement	$3,000

Anticipated Impacts of the Use:

On-site activities to accomplish environmental education and interpretation by groups of 50 students/teachers may result in low-level impacts in the sites that are used for these activities. These low-level impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate area during the activity. With the current visitor load, it is not anticipated that any wildlife and vegetation disturbance will be permanent or long-lasting. If at any time in the future the refuge observes permanent resource degradation, these activities will be modified or curtailed. Off-site education, such as classroom or library visits, will not create any biological impacts on wildlife resources.

Determination:

Environmental Education and Interpretation	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

- Activities should be held on-site where minimal impacts would occur. Periodic evaluation of the sites and programs should be held to assess if objectives are being met and the resource is not being degraded. If evidence of unacceptable adverse impacts begin to appear, it may be necessary to rotate the location of outdoor classroom activities.
- Guidelines to ensure the safety of all participants should be issued in writing to the teacher(s) or group leader(s) responsible for the activities and reviewed before the activities begin.
- An active law enforcement presence should be maintained to ensure regulatory compliance.

Justification:

Environmental education and interpretation are considered priority public uses as legislated by the National Wildlife Refuge System Improvement Act of 1997. These activities are non-consumptive wildlife uses that do not interfere with or detract from the refuge's purposes. With the refuge's current visitor load, impacts to wildlife and habitat will be temporary and minor.

Cross Creeks NWR uses environmental education to motivate citizens of all ages to action and understanding to maintain a healthy ecosystem. Environmental education is a tool the refuge uses to foster land stewardship within the public community; develop political support; lessen vandalism, littering, and poaching; and become visible in the community in a positive way.

Environmental education and interpretation reach thousands of visitors on Cross Creeks NWR and provides them with the awareness of the following specific resource issues that are in need of resolution: (1) Providing adequate habitat for wintering migratory waterfowl, (2) protecting habitat of species such as the bald eagle, osprey, golden eagle, and northern harrier, (3) improving awareness of refuge management techniques and why the refuge uses them; and (4) developing pride in public lands to reduce littering, poaching, and vandalism.

NEPA Compliance for Refuge Use Description: Place an X in appropriate space.

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 15-year Re-evaluation Date: 08/28/2024

Description of Use: Wildlife Observation

Allow the public observation of wildlife throughout the refuge. Wildlife observation can be pursued by walking, bicycling, using motorized vehicles, or motorized/non-motorized boats. Foot travel is allowed on refuge roads, levees, nature trail, and woodlands. Wildlife observation is also possible while boating in the refuge's two reservoirs and the Cumberland River. Motorized vehicle access will be limited to designated maintained roads and vehicles will be parked so as not to interfere with other traffic. Bicycles are allowed on refuge roads and the Interpretive Trail.

When will the use be conducted?

To minimize disturbance of wintering migratory waterfowl, public access to refuge waters and bottomlands will be allowed March 16 to November 14, during daylight hours. Public access is permitted year-round to the waters of Lake Barkley. Refuge signs will be posted to make visitors aware of refuge regulations, refuge closures, and boundaries.

The refuge visitor center and headquarters will serve as a visitor contact station.

Availability of Resources:

The refuge has a graveled road system and nature trail which has been open to public use since the refuge was developed. In the mid-1980s, a small visitor center was developed which contains a large picture window facing the refuge bottomlands. A spotting scope is set up at this window to provide wildlife viewing opportunities. No other specific facility exists to support wildlife observation. The refuge's gravel roads, parking areas, boat launching ramps, and nature trail provide public access to the refuge resources. The refuge's visitor center and headquarters serve as a visitor contact station.

Maintenance costs:

The following are estimated annual maintenance costs needed to maintain the current program level.

Road Maintenance:	$5,000
Boat ramp and parking lot maintenance:	$2,000
Sign maintenance:	$1,500

Monitoring costs:

Law Enforcement:	$5,000

Anticipated Impacts of the Use:

Public access for the observation of wildlife is expected to have only temporary impacts to wildlife or refuge lands. As with all use activities associated with people, some violations of federal, state, or refuge regulations will occur. Examples of regulatory violations that have occurred on this refuge include disturbing wildlife, taking plants, littering, and vandalism.

The only significant impact anticipated from this public use is wildlife disturbance around nesting sites, particularly those of bald eagles. Bald eagles have nested on and around the refuge since the early 1980s. To protect these birds during the nesting season, an area up to 1,500 feet around eagle nests will be posted closed to public entry. If it is found that wildlife observation poses threats to other wildlife, restricting seasonal access to designated sites may be required to protect threatened or endangered species.

Determination:

Wildlife Observation	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

- An active law enforcement presence will ensure regulatory compliance.
- Daylight use only regulations will be maintained.
- River bottom lands and impoundments under the exclusive control of the refuge will be closed to public use from November 15 through March 16 to protect wintering waterfowl from human disturbance. If significant disturbances are noted at other locations in the future, these areas may need to be closed to the public as well.
- No expansion of wildlife observation opportunities beyond current level is planned.
- Roads, trail, parking areas, boat launching ramps need to be maintained to provide safe access to refuge resources.

Justification:

Many refuge visitors come to the refuge to view wildlife. Wildlife observation is considered a priority use as legislated by the Improvement Act of 1997. Wildlife observation is a non-consumptive wildlife-dependent use that does not interfere with or detract from the refuge's purposes. With the refuge's current visitor load, impacts to wildlife and habitat will be temporary and minor. Wintering waterfowl and other wildlife can be protected from human disturbance through seasonal refuge closure and, when needed, selected areas may be closed to public entry.

NEPA Compliance for Refuge Use Decision: Place an X in appropriate space.

____ Categorical Exclusion without Environmental Action Statement
____ Categorical Exclusion and Environmental Action Statement
_X_ Environmental Assessment and Finding of No Significant Impact
____ Environmental Impact Statement and Record of Decision

Mandatory 15-year Re-evaluation Date: 08/28/2024

Description of Use: Wildlife Photography

Allow the visiting public to engage in wildlife photography on the refuge for the purpose of taking photographs for private enjoyment. Visitors have the opportunity to photograph plants and animals as they drive, bicycle, or walk along refuge roads, the nature trail, around the visitor center, or hike through woodlands. Photography opportunities are also abundant while boating on the refuge's two reservoirs and embayments having direct access to the Cumberland River.

Wildlife photography is allowed throughout the refuge between March 16 and November 14. Between November 15 and March 16 public access is limited to areas which have direct boat access from the Cumberland River to minimize disturbance to wintering migratory waterfowl. Refuge signs will be posted at roads' access points to ensure that refuge visitors will be aware of refuge closed areas. Posted signs and gates will inform visitors whether a gravel road is open to vehicle or foot traffic.

This use is a self-guided activity for which the refuge does not provide any special blinds or other facilities for taking pictures.

Wildlife photography is proposed because it has been legislated as a priority public use for the National Wildlife Refuge System, as identified in the Improvement Act of 1997. This activity is pursued by a very small segment of the visiting public, making it very compatible with the refuge purpose.

Availability of Resources:

The refuge has a gravel road system and nature trail which has been open to public use since the refuge was being developed. The refuge's existing roads, parking areas, boat launching ramps, and nature trail will enable visitors access to the refuge to photograph its resources. The refuge's visitor center and headquarters serve as a visitor contact station.

Anticipated Impacts of the Use:

Wildlife photography will have few, if any, negative impacts on the wildlife or other natural resources on the refuge. The number of visitors that specifically come to the refuge to take photographs is so small that their effects, for the most part, on natural resources will be minimal.

The only significant impact anticipated from this use is wildlife disturbances around nesting sites, particularly those of bald eagles.

Determination:

Photography (wildlife)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

- Photography will be permitted during daylight hours only.
- Roads, trail, parking areas, and boat launching ramps will need to be maintained to provide safe access to refuge resources.
- Post signs at access points and other designated areas to inform visitors of closures or refuge regulations.
- Photographers who set up blinds and other equipment clear their activities through the Cross Creeks NWR office by means of a special use permit.
- An active law enforcement presence will ensure regulatory compliance.

Justification:

Wildlife photography is a low-impact and low-cost activity, which will not materially interfere with or detract from the purposes of Cross Creeks NWR. It is photography that develops the power of observation and appreciation for wildlife and wild lands. Giving visitors the opportunity to develop and enjoy an understanding of our natural resources helps fulfill the mission of the Refuge System. Potential disturbance to wildlife or habitat resulting from this use are anticipated to be temporary and minor.

NEPA Compliance for Refuge Use Decision *Place an X in appropriate space*

____ Categorical Exclusion without Environmental Action Statement
____ Categorical Exclusion and Environmental Action Statement
_X_ Environmental Assessment and Finding of No Significant Impact
____ Environmental Impact Statement and Record of Decision

Mandatory 15-year Re-evaluation Date: 08/28/2024

Description of Use: Boating – motorized and non-motorized (non-commercial)

Continue to allow non-commercial boat use of refuge waters by refuge visitors. Boating itself is not one of the six priority uses identified in the National Wildlife Refuge System Improvement Act of 1997, but boating does facilitate fishing, wildlife observation, wildlife photography, and hunting.

Boating will be permitted in waterfowl impoundments, refuge reservoirs, and Lake Barkley/Cumberland River for which the refuge provides access with boat launching ramps. Boating will be permitted in Elk and South Cross Creek Reservoirs and all refuge waterfowl impoundments from March 16 through November 14, during daylight hours. Boats will be restricted to “slow speed/minimum wake” on all refuge pools. No overnight boat moorage will be allowed on any refuge property. Cross Creeks NWR maintains twelve boat launching ramps to provide boat access to refuge waterfowl impoundments, reservoirs, and the waters of Lake Barkley/Cumberland River.

While boating is not a priority public use, it does facilitate priority public uses by making parts of the refuge accessible that are otherwise not accessible to the public. Also, Article 7 of the Memorandum of Understanding between the Fish and Wildlife Service and the Corps of Engineers states that Cross Creeks NWR will construct and maintain its own boating and recreation facilities in a manner agreed upon by the agencies involved. Approximately 3,260 acres of the refuge's 8,862 acres are suitable for fishing seasonally. Permitting boating enhances the fishing experience and increases the refuge's visitation capacity without significantly increasing visitor crowding. Boating, whether motorized or human-powered, provides additional wildlife observation and photography opportunities. Boating is not allowed on the refuge between November 15 and March 16 to avoid conflict between this activity and the refuge's wintering migratory waterfowl responsibilities.

Availability of Resources:

Resources involved in the administration and management of the use:

- Staff and funds necessary to maintain boat launching ramps and parking facilities.
- Law enforcement to ensure compliance with safe boating regulations and curtail illegal activities.

Special equipment, facilities, or improvements necessary to support the use:

- Refuge gravel roads, boat launching ramps, and parking facilities are required to support this use.

Maintenance costs:

Estimated staff and materials costs directly attributable to boating are the funds expended to maintain boat launching ramps and parking facilities provided for vehicles trailering boats. Costs associated with annual maintenance work and materials include the following:

Estimated staff time:

• Mowing facilities to control encroaching vegetation	5 staff days
• Grading gravel parking facilities	5 staff days
• Various maintenance tasks: i.e. sign, gate repairs or replacement	2 staff days
• Rehabilitating gravel parking facilities with new gravel	5 staff days
	17 total staff days

Estimated materials costs:

• Fuel and routine maintenance costs to operate equipment	$ 800
• Replacement gravel	$4000
	$4800

Monitoring costs:

Monitoring and compliance will be conducted within existing programs and staff. Boating will be monitored primarily while conducting fishing and hunting regulations compliance checks by law enforcement officers, and as such will not create an exclusive monitoring cost.

Offsetting revenues:

Some revenue is collected during the year from hunting permit sales which is used to maintain boat launch facilities. Ramps and parking areas are used by some hunters during the archery, youth, and quota gun deer hunts on the refuge.

