Environmental Assessment

Trinity River NWR Comprehensive Conservation Plan

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Prepared by

Stuart Marcus, Refuge Manager
Laurie Lomas, Refuge Biologist
Joseph Luján, Division of Planning, Regional Office
U.S. Fish and Wildlife Service Southwest Region

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1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE

Refuge bayou. USFWS

1.1 Introduction

The United States Fish and Wildlife Service (Service) proposes to implement a Comprehensive Conservation Plan (CCP) for the Trinity River National Wildlife Refuge (refuge, Trinity River NWR), which would guide management on the refuge for the next 15 years. This Environmental Assessment (EA) is being prepared to evaluate the effects associated with this proposal and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (516 DM 8) and Service (550 FW 3) policies (see Section 1.7 for a list of additional regulations with which this EA complies). NEPA requires examination of the effects of proposed actions on the natural and human environment. In the following chapters, we describe three alternatives for future refuge management, the environmental consequences of each alternative, and our preferred management direction. Each alternative was designed to contain a reasonable mix of fish and wildlife habitat prescriptions and wildlife-dependent recreational opportunities consistent with the Refuge System Improvement Act and specific refuge purposes.

The environmental consequences of each alternative are described in the following text and form the basis for selection of the proposed action. This EA is designed to cover the environmental consequences for future management actions and current facilities on the Trinity River NWR. However, some