Anticipated Impacts of the Use:

Short-term impacts:

Wildlife disturbance is one short-term impact that may have to be managed to protect selected species. Human activity and noise from boats could adversely affect nesting bald eagles. Bald eagles have nested in and around the refuge since the 1980s. Repeated visits to or lingering around bald eagle nests during spring could affect these birds' reproductive success.

The only other wildlife expected to suffer from boating disturbance will be the refuge's wintering waterfowl. The waterfowl disturbance impact has been eliminated by excluding this use from November 15 to March 16.

Long-term impacts:

Currently, the refuge has not identified any long-term adverse impacts to wildlife habitat or the management of migratory birds attributable solely to recreational boating.

Public uses, which include boating, do have long-term readily observable impacts on existing infrastructure which supports these activities. Boat launching ramps, parking areas, and gravel roads will require maintenance as a result of normal wear and tear. Without the refuge's boat launching ramps, parking areas, and gravel road system, the refuge could not provide boating access at its current level. Although boaters and other visitors cause wear and tear on the refuge's maintained infrastructure, it is not foreseen that boating will have long-term negative impacts on wildlife habitat.

Cumulative impacts:

The refuge does not anticipate direct or indirect cumulative impacts in conjunction with other existing refuge uses.

Determination:

Boating – motorized and non-motorized (non-commercial)	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

- The refuge will maintain an active law enforcement presence by utilizing law enforcement officers assigned to work on the Tennessee NWR Complex. Tennessee Wildlife Resources Agency wildlife officers will also intermittently perform law enforcement patrols. The presence of these law enforcement officers will ensure regulatory compliance.
- Daylight use only regulations will be maintained.
- The refuge waterfowl impoundments and reservoirs under the exclusive control of the refuge will be closed to boating use from November 15 through March 16 to protect wintering waterfowl from human disturbance. If significant disturbances are noted at other locations in the future, these areas may need to be closed to boating as well.
- No expansion of sport recreational fishing opportunities beyond the current level is planned.
- Waters will be posted closed to the public where boaters will have the potential to disturb bald eagles or other migratory birds during the nesting season.

Justification:

The refuge is located at the headwaters of the Corps of Engineers' Lake Barkley project, stretching 12 miles along both sides of the Cumberland River. Cross Creeks NWR has an approved objective to provide 50,000 fishing activity hours. Visitor facilities include a visitor center, gravel access roads, and numerous boat launching ramps and parking lots. Cross Creeks NWR provides boat access to the Cumberland River, with the nearest alternative access points being 6 miles upstream and downstream. The refuge manages sixteen shallow water migratory bird impoundments, which provide seasonal fishing opportunities. Two deeper bodies of water, Elk and South Cross Creeks Reservoirs, provide fishing opportunities for people who like to fish in reservoirs smaller than the larger Tennessee Valley Authority and Corps of Engineers' lakes. With the abundance of water on the refuge, and infrastructure providing access, the refuge can provide ample boating opportunities in support of fishing and other priority public uses.

The refuge's boating access has been made compatible with its waterfowl management objective by setting a boating season that excludes human disturbance when the refuge provides wintering habitat for migrating waterfowl. Boat access to refuge waterfowl impoundments and reservoirs is controlled by gates at major refuge entrances and specific boat launching ramps. These gates are opened from March 16 to November 14, thus time spacing waterfowl use and recreational boating.

Nesting bald eagles are afforded protection by establishing closed areas when necessary. From egg incubation to when eaglets fledge, any eagle nest considered at risk from human disturbance is protected through posting.

The National Wildlife Refuge System Improvement Act of 1997 does not identify boating as a priority public use for national wildlife refuges, but boating on this refuge supports fishing and other priority public uses. The refuge strives to provide priority public uses when compatible with the purpose of the refuge and the mission of the Refuge System. Recreational boating managed in accordance with the stipulations stated herein will make this public use compatible with the refuge purposes and the Refuge System mission.

NEPA Compliance for Refuge Use Description: Place an X in appropriate space.

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: 08/28/2019

Description of Use: Cooperative Farming

Cooperative farming is not one of the six priority wildlife-dependent public uses of the National Wildlife Refuge System, but is an existing economic activity that supports the refuge's migratory bird management trust responsibility. Through cooperative farming agreements, the refuge maintains 1,200 acres annually planted to agricultural crops to provide food and resting habitat for wintering migratory waterfowl, as well as other wildlife. These 1,200 acres are fields that occur throughout the refuge's river bottomlands, both in and around impoundments. Cooperative farmers grow crops, such as corn and soybeans, and leave a

percentage of the crop standing in the field or plant refuge shares of more desirable wildlife crops. The arrangement typically yields the refuge about 238 acres of corn, making available about 23,800 bushels of corn available as wildlife food if the crop produces an average of 100 bushels per acre. The other portion of the cooperative farming acreage is used to produce about 150 acres of winter wheat for Canada goose browse. Additionally, the farming program maintains the open fields that migratory Canada geese prefer to use throughout the winter.

Where will the use be conducted?

Cooperative farming would continue to be conducted in the bottomland agricultural fields that have been part of the refuge farming program for the past 47 years.

When will the use be conducted?

Farming agreements will permit farming activities from March 1 to November 14, weather conditions permitting.

How will the use be conducted?

Cooperative farming will be permitted through the cooperative farming agreement process. Agreements could cover 1-year or 3-year increments. Farming agreements will be prepared and monitored by the refuge. Farmers will be limited to using herbicides and insecticides approved through pesticide use proposal procedures. Farmers will perform annual soil tests through the University of Tennessee, Agricultural Extension Service, and apply the recommended soil treatments. Cooperators will supply the refuge with annual pesticide use information.

Why is the use being proposed?

Winter waterfowl management is the primary wildlife resource trust responsibility for Cross Creeks NWR. Cooperative farming is a cost effective way to produce winter waterfowl food and resting habitat under current funding and staffing levels.

Availability of Resources:

Resources involved in the administration and management of the use:

Administration of the cooperative farming program will require several days work by one or more staff members. Estimated time needed to complete various tasks is as follows:

Prepare Cooperative Farming Agreements	4 staff days
Prepare Pesticide Use Proposals	5 staff days
Prepare Region 4 Intra-Service Section 7 Biological Evaluations	4 staff days
Prepare Pesticide Use Report	3 staff days
Meet with Cooperative Farmers	3 staff days
Monitor farming activities through the growing season	5 staff days
Conduct various administrative tasks	1 staff day
	25 staff days

Special equipment, facilities, or improvements necessary to support the use:

The refuge's gravel roads and bridges provide access to the farm units.

Maintenance cost:

Cooperative farming operations do not generate enough traffic on refuge facilities to assign an annual maintenance cost.

Monitoring cost:

Time spent monitoring field farming operations typically amounts to about five staff days. Approximately $1,500 of staff costs will be required to monitor farming activities.

Offsetting revenue:

The cooperative farming program does not have any offsetting revenue associated with the program.

Anticipated Impacts of the Use:

Short-term impacts:

Cooperative farming is an important program that the refuge uses to meet its migratory waterfowl management responsibility for which it was established. Farming provides a steady, reliable winter food source for wintering waterfowl, as well as for other wildlife. A significant percentage of the food resources provided for geese and ducks are the result of this program. Farming also maintains open field habitat that attracts Canada geese.

Possible negative impacts of greatest concern are those associated with the use of pesticides in farming operations. Pesticide use in crop production could have a variety of direct or indirect effects on wild plants and animals, if used outside the guidelines prescribed by pesticide manufacturers. During application, care must be taken to apply the product only in the target area. Pesticides need to be applied when wind conditions do not facilitate drift to non-target plants or animals. Pesticides need to be applied in the quantities and under weather conditions that do not promote runoff. To prevent pesticide runoff from entering surface waters, no farming is done within 50 feet of standing water. Virtually all unintended plant impacts are short term.

Processes are in place to assist the refuge to limit possible adverse effects from the use of farm pesticides. Before each proposed pesticide is used in the program, it must go through the Pesticide Use Proposal review process. The refuge must also consult with its local Ecological Services Office through the Intra-Service Section 7 Biological Evaluation process to determine if a proposed pesticide use has potential impacts to threatened and/or endangered species.

Refuge cooperative farming uses fertilizers to produce a profitable crop. If the cooperative farming program cannot produce yields above the economic threshold, the program cannot sustain itself. To manage the necessary use of fertilizers, annual soil tests are taken by the farmers. Fertilizer and lime are then applied based on the test results and Extension Service recommendations. Applying fertilizers using these guidelines limits possible adverse effects on surface soil, runoff to surface water, or groundwater.

Field preparation and planting by its very nature causes both beneficial and negative short-term wildlife impacts. Spring disking alters the wildlife use pattern by temporarily displacing small fauna until vegetative covers regenerate. Wildlife observation is effected negatively by the absence of wildlife early in the farming season, but is positively impacted as the season progresses by attracting deer and Canada geese and other wildlife as crops germinate and mature. Productive row crops improve hunting opportunities by providing feeding areas for deer and turkey.

Long-term impacts:

The long-term impact of the cooperative farming program is that it provides a cost effective way for the refuge to provide steady, reliable food and habitat for wintering waterfowl. Cooperative farming maintains large open field habitat that attracts thousands of Canada geese and sandhill cranes each winter. Without the open fields, geese and cranes would find few places to browse and rest to rebuild their strength for their spring migration north. Refuge crops provide geese and ducks a readily available food source on cold winter days when natural food may be snowed under or frozen over.

These refuge river bottoms have been farmed since long before the refuge was established in 1962. The refuge has maintained farming activities since its establishment and the land's productivity has not declined. The refuge is subjected to spring flooding, but rather than erode the refuge's bottomlands, these floods continue to build up the soils as the river drops its silt load once it comes out of its banks. Evidence of this soil accumulation process is regularly seen on flooded refuge roads, which accumulate silt during flood events.

Cumulative Impacts:

Successful cooperative farming operations will continue to provide wildlife food and winter waterfowl habitat. The program's cumulative impact is its annual contribution to helping the refuge fulfill its winter waterfowl management responsibility.

Determination:

Cooperative Farming	Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

- Cooperative farmers adhere to all conditions of the Cooperative Farming Agreement (3-1492), issued on an annual basis or 3-year cycle. Crops and fields are planted in accordance with best management practices to minimize negative impacts on the environment.
- Pesticide use will be done through the Pesticide Use Proposal. The proposals will be submitted by the refuge manager on an annual basis.
- Annual soil tests through the University of Tennessee, Agricultural Extension Service, are performed and recommended lime and fertilizer are applied.
- Cooperative farmers will adhere to all regulations set forth in the Code of Federal Regulations (50 CFR).
- Maintain a close liaison between the cooperative farmer and refuge manager.
- Cooperative farmers will supply the refuge with an annual report of soil tests and pesticides used.

Justification:

The Cooperative Farming Program has been an integral part of the management of Cross Creeks NWR since 1962. The existing use has not significantly changed, based on the enabling legislation's primary reason for establishing the refuge. The number of cooperative farmers and amount of cultivated acreage have been reduced over the years to approximately 1,200 acres. Equipment, techniques, and basic land stewardship have greatly improved.

The grains produced through the farming program supplement other management programs (i.e., water manipulation and moist-soil management). These grains meet the food requirement of wintering waterfowl seeking rich carbohydrates during the cold winter months; demand for high energy foods and thermoregulatory needs. The abundance and availability of these grains (corn - primarily) allow waterfowl to spend less time foraging during the winter months; therefore, remaining in better condition for spring migration and the rigors of breeding.

Agricultural crops are important in meeting the physiological requirements of wintering waterfowl. The food produced meets the demands of high carbohydrate diets that facilitate lipid storage. Lipids are the primary form of energy storage in birds and contribute to the well-being of these birds during the winter months. With quality crops, this energy storage can be obtained rapidly and available during peak demand periods. As natural food becomes less available, birds spend more time foraging and more energy is expended. These grains become more critical and contribute to meeting the nutritional and energetic demands of wintering waterfowl. In addition, corn is approximately 10 percent protein and contributes significantly to the maintenance of all tissues. Since there is an average daily turnover of protein in body tissue, the agricultural crops are a prime dietary source for replenishment (Nelms 2001).

Cooperative farming would produce positive results for the primary purpose for which this refuge was established—migratory bird management. Each winter, this refuge winters up to 60,000 ducks and 15,000 geese. Cooperative farming produces hundreds of bushels of high-energy food for wintering waterfowl that could not be produced using force account labor or refuge operating funds. Not only does this program provide food for wintering waterfowl, but also for a variety of other migratory and resident wildlife species, which incorporate cereal grains into their diets. Cooperative farming provides goose browse in the form of winter wheat and encourages winter goose use by maintaining open spaces. These open spaces also support wildlife observation, making it much easier for some visitors to observe wildlife.

It is the general thought among biologists that Canada geese require large open areas not just for feeding but also for loafing and resting. Particularly attractive to geese are open habitats associated with agricultural crops while wintering in the southern United States. Agricultural crops are unquestionably the mainstay of Canada geese on their migration and wintering grounds (Bellrose 1976). There are no hard and fast guidelines to indicate how much open habitat (e.g., agricultural land, pasture, hay fields, and open water) is necessary to maintain a given population of geese. The minimum amount of open habitat currently maintained is largely dependent upon this refuge's waterfowl use day objectives and acres needed for the cooperative farming program to produce the food resources needed to support these objectives.

Cross Creeks NWR plans to provide the food resources for 1.4 million goose-use-days and 4.9 million duck-use-days each winter. Under the current 75/25 crop share division, the minimum number of acres needed to meet the target waterfowl objectives is about 1,200 acres.

From an overall management aspect, agricultural crops are readily available through the cooperative farming program and produce a high-energy food source. Field feeding waterfowl also glean other seeds and enrich the soil through excrements; therefore, reducing cost for overall operations. They also use waste grains from harvest operations and reduce costs and need to remove a "volunteer" crop (sprouting corn).

The cooperative farming program compliments the management program(s) at Cross Creeks NWR. Various other species of wildlife also benefit from the program and contribute to the overall diversity of the refuge.

NEPA Compliance for Refuge Use Description: Place an X in appropriate space.

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: 08/28/2019

References:

Bellrose, F.C. 1976, *Ducks, Geese, and Swans of North America.* Harrisburg, Pa.: Stackpole Books. 540 pp.

Nelms, K.D. 2001. Wetland Management for Waterfowl. Natural Resources Conservation Service, Mississippi, 119pp.

U.S. Fish and Wildlife Service, Cross Creeks National Wildlife Refuge. 1967 Croplands Management Plan

U.S. Fish and Wildlife Service, Cross Creeks National Wildlife Refuge. 1987 Refuge Objectives

Approval of Compatibility Determinations

The signature of approval is for all compatibility determinations considered within the CCP for Cross Creeks NWR. If one of the descriptive uses is considered for compatibility outside of the CCP, the approval signature becomes part of that determination.

Refuge Manager: Rick E. Hines 6/24/09
(Signature/Date)

Regional Compatibility Coordinator: Brenda Hall 7/7/09
(Signature/Date)

Refuge Supervisor: Acting Brett E. Hunter 8/12/09
(Signature/Date)

Acting
Regional Chief, National Wildlife Refuge System, Southeast Region: Richard P. Ingram 8/13/09
(Signature/Date)

APPENDIX H. Intra-Service Section 7 Biological Evaluation

Division/Office: Cross Creeks NWR

Refuge Manager/Phone #: John Taylor; 931/232-7477

Date: May 29, 2008

I. Proposed Action: Implementation of the Comprehensive Conservation Plan.

The U.S. Fish and Wildlife Service (Service) has developed a Comprehensive Conservation Plan (CCP) to provide a foundation for the management and use of Cross Creeks NWR. The CCP is intended to serve as a working guide for the refuge's management programs and actions over the next 15 years.

II. Location (County and State/attach project area map):

Cross Creeks NWR stretches 12 miles on either side of the Lake Barkley Reservoir and the Cumberland River between Dover and Cumberland City, in Stewart County, Tennessee. The river creates a north side and a south side of the refuge. Cross Creeks NWR is 8,862 acres in size. The reservoir and refuge are on the middle transition portion of Cumberland River between the Cheatham Dam and Barkley Dam.

III. Description of proposed action (describe in enough detail to allow proper evaluation of project impacts, attach additional pages as needed):

The CCP's overriding consideration is to carry out the purposes for which the refuge was established. Fish and wildlife are the first priority in refuge management, and public use (wildlife-dependent recreation) is allowed and encouraged as long as it is compatible with, or does not detract from, the refuge's mission and purposes.

Individual consultations will occur under Section 7 for projects related to endangered species and are not intended to be covered in this document. This CCP prioritizes wildlife and habitat management, and proposes wildlife-dependent, compatible recreational opportunities. Chapter IV of the CCP outlines specific goals, objectives, and strategies to achieve an expanded wildlife and habitat management approach, while optimizing (making the best use of) public use and environmental education opportunities. While seeking concurrences on the general management direction of the refuge, as stated previously, individual consultations will occur for projects specifically related to endangered species and critical habitat.

IV. Species and Habitats Considered:

A. List all federally endangered, threatened, proposed, and candidate species, and describe any associated critical or proposed critical habitat that may be affected by the proposed action. Make a determination of how the proposed action may affect each:

SPECIES/CRITICAL HABITAT	STATUS[1]	DETERMINATION[2]			RESPONSE REQUESTED[3]
		NE	NA	AA	
Least Tern	E		X		

[1]STATUS: E = endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, CH = critical habitat, PCH = proposed critical habitat, C = candidate species

[2]DETERMINATION:

NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources.

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat.

[3]RESPONSE REQUESTED: conference, concurrence, formal consultation

V. Determination of effects:

A. Explanation of effects of the action: include direct, indirect, interrelated, interdependent, and cumulative effects (attach additional pages as needed):

Definitions for Effects of the Action:

Direct Effects = are those that are an immediate result of the action.

Indirect Effects = are those that are caused by the action and are later in time but are still reasonably certain to occur. They include the effects of future activities that are induced by the action and that occur after the action is completed.

Interrelated = are those that are part of a larger action and depend on the larger action for their justification.

Interdependent = are those that have no significant independent utility apart from the action that is under consideration.

Cumulative Effects = are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area.

The proposed CCP should benefit the listed species.

B. Explanation of actions to be implemented to reduce adverse effects:

n/a

VI.

Project Leader: Mike Dawson _____ 5/29/08
Signature Date

No effect:_____

Is not likely to adversely affect: ✓

Is likely to adversely affect:_____

VII. Reviewing Ecological Services Office(ESO) Evaluation:

A. Concurrence ___ Nonconcurrence ___

B. Formal Consultation Required ___

C. Conference Required ___

D. Remarks (attach additional pages if needed): ___

VIII. Signatory Approval:

ES Supervisor: Scott Barclay _____ Date: 7/1/08
Signature

Note: The process ends here if the proposed action is "not likely to adversely affect".

Acting **REFUGE CHIEF :** Richard P Ingram _____ 8/26/09
Signature Date

Note: These signatures are required for approval of a conference report or biological opinion.

APPENDIX I. Wilderness Review

The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which:

1. generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;

2. has outstanding opportunities for solitude or primitive and unconfined types of recreation;

3. has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;

4. does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and

5. may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within Cross Creeks NWR were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. No lands in the refuge were found to meet these criteria, in particular criterion #3 (5,000 contiguous roadless acres). Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this CCP.

APPENDIX J. Refuge Biota

BIRDS

LOONS	Sp	S	F	W
Common Loon (*Gavia immer*)	o	-	u	o

GREBES	Sp	S	F	W
Pied-billed Grebe (*Podilymbus podiceps*)	c	-	c	u
Horned Grebe (*Podiceps auritus*)	r	-	o	r

PELICANS AND ALLIES	Sp	S	F	W
Double-crested Cormorant (*Phalacrocorax auritus*)	o	-	o	o
Anhinga (*Anhinga anhinga*)	-	r	-	-

HERONS, EGRETS AND ALLIES	Sp	S	F	W
American Bittern (*Botaurus lentiginosus*)	o	-	o	r
Least Bittern (*Ixobrychus exilis*)	o	r	-	-
Great Blue Heron (*Ardea herodias*)	c	c	c	c
Great Egret (*Ardea alba*)	u	u	u	r
Snowy Egret (*Egretta thula*)	r	r	r	-
Little Blue Heron (*Egretta caerulea*)	u	u	u	-
Cattle Egret (*Bubulcus ibis*)	u	o	o	-
Green Heron* (*Butorides virescens*)	c	c	c	-
Black-crowned Night-Heron (*Nycticorax nycticorax*)	u	c	c	r
Yellow-crowned Night-Heron (*Nyctanassa violacea*)	o	u	r	-

IBISES, SPOONBILL, STORK	Sp	S	F	W
White Ibis+ (*Eudocimus albus*)	r	-	r	-
Wood Stork+ (*Mycteria americana*)	r	r	r	-

WATERFOWL	Sp	S	F	W
Tundra Swan (*Cygnus columbianus*)	-	-	r	-
Greater White-Fronted Goose (*Anser albifrons*)	r	-	r	r
Snow Goose (*Chen caerulescens*)	o	-	u	u
Canada Goose* (*Branta canadensis*)	c	c	a	a
Wood Duck* (*Aix sponsa*)	c	c	c	u
Green-winged Teal (*Anas crecca*)	c	-	c	c
American Black Duck (*Anas rubripes*)	u	r	a	a
Mallard* (*Anas platyrhynchos*)	u	u	a	a
Northern Pintail (*Anas acuta*)	u	-	c	c
Blue-winged Teal (*Anas discors*)	c	r	c	r
Northern Shoveler (*Anas clypeata*)	c	-	u	u

Gadwall (*Anas strepera*)	u	-	c	c
Eurasian Wigeon (*Anas penelope*)	r	-	r	r
American Wigeon (*Anas americana*)	u	-	c	c
Canvasback (*Aytha valisineria*)	o	-	u	c
Redhead (*Aythya americana*)	u	-	u	u
Ring-necked Duck (*Aythya collaris*)	c	-	c	c
Greater Scaup (*Aythya marila*)	r	-	-	r
Lesser Scaup (*Aythya affinis*)	u	-	u	u
Oldsquaw (*Clangula hyemalis*)	-	-	-	r
White-winged Scoter (*Melanitta fusca)*	-	-	r	r
Common Goldeneye (*Bucephala clangula*)	o	-	o	u
Bufflehead (*Bucephala albeola*)	o	-	o	o
Hooded Merganser* (*Lophodytes cucullatus*)	u	-	c	c
Common Merganser (*Mergus merganser*)	r	-	o	u
Red-breasted Merganser (*Mergus serrator*)	o	-	o	u
Ruddy Duck (*Oxyura jamaicensis*)	o	-	o	o
VULTURES, HAWKS AND ALLIES	Sp	S	F	W
Black Vulture* (*Coragyps atratus*)	c	c	c	u
Turkey Vulture* (*Cathartes aura*)	c	c	c	c
Osprey (*Pandion haliaetus*)	u	-	u	-
Bald Eagle* (*Haliaeetus leucocephalus*)	u	u	u	u
Northern Harrier (*Circus cyaneus*)	u	-	c	c
Sharp-shinned Hawk (*Accipiter striatus*)	u	-	c	u
Cooper's Hawk* (*Accipiter cooperii*)	u	o	u	u
Red-shouldered Hawk* (*Buteo lineatus*)	c	c	c	c
Broad-winged Hawk* (*Buteo platypterus*)	u	o	u	-
Red-tailed Hawk* (*Buteo jamaicensis*)	c	c	c	c
Rough-legged Hawk+ (*Buteo lagopus*)	-	-	r	r
Golden Eagle (*Aquila chrysaetos*)	-	-	o	o
American Kestrel* (*Falco sparverius*)	u	u	u	u
Merlin (*Falco columbarius*)	r	-	r	-
Peregrine Falcon (*Falco peregrinus*)	r	-	r	r
GALLINACEOUS BIRDS	Sp	S	F	W
Wild Turkey* (*Meleagris gallopavo*)	o	o	o	o
Northern Bobwhite* (*Colinus virginianus*)	c	c	c	c
RAILS, GALLINULES, COOTS AND CRANES	Sp	S	F	W
King Rail (*Rallus elegans*)	o	-	r	-
Virginia Rail (*Rallus limicola*)	o	-	o	r
Sora (*Porzana carolina*)	u	-	u	r
Common Moorhen (*Gallinula chloropus*)	o	-	-	-
American Coot (*Fulica americana*)	u	-	c	u
Sandhill Crane (*Grus canadensis*)	-	-	r	r

SHOREBIRDS	Sp	S	F	W
Black-bellied Plover (*Pluvialis squatarola*)	-	-	o	-
American Golden Plover (*Pluvialis dominica*)	u	r	r	-
Semipalmated Plover (*Charadrius semipalmatus*)	u	o	u	-
Piping Plover (*Charadrius melodus*)	-	r	r	-
Killdeer* (*Charadrius vociferous*)	c	c	c	c
American Avocet (*Recurvirostra americana*)	-	r	r	-
Greater Yellowlegs (*Tringa melanoleuca*)	c	o	c	-
Lesser Yellowlegs (*Tringa flavipes*)	c	o	c	-
Solitary Sandpiper (*Tringa solitaria*)	c	o	u	-
Willet (*Catoptrophorus semipalmatus*)	-	r	r	-
Spotted Sandpiper (*Actitis macularia*)	c	o	u	-
Upland Sandpiper (*Bartramia longicauda*)	r	r	r	-
Sanderling (*Calidris alba*)	-	r	r	-
Semipalmated Sandpiper (*Calidris pusilla*)	c	o	c	-
Western Sandpiper (*Calidris mauri*)	-	r	r	-
Least Sandpiper (*Calidris minutilla*)	c	u	c	-
White-rumped Sandpiper (*Calidris fuscicollis*)	o	r	r	-
Baird's Sandpiper (*Calidris bairdii*)	-	-	r	-
Pectoral Sandpiper (*Calidris melanotus*)	c	o	c	-
Dunlin (*Calidris alpina*)	-	-	o	-
Stilt Sandpiper (*Calidris himantopus*)	r	u	u	-
Buff-breasted Sandpiper (*Tryngites subrufcollis*)	-	-	r	-
Short-billed Dowitcher (*Limnodromus griseus*)	o	o	u	-
Long-billed Dowitcher (*Limnodromus scolopaceus*)	r	-	r	-
Common Snipe (*Gallinago gallinago*)	c	-	u	c
American Woodcock* (*Scolopax minor*)	u	o	o	r
Wilson's Phalarope (*Phalaropus tricolor*)	-	-	r	-
Bonaparte's Gull (*Larus philadelphia*)	o	-	o	o
Ring-billed Gull (*Larus delawarensis*)	u	-	c	c
Herring Gull (*Larus argentatus*)	o	-	-	o
Caspian Tern (*Sterna caspia*)	o	r	o	-
Common Tern (*Sterna hirundo*)	r	-	r	-
Forster's Tern (*Sterna forsteri*)	o	r	o	-
Least Tern (*Sternula antillarum*)	r	r	-	-
Black Tern (*Chlidonias niger*)	u	r	o	-

PIGEONS, DOVES	Sp	S	F	W
Rock Dove* (*Columba livia*)	o	o	o	o
Mourning Dove* (*Zenaida macroura*)	c	c	c	c

CUCKOOS	Sp	S	F	W
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	r	-	r	-
Yellow-billed Cuckoo* (*Coccyzus americanus*)	u	c	c	-

OWLS	Sp	S	F	W
Eastern Screech-Owl* (*Megascops asio*)	u	u	u	u
Great Horned Owl* (*Bubo virginianus*)	u	u	u	u
Barred Owl* (*Strix varia*)	c	c	c	c
Short-eared Owl (*Asio flammeus*)	-	-	r	r

NIGHTJARS	Sp	S	F	W
Common Nighthawk (*Chordeiles minor*)	u	u	u	-
Chuck-will's-widow* (*Caprimulgus carolinensis*)	u	u	-	-
Whip-poor-will* (*Caprimulgus vociferus*)	c	c	o	-

SWIFTS, HUMMINGBIRDS	Sp	S	F	W
Chimney Swift* (*Chaetura pelagica*)	u	c	c	-
Ruby-throated Hummingbird* (*Archilochus colubris*)	u	c	u	-

KINGFISHERS	Sp	S	F	W
Belted Kingfisher* (*Megaceryle alcyon*)	c	c	c	c

WOODPECKERS	Sp	S	F	W
Red-headed Woodpecker* (*Melanerpes erythrocephalus*)	u	u	u	u
Red-bellied Woodpecker* (*Melanerpes carolinus*)	c	c	c	c
Yellow-bellied Sapsucker (*Sphyrapicus varius*)	c	-	-	-
Downy Woodpecker* (*Picoides pubescens*)	c	c	c	c
Hairy Woodpecker* (*Picoides villosus*)	c	c	c	c
Northern Flicker* (*Colaptes auratus*)	c	c	c	c
Pileated Woodpecker* (*Dryocopus pileatus*)	u	u	u	u

FLYCATCHERS	Sp	S	F	W
Olive-sided Flycatcher (*Contopus borealis*)	r	-	r	-
Eastern Wood-Pewee* (*Contopus virens*)	c	c	u	-
Yellow-bellied Flycatcher (*Empidonax flaviventris*)	r	-	r	-
Acadian Flycatcher* (*Empidonax virescens*)	c	c	u	-
Alder Flycatcher (*Empidonax alnorum*)	r	-	-	-
Willow Flycatcher* (*Empidonax traillii*)	o	u	r	-
Least Flycatcher (*Empidonax minimus*)	o	-	-	-
Eastern Phoebe* (*Sayornis phoebe*)	c	c	u	o
Great Crested Flycatcher* (*Myiarchus crinitus*)	c	c	o	-
Eastern Kingbird* (*Tyrannus tyrannus*)	c	c	u	-

LARKS	Sp	S	F	W
Horned Lark (*Eremophila alpestris*)	u	r	u	u

MARTINS AND SWALLOWS	Sp	S	F	W
Purple Martin* (*Progne subis*)	u	c	o	-
Tree Swallow* (*Tachycineta bicolor*)	c	u	c	-
Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)	u	u	u	-
Bank Swallow (*Hirundo rustica*)	u	u	o	-
Cliff Swallow* (*Hirundo pyrrhonota*)	u	u	o	-
Barn Swallow* (*Hirundo rustica*)	c	c	u	-

JAYS AND CROWS	Sp	S	F	W
Blue Jay* (*Cyanocitta cristata*)	c	c	c	c
American Crow* (*Corvus brachyrhynchos*)	c	c	c	c

CHICKADEES AND TITMICE	Sp	S	F	W
Carolina Chickadee* (*Parus carolinensis*)	c	c	c	c
Tufted Titmouse* (*Parus bicolor*)	c	c	c	c

NUTHATCHES	Sp	S	F	W
Red-breasted Nuthatch+ (*Sitta canadensis*)	o	-	o	o
White-breasted Nuthatch* (*Sitta carolinensis*)	u	u	u	u

CREEPERS	Sp	S	F	W
Brown Creeper (*Certhia americana*)	u	-	u	u

WRENS	Sp	S	F	W
Carolina Wren* (*Thryothorus ludovicianus*)	c	c	c	c
Bewick's Wren (*Thryomanes bewickii*)	r	r	r	-
House Wren (*Troglodytes aedon*)	o	r	o	-
Winter Wren (*Troglodytes troglodytes*)	u	-	o	u
Sedge Wren (*Cistothorus platensis*)	u	r	u	r
Marsh Wren (*Cistothorus palustris*)	u	-	u	-

KINGLETS AND GNATCATCHERS	Sp	S	F	W
Golden-crowned Kinglet (*Regulus satrapa*)	c	-	c	u
Ruby-crowned Kinglet (*Regulus calendula*)	c	-	c	o
Blue-gray Gnatcatcher* (*Polioptila caerulea*)	c	c	u	-

BLUEBIRDS, THRUSHES AND ROBIN	Sp	S	F	W
Eastern Bluebird* (*Sialia sialis*)	c	c	c	c
Veery (*Catharus fuscescens*)	u	-	o	-
Gray-cheeked Thrush (*Catharus minimus*)	u	-	u	-
Swainson's Thrush (*Catharus ustulatus*)	c	-	u	-
Hermit Thrush (*Catharus guttatus*)	u	-	u	u

Wood Thrush* (*Hylocichla mustelina*)	c	c	u	-
American Robin* (*Turdus migratorius*)	c	c	c	c
THRASHERS	Sp	S	F	W
Gray Catbird* (*Dumetella carolinensis*)	c	c	u	-
Northern Mockingbird* (*Mimus polyglottos*)	c	c	c	c
Brown Thrasher* (*Toxostoma rufum*)	c	c	c	u
PIPITS	Sp	S	F	W
American Pipit (*Anthus rubescens*)	u	-	u	u
WAXWINGS	Sp	S	F	W
Cedar Waxwing (*Bombycilla cedrorum*)	u	r	u	u
STARLINGS	Sp	S	F	W
European Starling* (*Sturnus vulgaris*)	c	c	c	a
SHRIKES	Sp	S	F	W
Loggerhead Shrike* (*Lanius ludovicianus*)	u	u	u	u
VIREOS	Sp	S	F	W
White-eyed Vireo* (*Vireo griseus*)	c	c	u	-
Solitary Vireo (*Vireo solitarius*)	o	-	o	-
Yellow-throated Vireo* (*Vireo flavifrons*)	u	u	o	-
Warbling Vireo* (*Vireo gilvus*)	u	u	o	-
Philadelphia Vireo (*Vireo philadelphicus*)	r	-	r	-
Red-eyed Vireo* (*Vireo olivaceus*)	c	c	u	-
WARBLERS	Sp	S	F	W
Blue-winged Warbler* (*Vermivora pinus*)	u	u	r	-
Golden-winged Warbler (*Vermivora chrysoptera*)	o	-	r	-
Tennessee Warbler (*Vermivora peregrina*)	c	-	c	-
Orange-crowned Warbler (*Vermivora celata*)	r	-	r	-
Nashville Warbler (*Vermivora ruficapilla*)	c	-	u	-
Northern Parula* (*Parula americana*)	u	u	u	-
Yellow Warbler* (*Dendroica petechia*)	u	u	r	-
Chestnut-sided Warbler (*Dendroica pensylvanica*)	u	-	u	-
Magnolia Warbler (*Dendroica magnolia*)	u	-	c	-
Cape May Warbler (*Dendroica tigrina*)	o	-	r	-
Black-throated Blue Warbler (*Dendroica caerulescens*)	r	-	r	-
Yellow-rumped Warbler (*Dendroica coronata*)	c	-	c	u
Black-throated Green Warbler (*Dendroica virens*)	c	-	c	-
Blackburnian Warbler (*Dendroica fusca*)	u	-	u	-

Yellow-throated Warbler* (*Dendroica dominica*)	u	u	u	-
Pine Warbler* (*Dendroica pinus*)	o	o	o	r
Prairie Warbler (*Dendroica discolor*)	u	u	o	-
Palm Warbler (*Dendroica palmarum*)	u	-	u	-
Bay-breasted Warbler (*Dendroica castanea*)	u	-	c	-
Blackpoll Warbler (*Dendroica striata*)	c	-	r	-
Cerulean Warbler (*Dendroica cerulea*)	u	u	o	-
Black-and-white Warbler (*Mniotilta varia*)	u	r	u	-
American Redstart (*Setophaga ruticilla*)	u	r	u	-
Prothonotary Warbler* (*Protonotaria citrea*)	c	c	u	-
Worm-eating Warbler* (*Helmitheros vermivorus*)	u	u	o	-
Ovenbird (*Seiurus aurocapilla*)	u	-	u	-
Northern Waterthrush (*Seiurus noveboracensis*)	u	-	u	-
Louisiana Waterthrush* (*Seiurus motacilla*)	c	c	r	-
Kentucky Warbler* (*Oporornis formosus*)	u	c	u	-
Connecticut Warbler (*Oporornis agilis)*	r	-	-	-
Mourning Warbler (*Oporornis philadelphia)*	r	-	-	-
Common Yellowthroat* (*Geothlypos trichas*)	c	c	c	-
Hooded Warbler* (*Wilsonia citrine*)	u	u	r	-
Wilson's Warbler (*Wilsonia pusilla*)	u	-	u	-
Canada Warbler (*Wilsonia canadensis)*	r	-	r	-
Yellow-breasted Chat* (*Icteria virens*)	c	c	o	-
TANAGERS	Sp	S	F	W
Summer Tanager* (*Piranga rubra*)	c	c	u	-
Scarlet Tanager* (*Piranga olivacea*)	u	u	u	-
NEW WORLD FINCHES	Sp	S	F	W
Northern Cardinal* (*Cardinalis cardinalis*)	c	c	c	c
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	c	-	c	-
Blue Grosbeak* *(Passerina caerulea)*	u	u	o	-
Indigo Bunting* (*Passerina cyanea*)	c	c	c	-
Dickcissel* (*Spiza americana*)	u	c	o	-
SPARROWS	Sp	S	F	W
Rufous-sided Towhee* (*Pipilo erythrophthalmus*)	c	c	c	c
American Tree Sparrow+ (*Spizella arborea*)	-	-	-	o
Chipping Sparrow* (*Spizella passerine*)	u	u	o	-
Field Sparrow* (*Spizella pusilla*)	c	c	c	c
Vesper Sparrow (*Pooecetes gramineus*)	c	-	u	-
Lark Sparrow (*Chondestes grammacus*)	o	r	-	-
Savannah Sparrow (*Passerculus sandwichensis*)	c	-	c	c
Grasshopper Sparrow (*Ammodramus savannarum*)	o	r	-	-
Le Conte's Sparrow (*Ammodramus leconteii*)	r	-	r	r
Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*)	-	-	o	-
Fox Sparrow (*Passerella iliaca*)	u	-	u	u
Song Sparrow* (*Melospiza melodia*)	c	o	c	c
Lincoln's Sparrow (*Melospiza lincolnii*)	u	-	u	-

Swamp Sparrow (*Melospiza georgiana*)	c	-	c	a
White-throated Sparrow (*Zonotrichia albicollis*)	c	-	c	a
White-crowned Sparrow (*Zonatrichia leucophrys*)	u	-	u	u
Dark-eyed Junco (*Junco hyemalis*)	c	-	c	c
Lapland Longspur (*Calcarius lapponicus*)	r	-	o	o
BLACKBIRDS, GRACKLES, COWBIRDS AND ORIOLES	Sp	S	F	W
Bobolink (*Dolichonyx oryzivorus*)	u	-	u	-
Red-winged Blackbird* (*Agelais phoeniceus*)	c	c	c	a
Eastern Meadowlark* (*Sturnella magna*)	c	c	c	c
Rusty Blackbird (*Euphagus carolinus*)	u	-	u	u
Common Grackle* (*Quiscalus quiscula*)	c	c	c	c
Brown-headed Cowbird* (*Molothrus ater*)	c	c	c	c
Orchard Oriole* (*Icterus spurious*)	c	c	r	-
Northern Oriole (*Icterus galbula*)	u	-	o	-
OLD WORLD FINCHES	Sp	S	F	W
Purple Finch+ (*Carpodacus purpureus*)	c	-	u	c
House Finch (*Carpodacus mexicanus*)	c	u	u	c
Pine Siskin+ (*Carduelis pinus*)	o	-	u	u
American Goldfinch* (*Carduelis tristis*)	c	c	c	c
Evening Grosbeak+ (*Coccothraustes vespertinus*)	o	-	r	u
WEAVER FINCHES	Sp	S	F	W
House Sparrow* (*Passer domesticus*)	c	c	c	c

Seasonal appearance

Sp - Spring - March to May

S - Summer - June to August

F - Fall - September to November

W - Winter - December to February

Seasonal abundance

a - abundant: a common species which is very numerous

c - common: certain to be seen in suitable habitat

u - uncommon: present but not certain to be seen

o - occasional: seen only a few times during a season

r - rare: seen at intervals of 2 to 5 years

x - accidental: out of normal species range

* - known or suspected to have nested on refuge

+ - Irruptive species seen most frequently during invasion years (2-10 year intervals)

ACCIDENTAL BIRDS: The following species have been observed sporadically on the refuge and are considered accidental:

American White Pelican (*Pelecanus erythrorhynchos*)
Tricolored Heron (*Egretta tricolor*)
Glossy Ibis (*Plegadis falcinellus*)
Roseate Spoonbill (*Ajaia ajaia*)
Fulvous Whistling-Duck (*Dendrocygna bicolor*)
Mute Swan (*Cygnus olor)*
Brant (*Branta bernicla)*
Ross' Goose (*Chen rossii)*
Barnacle Goose (*Branta leucopsis)*
Cinnamon Teal (*Anas cyanoptera*)
Mississippi Kite (*Ictinia mississippiensis*)
Northern Goshawk (*Accipiter gentilis*)
Purple Gallinule (*Porphyrio martinica*)
Piping Plover (*Charadrius melodus*)
Marbled Godwit (*Limosa fedoa*)
Red-necked Phalarope (*Phalaropus lobatus*)
Laughing Gull (*Larus atricilla*)
Franklin's Gull (*Larus pipixcan*)
Common Ground-Dove (*Columbina passerina*)
Snowy Owl (*Nyctea scandiaca)*
Swainson's Warbler (*Limnothlypis swainsonii*)
Snow Bunting (*Plectrophenax nivalis*)
Western Meadowlark (*Sturnella neglecta*)
Yellow Rail (*Coturnicops noveboracensis*)
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)

MAMMALS

The following list includes those mammal species known to exist on the refuge through documented sightings as well as those expected to be found within this region of Tennessee.

Common Name	Scientific Name
Southeastern Shrew	*Sorex longirostris*
Southern Short-tailed Shrew	*Blarina carolinensis*
Least Shrew	*Cryptotis parva*
Eastern Mole	*Scalopus aquaticus*
Little Brown Myotis	*Myotis lucifugus*
Gray Bat	*Myotis grisescens*
Indiana or Social Myotis	*Myotis sodalist*
Big Brown Bat	*Eptesicus fuscus*
Eastern Red Bat	*Lasiurus borealis*
Hoary Bat	*Lasiurus cinereus*
Evening Bat	*Nycticeius humeralis*
Eastern Pipistrel	*Pipistrellus subflavus*
Northern Long-eared Bat	*Myotis septentrionalis*
Eastern Cottontail	*Sylvilagus floridanus*
Eastern Chipmunk	*Tamias striatus*
Eastern Harvest Mouse	*Reithrodontomys humulis*
Deer Mouse	*Peromyscus maniculatus*
White-footed Mouse	*Peromyscus leucopus*

Common Name	Scientific Name
Cotton Mouse	*Peromyscus gossypinus*
Eastern Woodrat	*Neotoma floridana*
Marsh Rice Rat	*Oryzomys palustris*
Hispid Cotton Rat	*Sigmodon hispidus*
Prairie Vole	*Microtus ochrogaster*
Woodland Vole	*Microtus pinetorum*
Muskrat	*Ondatra zibethicus*
Virginia Opossum	*Didelphis virginiana*
Woodchuck	*Marmota monax*
Eastern Gray Squirrel	*Sciurus carolinensis*
Eastern Fox Squirrel	*Sciurus niger*
Southern Flying Squirrel	*Glaucomys volans*
Beaver	*Castor Canadensis*
Coyote	*Canis latrans*
Red Fox	*Vulpes fulva*
Gray Fox	*Urocyon cinereoargenteus*
Raccoon	*Procyon lotor*
Long-tailed Weasel	*Mustela frenata*
Mink	*Mustela vison*
Eastern Spotted Skunk	*Spilogale putorius*
Striped Skunk	*Mephitis mephitis*
River Otter	*Lutra Canadensis*
Bobcat	*Lynx rufus*
White-tailed Deer	*Odocoileus viginianus*

FISH

The following list includes those fish species known to inhabit refuge waters and surrounding waterways.

Common Name	Scientific Name
American Brook Lamprey	*Lampetra appendix*
Spotted Gar	*Lepisosteus oculatus*
Longnose Gar	*Lepisosteus osseus*
Shortnose Gar	*Lepisosteus platostomus*
Mooneye	*Hiodon tergisus*
American Eel	*Anguilla rostrata*
Gizzard Shad	*Dorosoma cepedianum*
Central Stoneroller	*Campostoma anomalum*
Goldfish	*Carassius auratus*
Rosyside Dace	*Clinostomus funduloides*
Spotfin Shiner	*Notropis spilopterus*
Common Carp	*Cyprinus carpio*
Rosefin Shiner	*Lythrurus ardens*
Redtail Chub	*Nocomis effuses*
Emerald Shiner	*Notropis atherinoides*
Ghost Shiner	*Notropis buchanani*
Pugnose Minnow	*Opsopoeodus emiliae*
Southern Redbelly Dace	*Phoxinus erythrogaster*
Bluntnose Minnow	*Pimephales notatus*
Fathead Minnow	*Pimephales promelas*
Bullhead Minnow	*Pimephales vigilax*
Blacknose Dace	*Rhinichthys atratus*
Creek Chub	*Semotilus atromaculatus*
River Carpsucker	*Carpiodes carpio*
Quillback	*Carpiodes cyprinus*
White Sucker	*Catostomus commersoni*
Creek Chubsucker	*Erimyzon oblongus*
Northern Hogsucker	*Hypentelium nigricans*
Smallmouth Buffalo	*Ictiobus bubalus*
Bigmouth Buffalo	*Ictiobus cyprinellus*

Common Name	Scientific Name
Spotted Sucker	*Minytrema melanops*
Black Buffalo	*Ictiobus niger*
River Redhorse	*Moxostoma carinatum*
Golden Redhorse	*Moxostoma erythrurum*
Black Redhorse	*Moxostoma duquesnei*
Shorthead Redhorse	*Moxostoma macrolepidotum*
Black Bullhead	*Ameiurus melas*
Yellow Bullhead	*Ameiurus natalis*
Blue Catfish	*Ictalurus furcatus*
Channel Catfish	*Ictalurus punctatus*
Slender Madtom	*Noturus exilis*
Tadpole Madtom	*Noturus gyrinus*
Flathead Catfish	*Pylodictis olivaris*
Grass Pickerel	*Esox americanus*
Pirate Perch	*Aphredoderus sayanus*
Spring Cavefish	*Forbesichthys agassizi*
Blackstripe Topminnow	*Fundulus notatus*
Blackspotted Topminnow	*Fundulus olivaceus*
Western Mosquitofish	*Gambusia affinis*
Brook Silverside	*Labidesthes sicculus*
Banded Sculpin	*Cottus carolinae*
White Bass	*Morone chrysops*
Yellow Bass	*Morone mississippiensis*
Rock Bass	*Ambloplites rupestris*
Green Sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gulosus*
Orange Spotted Sunfish	*Lepomis humilis*
Bluegill	*Lepomis macrochirus*
Longear Sunfish	*Lepomis megalotis*
Redear Sunfish	*Lepomis microlophus*
Smallmouth Bass	*Micropterus dolomieu*
Spotted Bass	*Micropterus punctulatus*

Common Name	Scientific Name
Largemouth Bass	*Micropterus salmoides*
White Crappie	*Pomoxis annularis*
Black Crappie	*Pomoxis nigromaculatus*
Mud Darter	*Etheostoma asprigene*
Rainbow Darter	*Etheostoma caeruleum*
Bluntnose Darter	*Etheostoma chlorosomum*
Fantail Darter	*Etheostoma flabellare*
Saffron Darter	*Etheostoma flavum*
Redline Darter	*Etheostoma rufilineatum*
Slabrock Darter	*Etheostoma smithi*
Orangethroat Darter	*Etheostoma spectabile*
Logperch	*Percina caprodes*
Blackside Darter	*Percina maculate*
Dusky Darter	*Percina sciera*
River Darter	*Percina shumardi*
Sauger	*Stizostedion canadense*
Walleye	*Sander vitreus vitreus*
Freshwater Drum	*Aplodinotus grunniens*

REPTILES

The following list includes those reptile species known to exist on the refuge through documented sightings as well as those expected to be found within this region of Tennessee.

Common Name	Scientific Name
Turtles:	
Common Snapping Turtle	*Chelydra serpentina*
Alligator Snapping Turtle	*Macroclemys temminckii*
Eastern Mud Turtle	*Kinosternon subrubrum subrubrum*
Common Musk Turtle	*Sternotherus odoratus*
Eastern River Cooter	*Pseudemys concinna concinna*
Midland Painted Turtle	*Chrysemys picta marginata*
Red-eared Slider	*Trachemys scripta carolina*

Common Name	Scientific Name
Mississippi Map Turtle	*Graptemys kohnii*
Common Map Turtle	*Graptemys geographica*
Ouachita Map Turtle	*Graptemys ouachitensis ouachitensis*
Eastern Box Turtle	*Terrapene carolina carolina*
Midland Smooth Softshell Turtle	*Apalone mutica mutica*
Eastern Spiny Softshell Turtle	*Trionyx spiniferus*
Lizards:	
Northern Fence Lizard	*Sceloporus undulatus hyacinthinus*
Eastern Slender Glass Lizard	*Ophisaurus attenuatus attenuatus*
Six-lined Racerunner	*Cnemidophorus sexlineatus sexlineatus*
Five-lined Skink	*Eumeces fasciatus*
Broad-headed Skink	*Eumeces laticeps*
Ground Skink	*Scincella lateralis*
Snakes:	
Midwest Worm Snake	*Carphphis amoenus helenae*
Northern Scarlet Snake	*Cemophora coccinea copei*
Southern Black Racer	*Coluber constrictor priapus or latrunculus*
Mississippi Ringneck Snake	*Diadophis punctatus strictogenys*
Rat Snake	*Drymobius elaphe*
Eastern Hognose Snake	*Heterodon platyrhinos*
Black Kingsnake	*Lampropeltis getulus niger*
Eastern Milksnake	*Lampropeltis triangulum triangulum*
Plainbelly Water Snake	*Nerodia erythrogaster*
Diamondback Water Snake	*Nerodia rhombifer*
Midland Water Snake	*Nerodia sipedon pleuralis*
Rough Green Snake	*Opheodrys aestivus*
Midland Brown Snake	*Storeiria decayi wrightorum*
Northern Red-bellied Snake	*Storeiria occipitmaculata occipitmaculata*
Southeastern Crowned Snake	*Tantilla coronata*
Eastern Ribbon Snake	*Thamnophis sauritus sauritus*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Western Earth Snake	*Virginia valeriae elegans*

Common Name	Scientific Name
Timber Rattlesnake	*Crotalus horridus*
Northern Copperhead	*Agkistrodon contortrix mokasen*
Western Pigmy Rattlesnake	*Sistrurus miliarius streckeri*
Western Cottonmouth	*Agkistrodon piscivorus leucostoma*

AMPHIBIANS

The following list includes those amphibian species known to exist on the refuge through documented sightings as well as those expected to be found within this region of Tennessee.

Common Name	Scientific Name
Salamanders:	
Eastern Hellbender	*Cryptobranchus alleganiensis alleganiensis*
Western Lesser Siren	*Siren intermedia nettingi*
Central Newt	*Notophthalmus viridescens louisianensis*
Common Mudpuppy	*Necturus maculosus*
Spotted Salamander	*Ambystoma maculatum*
Marbled Salamander	*Ambystoma opacum*
Mole Salamander	*Ambystoma talpoideum*
Smallmouth Salamander	*Ambystoma texanum*
Tiger Salamander	*Ambystoma tigrinum*
Spotted Dusky Salamander	*Desmognathus fusus conanti*
Southern Two-lined Salamander	*Eurycea cirrigera*
Long-Tailed Salamander	*Eurycea longicauda*
Southern Zigzag Salamander	*Plethodon ventralis*
Mississippi Slimy Salamander	*Plethedon mississippii*
Cave Salamander	*Eurycea lucifuga*
Northern Red Salamander	*Pseudotriton ruber ruber*
Frogs and Toads:	
Eastern Spadefoot Toad	*Scaphiopus holbrooki holbrooki*
Bullfrog	*Rana catesbieana*
Greenfrog	*Rana clamitans clamitans* or *melanota*
Pickerel Frog	*Rana palustris*

Common Name	Scientific Name
Southern Leopard Frog	*Rana utricularia*
Eastern Narrow-mouthed Toad	*Gastrophryne carolinensis*
American Toad	*Bufo americanus*
Fowler's Toad	*Bufo woodhousii fowleri*
Northern Cricket Frog	*Acris crepitians crepitians*
Gray Treefrog	*Hyla chrysoscelis versicolor*
Green Treefrog	*Hyla cinerea*
Northern Spring Peeper	*Pseudacris crucifer crucifer*
Upland Chorus Frog	*Pseudacris triseriata feriarum*

PLANTS

A detailed floristic inventory of the refuge was conducted in the early 1990s by Austin Peay University. This inventory documented over 600 plant species and was published in *Castanea*, the Journal of the Southern Appalachian Botanical Society, Vol. 59, No. 2 (June 1994), pp. 117-145.

APPENDIX K. Budget Requests

REFUGE OPERATING NEEDS SYSTEM (RONS)

Projects listed in Chapter V, Implementation of the Cross Creeks Comprehensive Conservation Plan, combine projects found within the Refuge Operating Needs System and the Service Asset Maintenance Management System and show these as a total project cost. However, the following two tables show individual first-year project costs.

Table 10. RONS projects at Cross Creeks NWR

Project Number	Project Title	Cost Estimate ($)	Station Rank	Type
2856	Restore Management Capabilities	94,588	1	Tier 1
2869	Provide a Full-time LE Officer	97,292	2	
2915	Provide Biological Assistance For Refuge Management Direction	94,588	3	
3170	Provide Water Management Strategies	75,000	4	
31771	Control Nuisance Species	35,000	5	Tier 2
3182	Develop Auto Tour Interpretive Signs	15,400	6	
3325	Develop Refuge Interpretive Video	35,000	7	
3330	Vegetation Mapping	120,000	8	
3357	Maintain Public Use Facilities and Increase Habitat Management	67,129	9	
3362	Provide Visitor Services Program	77,321	10	
3397	Control Invasive and Exotic Plants and Animals	69,584	11	
3927	Implement Forest Management Program	94,588	12	

SERVICE ASSET MANAGEMENT SYSTEM NEEDS

Table 11. Service Asset Management System (SAMMS)

Work Order Number	Project Description	Cost Estimate ($)	Type
2007752731	Replace 10 Miles of Boundary Signs	75,000	Deferred Maintenance
-	Improve Gravel Boat Ramp @Bull Pasture	261,000	NEW
-	Improve Gravel Boat Ramp @ West Bellwood	285,000	

APPENDIX L. List of Preparers

U.S. Fish and Wildlife Service

Mike Dawson, Mississippi Field Office, Jackson, MS
Robert Ford, Memphis Migratory Bird Office, Tennessee
Raye Nilius, Tennessee National Wildlife Refuge
Karen Pacheco, Cross Creeks National Wildlife Refuge
Christopher Swanson, Tennessee National Wildlife Refuge
John Taylor, Tennessee National Wildlife Refuge
Sarah Welker, Cross Creeks National Wildlife Refuge
Robert Wheat, Tennessee National Wildlife Refuge

Tennessee Wildlife Resources Agency

Alan Peterson, Jackson, Tennessee
Ed Warr, Nashville, Tennessee

U.S. Army Corps of Engineers

Jeff Hancock, Lake Barkley, Dover, Tennessee

Mangi Environmental Group

Mark Blevins, McLean, Virginia
Leon Kolankiewicz, McLean, Virginia
Meghan Morse, McLean, Virginia

APPENDIX M. Finding of No Significant Impact

Introduction
The U.S. Fish and Wildlife Service (Service) has developed a Comprehensive Conservation Plan (CCP) to provide a foundation for the management and use of Cross Creeks National Wildlife Refuge (Refuge) over the next 15 years. An Environmental Assessment was prepared to inform the public of the possible environmental consequences of implementing the CCP for Cross Creeks National Wildlife Refuge (NWR). A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the Environmental Assessment, which was Section B of the Draft Comprehensive Conservation Plan for Cross Creeks NWR.

Alternatives
In developing the CCP for the Complex, the Service evaluated four alternatives: Alternatives A, B, C, and D.

The Service adopted Alternative D, the "Preferred Alternative," as the plan for guiding the direction of the refuge for the next 15 years. The overriding concern reflected in this CCP is that wildlife conservation assumes first priority in refuge management; wildlife-dependant recreational uses are allowed if they are compatible with wildlife conservation. Wildlife-dependent recreation uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) will be emphasized and encouraged.

ALTERNATIVE A - CURRENT MANAGEMENT (NO ACTION)

In general, Alternative A would maintain current management direction, that is, the refuge's habitats and wildlife populations would continue to be managed as they have in recent years. Public use patterns would remain relatively unchanged from those that exist at present. This alternative would pursue the same five broad refuge goals as each of the other alternatives.

Cross Creeks NWR would continue to provide adequate foraging habitats to meet the needs of 33,100 ducks for 110 days and other habitats that are needed for loafing, roosting, molting, and other needs. The refuge would also provide adequate foraging habitat to meet the needs of 15,400 migratory Canada geese for 90 days. Cross Creeks NWR would continue to provide sanctuary for wintering waterfowl and other migratory birds from November 15 to March 15.

Staff/volunteers would work to provide a minimum of 20 nesting boxes in accordance with the 2003 Regional Wood Duck Management Guidelines for nest box programs. The refuge would continue to use partners in the Christmas Bird Count and North American Migration Count (in conjunction with International Migratory Bird Day).

The staff would continue to protect all federally listed species under the Endangered Species Act. Limited hunting would continue for deer, turkey, squirrel, and resident Canada goose. Under this alternative, there would be no active management for marsh birds, shorebirds, colonial nesting waterbirds, and non-game species. The control of problem beavers would continue under this alternative on a limited basis as necessary.

The staff and volunteers would continue to passively manage about 150 acres as moist soil with limited water management and control of invasive species. The refuge would continue to provide other habitats, such as mudflats, native submerged and emergent aquatic vegetation, flooded woodlands, beaver ponds, and open water that provide food resources, as well as habitats for loafing, resting, roosting, and molting. Staff would continue cooperative farming of corn, milo, millet, soybeans, and wheat on 1,200-1,300 acres

to benefit waterfowl and other species. The refuge staff would also continue limited annual spraying of aquatic plants (e.g., alligatorweed, spatterdock, and parrot feather) as well as conduct mechanical control (e.g., mowing and disking) as needed of certain upland plants.

Under Alternative A, there would continue to be no active management of the refuge's forests, scrub-shrub habitat, and warm season grasses. There would be a reduced ability to manage water because of clogged structures from beaver or aquatic plants, neglected units (restricted by probable sedimentation in channels inside units and vegetation), and the timing of the operations schedule for Lake Barkley.

The refuge would continue to provide visitor services under the existing public use development plan approved in 1985. Staff would continue to provide managed, limited hunting for deer, turkey, squirrels, and resident Canada geese. The refuge would also continue to provide quality fishing and compatible water-related recreation programs on 3,260 acres. Cross Creeks NWR would continue to offer opportunities for wildlife observation and photography throughout the refuge, accessible along the refuge road system from March 16 to November 14, but with the addition of a wildlife observation deck next to the visitor center. The staff would continue to provide environmental education services to the public, including limited visits to schools, environmental education workshops, and on-site and off-site environmental education programs. The staff would continue to maintain exhibits in the visitor center, kiosk outside visitor center, and on the Woodpecker Interpretive Trail. The refuge staff would continue to manage cultural resources consistent with Section 106 of the National Historic Preservation Act.

The refuge would maintain a staff size of 4-5 fulltime positions, including the refuge manager, office assistant, maintenance mechanic, and equipment operator. Staff would maintain existing facilities including headquarters, visitor center, maintenance building and yard, roads, gates, and equipment such as road grader, tractors, dozers, and backhoe.

ALTERNATIVE B - PUBLIC USE EMPHASIS

Alternative B would emphasize enhanced public use on Cross Creeks NWR. Additional efforts and expenditures would be made to expand the public use program, visitor facilities, and overall level of public use opportunities on the refuge. Special emphasis would be accorded to promoting the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. This alternative would pursue the same five broad refuge goals as each of the other alternatives.

Cross Creeks NWR would continue to provide adequate foraging habitats to meet the needs of 33,100 ducks for 110 days and other habitats that are needed for loafing, roosting, molting, and other needs. The refuge would also provide adequate foraging habitat to meet the needs of 15,400 migratory Canada geese for 90 days. Staff/volunteers would work to provide a minimum of 20 nesting boxes in accordance with the 2003 Regional Wood Duck Management Guidelines for nest box programs.

Alternative B calls for opening portions of the refuge to additional hunting and wildlife observation opportunities during the sanctuary period. Alternative B would also open portions of the refuge to additional hunting and/or increase quota limits for deer, turkey, squirrels, and Canada geese. Furthermore, hunts for doves, rabbits, and raccoons would be added.

Under this alternative, there would be no active management for marsh birds. The refuge would develop additional partnerships with non-governmental organizations and the public in efforts to inventory and possibly in certain habitat management activities for shorebirds, colonial nesting waterbirds, landbirds, and non-game species.

The refuge staff would continue to protect all federally listed species under the Endangered Species Act, as well as use partners and volunteers to help determine the distribution and abundance of select listed species. The control of problem beavers would continue under this alternative on a limited basis as necessary. In addition, control of feral hogs and snakehead fish would occur if these species appeared.

The refuge would continue to provide other habitats, such as mudflats, native submerged and emergent aquatic vegetation, flooded woodlands, beaver ponds, and open water that provide food resources, as well as habitats for loafing, resting, roosting, and molting. Under Alternative B, there would continue to be no active management of the refuge's forests, scrub-shrub habitat, and warm season grasses. Staff would continue cooperative farming of corn, milo, millet, soybeans, and wheat on 1,200-1,300 acres to benefit waterfowl and other species.

Alternative B calls for water management efforts to focus on providing sport fishing opportunities within the impoundments. Further, it would reduce moist-soil management efforts on 150 acres of impoundments, allowing for higher water levels to realize optimal fishing opportunities.

The refuge staff would continue limited annual spraying of aquatic plants alligatorweed, spatterdock, parrot feather, and Eurasian water milfoil, as well as conduct mechanical control (i.e., mowing and disking) as needed of certain upland plants. The staff would also develop additional partnerships with other agencies, non-governmental organizations, and the public in control efforts.

Within 5 years of the date of the CCP, the refuge staff would draft, approve, and begin to implement a new Visitor Services Plan, using the current format for such documents. Alternative B would open portions of the refuge to additional hunting and/or increase quota limits for deer, turkey, squirrels, and Canada geese. Additionally, hunts for doves, rabbits, and raccoons would be added. The refuge would provide quality fishing and compatible water-related recreation programs on 3,260 acres by furnishing adequate launching facilities, bank fishing areas, and (within 5 years of the date of the CCP and contingent on funding) at least one ADA-compliant pier to accommodate anglers of all abilities. The refuge staff would continue to manage cultural resources consistent with Section 106 of the National Historic Preservation Act.

Cross Creeks NWR would continue to offer opportunities for wildlife observation and photography throughout the refuge, accessible along the refuge road system from March 16 to November 14, but with the addition of a wildlife observation deck next to visitor center. During winter months, Alternative B would re-open the 1-mile auto tour route in vicinity of visitor center that was used previously. Under Alternative B, the staff would continue to provide environmental education services to the public, including Earth Camp, visits to schools, environmental education workshops, and on-site and off-site environmental education programs. However, the staff would expand the refuge's role as an outdoor classroom both for students and the general public for Stewart and surrounding counties. Within five years of the date of the CCP, the staff would increase the number of wayside signs and add wildlife-oriented signs along the Woodpecker Interpretive Trail, as well as develop an interpretive kiosk at Elk Reservoir.

The refuge would maintain staff of 5-6 fulltime positions, including the refuge manager, park ranger (public use), office assistant, maintenance mechanic, law enforcement officer, and equipment operator. Alternative B would replace the now separate visitor center and headquarters with one common building. Staff would maintain existing equipment fleet, replacing obsolete equipment as needed. There would be an additional three portable toilets along road system.

ALTERNATIVE C - WILDLIFE MANAGEMENT EMPHASIS

Alternative C aims to intensify and expand wildlife and habitat management at Cross Creeks NWR. This would increase benefits for wildlife species, which fulfills the refuge purpose and goals. Public use opportunities, and refuge's efforts to provide these, would remain approximately as they are now. This alternative would pursue the same five broad refuge goals as each of the other alternatives.

The refuge would provide foraging habitats to meet the needs of 44,400 ducks (25 percent more than Alternative A) for 110 days and other habitats that are needed for loafing, roosting, molting, and other needs. The refuge would also provide adequate foraging habitat to meet the needs of 15,400 migratory Canada geese for 90 days but evaluate the need for foraging habitat every 5 years and adjust accordingly. Cross Creeks NWR would continue to provide sanctuary, as in Alternative A, backed up by increased enforcement to reduce illegal disturbance and trespass.

The staff would determine the status of priority marsh bird species at Cross Creeks NWR. Alternative C calls for determining the status of shorebirds at Cross Creeks NWR and implement active shorebird management on at least one impoundment during fall migration. Under Alternative C, development of a baseline colonial waterbird inventory through systematic surveys would occur. Similarly, refuge staff would conduct baseline inventory of relative abundance, species richness, and distribution of landbirds. Within 10 years of the date of the CCP, staff would develop and implement baseline inventories for non-game mammals, reptiles, amphibians, and invertebrates. The refuge staff would continue to protect all federally listed species under the Endangered Species Act and determine the distribution and abundance of all listed species.

For the duration of the CCP, the refuge staff would manage game populations to maximize quality hunting opportunities while maintaining habitat for federal trust species. Staff and volunteers would provide 50 properly located and maintained nesting boxes, brood rearing habitat, and feeding areas throughout the refuge. When necessary, control of invasive animal species using approved techniques to help achieve refuge conservation goals and objectives would occur.

Alternative C would focus water management within the impoundments on migratory birds for the duration of the CCP, by providing adequate and reliable flooded habitat throughout the refuge, and assuring that water management capability can distribute water in a timely manner. Alternative C calls for expanding efforts to improve the moist soil management program on at least 300 acres by expanding the invasive plant control program, water management capabilities, and the use of management techniques that set back plant succession. Increasing the acreage of other habitats, such as mudflats, native submerged and emergent aquatic vegetation, flooded woodlands, beaver ponds, and open water that provide food resources, as well as habitats for loafing, resting, roosting, and molting, would occur under Alternative C. The staff would obtain control of invasive species through active methods of removal. These methods would work towards reducing the infestation, and eliminating populations whenever feasible.

Within five years of the date of the CCP, refuge staff would develop and begin to implement a Forest Management Plan that would aim to benefit nesting and migratory birds. For the duration of the CCP, staff would explore possibilities of managing for scrub-shrub habitat to benefit certain birds in suitable locations on the refuge. They would explore potential benefits of planting and managing native warm season grasses on formerly farmed fields (up to 75 percent of existing cultivated acreage). Over the lifetime of the CCP, Cross Creeks NWR would gradually phase out cooperative farming in favor of force-account or contract farming of wheat, corn, milo, and millet on 600 acres to meet wildlife foraging objectives.

The refuge would continue to provide visitor services under the existing public use development plan approved in 1985. For the duration of the CCP, staff would manage game populations to maximize quality hunting opportunities while maintaining habitat for federal trust species. The refuge would continue to provide quality fishing and compatible water-related recreation programs on 3,260 acres of the refuge. Cross Creeks NWR would continue to offer opportunities for wildlife observation and photography throughout the refuge, accessible along the refuge road system from March 16 to November 14, but with the addition of a wildlife observation deck next to the visitor center. Alternative C calls for reduced refuge-facilitated environmental education activities for the public on and off refuge. The staff would continue to maintain exhibits in the visitor center, the kiosk outside visitor center, and on the Woodpecker Interpretive Trail. The refuge staff would continue to manage cultural resources consistent with Section 106 of the National Historic Preservation Act.

The refuge would maintain a staff of 12 fulltime positions, including refuge manager, park ranger, office assistant, maintenance mechanic, assistant refuge manager, one forester to serve all Tennessee and Cumberland Rivers refuges, one biologist, one law enforcement officer, one maintenance worker, one IT/data base manager, one bio-technician, and one equipment operator. The staff would maintain existing facilities including headquarters, visitor center, maintenance building and yard, roads, gates, and equipment, such as road grader, tractors, dozers, and backhoe. However, management under Alternative C would reduce maintenance of signage and other infrastructure in bottomlands. The refuge would install one pump and would add farm and fire management equipment such as a corn planter, all-terrain vehicles, and a pumper truck.

ALTERNATIVE D - ENHANCED WILDLIFE MANAGEMENT AND PUBLIC USE PROGRAM (PREFERRED MANAGEMENT ACTION)

The preferred alternative, Alternative D, will balance an enhanced wildlife management program with increased opportunities for public use on the refuge. Wildlife and habitat management as well as public use activities will increase under this alternative. This alternative will pursue the same five broad refuge goals as each of the other alternatives.

The refuge will provide foraging habitats to meet the needs of 33,100 to 44,400 ducks (25 percent more than Alternative A) for 110 days and other habitats that are needed for loafing, roosting, molting, and other needs. The refuge will also provide adequate foraging habitat to meet the needs of 15,400 migratory Canada geese for 90 days, but evaluate need for foraging habitat every 5 years and adjust accordingly. Cross Creeks NWR will continue to provide sanctuary, as in Alternative A, backed up by increased enforcement to reduce illegal disturbance and trespass. In addition, within 5 years of the date of the CCP, the refuge will seek opportunities for limited wildlife observation within the sanctuary. Staff and volunteers will provide 20 to 50 properly located and maintained nesting boxes, brood rearing habitat, and feeding areas throughout the refuge.

The staff will determine the status of priority marsh bird species at Cross Creeks NWR. Alternative D calls for determining the status of shorebirds at Cross Creeks NWR and implementing active shorebird management on at least one impoundment during fall migration. Staff will also develop additional partnerships with other agencies, non-governmental organizations, and the public in efforts to inventory shorebirds and possibly in certain habitat management activities. Under Alternative D, development of a baseline colonial waterbird inventory through systematic surveys will occur.

Refuge staff will also develop additional partnerships with other agencies, non-governmental organizations, and the public in efforts to inventory colonial nesting waterbirds and possibly in certain habitat management activities. Similarly, refuge staff will conduct baseline inventories of relative abundance, species richness, and distribution of landbirds. Staff will also develop additional partnerships with other agencies, non-

governmental organizations, and the public in efforts to inventory landbirds and possibly in certain habitat management and nest-promoting activities. Within 10 years of the date of the CCP, staff will develop and implement baseline inventories for non-game mammals, reptiles, amphibians, and invertebrates. Refuge staff will also develop partnerships with other agencies, non-governmental organizations, and the public in efforts to inventory non-game species and possibly in certain habitat management activities.

For the duration of the CCP, the refuge staff will manage game populations to maximize quality hunting opportunities while maintaining habitat for federal trust species. The refuge staff will continue to protect all federally listed species under the Endangered Species Act and will use partners and volunteers (when necessary) to determine the distribution and abundance of all listed species. When necessary, control of invasive animal species using approved techniques to help achieve refuge conservation goals and objectives will occur.

Alternative D will focus water management within the impoundments on migratory birds for the duration of the CCP. This will be accomplished by providing adequate and reliable flooded habitat throughout the refuge, and assuring that water management capability can distribute water in a timely manner, but also make a concerted effort to accommodate sport fishing opportunities where and when circumstances allow. Alternative D calls for expanding efforts to improve the moist-soil management program on at least 300 acres by expanding the invasive plant control program, water management capabilities, and the use of management techniques that set back plant succession, but also make a concerted effort to accommodate sport fishing opportunities where and when circumstances allow. Increasing the acreage of other habitats, such as mudflats, native submerged and emergent aquatic vegetation, flooded woodlands, beaver ponds, and open water that provide food resources, as well as habitats for loafing, resting, roosting, and molting will occur under Alternative D.

Within 5 years of the date of the CCP, refuge staff will develop and begin to implement a Forest Management Plan that will aim to benefit nesting and migrating birds. For the duration of the CCP, staff will explore possibilities of managing for scrub-shrub habitat to benefit certain birds in suitable locations on the refuge. They will explore potential benefits of planting and managing native warm season grasses on formerly farmed fields (up to 75 percent of existing cultivated acreage). Over the lifetime of the CCP, Cross Creeks NWR will gradually phase out cooperative farming in favor of force-account or contract farming of wheat, corn, milo, and millet on 600 acres to meet wildlife foraging objectives.

The staff will obtain control of invasive species through active methods of removal. These methods will work towards reducing the infestation, and eliminating populations whenever feasible. Alternative D will also extend control efforts to Eurasian water milfoil and develop additional partnerships with other agencies, non-governmental organizations, and the public in control efforts.

Within 5 years of the date of the CCP, the refuge staff will draft, approve, and begin to implement a new Visitor Services Plan using the current format for such documents. The refuge will also provide quality fishing and compatible water-related recreation programs on 3,260 acres of the refuge by furnishing adequate launching facilities, bank fishing areas, and (within 5 years of the date of the CCP, contingent on funding) at least one ADA-compliant pier to accommodate anglers of all abilities. The refuge staff will develop and begin to implement a Cultural Resources Management Plan.

For the duration of the CCP, staff will manage game populations to maximize quality hunting opportunities while maintaining habitat for federal trust species. Under Alternative D, the staff will continue to provide environmental education services to the public, including visits to schools, environmental education workshops, and on-site and off-site environmental education programs. However, the staff will also expand the refuge's role as an outdoor classroom both for students and the general public for Stewart and surrounding counties.

Under Alternative D, Cross Creeks NWR will continue to offer opportunities for wildlife observation and photography throughout the refuge, accessible along the refuge road system from March 16 to November 14, but with the addition of a wildlife observation deck next to visitor center. Within 5 years of date of the CCP, the refuge will explore feasibility of building a wildlife observation tower near Pool 1. Also within 5 years of the date of the CCP, the staff will increase the number of wayside signs and add wildlife-oriented signs along Woodpecker Interpretive Trail, as well as develop an interpretive kiosk at Elk Reservoir.

The refuge will maintain staff of 9 fulltime positions, including the refuge manager, park ranger, office assistant, maintenance mechanic, assistant refuge manager, one forester to serve all Tennessee and Cumberland Rivers refuges, one biologist, one law enforcement officer, and one equipment operator. Alternative D will replace the now separate visitor center and headquarters with one common building. The staff will maintain the existing equipment fleet, replacing obsolete equipment as needed. There will be an additional three portable toilets placed along road system. Finally, the refuge will install three pumps and will add farm and fire management equipment such as a corn planter, all-terrain vehicles, and a pumper truck.

Environmental Effects

Implementation of the Service's management action is expected to result in environmental, social, and economic effects as outlined in the CCP. Habitat management, population management, land conservation, and visitor services management activities on Cross Creeks NWR will result in increased protection for threatened and endangered species; enhanced wildlife populations; habitat restoration; and enhanced opportunities for wildlife-dependent recreation and environmental education. These effects are detailed as follows:

1. Additional staff and resources will create and properly manage the diversity of habitats found on the refuge, including hardwood, scrub-shrub, moist-soil areas, cropland, and open water. Active management of these communities will likely result in a greater species diversity and abundance of migratory birds. Baseline data will be collected on populations and habitats and monitoring protocols will be established. Invasive species will be controlled, which will have a positive effect on the biotic community.

2. Quality wildlife-dependent recreational activities (hunting, fishing, and wildlife observation and interpretation) will continue and environmental education programs will be developed. Improved interpretive and informational programs will increase awareness of the refuge and wildlife and of the mission of the National Wildlife Refuge System.

3. Cultural resources will be surveyed, documented, and protected on the refuge.

4. Habitat restoration and management, along with a focus on accessibility and facility developments, will result in improved wildlife-dependent recreational opportunities. While public use will result in some minimal, short-term adverse effects on wildlife, and user conflicts may occur at certain times of the year, these effects are minimized by site design, time zoning, and implementing refuge regulations. Anticipated long-term impacts to wildlife and wildlife habitats of implementing the management action are positive. In the long run, wildlife habitat and increased opportunities for wildlife-dependent recreation opportunities could result in an increase in economic benefits to the local community.

5. Implementing the CCP is not expected to have any significant adverse effects on wetlands and floodplains, pursuant to Executive Orders 11990 and 11988, as actions will not result in development of buildings and/or structures within floodplain areas, nor will they result in irrevocable, long-term adverse impacts.

Potential Adverse Effects and Mitigation Measures

Wildlife Disturbance

Disturbance to wildlife at some level is an unavoidable consequence of any public use program, regardless of the activity involved. Obviously, some activities innately have the potential to be more disturbing than others. The management actions to be implemented have been carefully planned to avoid unacceptable levels of impact.

As currently proposed, the known and anticipated levels of disturbance of the management action are considered minimal and well within the tolerance level of known wildlife species and populations present in the area. Implementation of the public use program will take place through carefully controlled time and space zoning, establishment of protection zones around key sites, closures of all-terrain vehicle trails, and routing of roads and trails to avoid direct contact with sensitive areas, such as nesting bird habitat. All hunting activities (season lengths, bag limits, number of hunters) will be conducted within the constraints of sound biological principles and refuge-specific regulations established to restrict illegal or non-conforming activities. Monitoring activities through wildlife inventories and assessments of public use levels and activities would be utilized, and public use programs will be adjusted as needed to limit disturbance.

User Group Conflicts

As public use levels expand across time, some conflicts between user groups may occur. Programs will be adjusted, as needed, to eliminate or minimize these problems and provide quality wildlife-dependent recreational opportunities. Experience has proven that time and space zonings, such as establishment of separate use areas, use periods, and restricting numbers of users, are effective tools in eliminating conflicts between user groups.

Effects on Adjacent Landowners

Implementation of the management action will not impact adjacent landowners. Essential access to private property will be allowed through issuance of special use permits. Future land acquisition will occur on a willing-seller basis only, at fair market values within the approved acquisition boundary. Lands are acquired through a combination of fee title purchases and/or donations and less-than-fee title interests (e.g., conservation easements, cooperative agreements) from willing sellers. Funds for the acquisition of lands within the approved acquisition boundary will likely come from the Land and Water Conservation Fund or the Migratory Bird Conservation Act. The management action contains neither provisions nor proposals to pursue off-refuge stream bank riparian zone protection measures (e.g., fencing) other than on a volunteer/partnership basis.

Land Ownership and Site Development

Proposed acquisition efforts by the Service will result in changes in land and recreational use patterns, since all uses on national wildlife refuges must meet compatibility standards. Land ownership by the Service also precludes any future economic development by the private sector. Potential development of access roads, dikes, control structures, and visitor parking areas could lead to minor short-term negative impacts on plants, soil, and some wildlife species. When site development activities are proposed, each activity will be given the appropriate National Environmental Policy Act consideration during pre-construction planning. At that time, any required mitigation activities will be incorporated into the specific project to reduce the level of impacts to the human environment and to protect fish and wildlife and their habitats.

As indicated earlier, one of the direct effects of site development is increased public use; this increased use may lead to littering, noise, and vehicle traffic. While funding and personnel resources will be allocated to minimize these effects, such allocations make these resources unavailable for other programs.

The management action is not expected to have significant adverse effects on wetlands and floodplains, pursuant to Executive Orders 11990 and 11988.

Coordination
The management action has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include:

All affected landowners
Congressional representatives
Governor of Tennessee
Tennessee Wildlife Resources Agency
Tennessee State Historic Preservation Officer
Local community officials
Interested citizens
Conservation organizations

Findings
It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an environmental impact statement is not required. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the Environmental Assessment for Cross Creeks NWR:

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Environmental Assessment, pages 136-145).

2. The actions will not have a significant effect on public health and safety. (Environmental Assessment, page 153).

3. The project will not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. (Environmental Assessment, page 152).

4. The effects on the quality of the human environment are not likely to be highly controversial. (Environmental Assessment, page 138).

5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Environmental Assessment, page 153).

6. The actions will not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Environmental Assessment, page 154).

7. There will be no cumulatively significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Environmental Assessment, page 154).

8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources. (Environmental Assessment, page 152).

9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Environmental Assessment, page 151).

10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment. (Environmental Assessment, page 153).

Supporting References

Fish and Wildlife Service. 2008. Draft Comprehensive Conservation Plan and Environmental Assessment for Cross Creeks National Wildlife Refuge, Stewart County, TN. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region.

Document Availability

The Environmental Assessment was Section B of the Draft Comprehensive Conservation Plan for Cross Creeks National Wildlife Refuge and was made available in June 2008. Additional copies are available by writing: Cross Creeks NWR, 643 Wildlife Road, Dover, TN 37058.

Patricia Ann Hollingsworth

For Sam D. Hamilton
Regional Director

8/28/09
Date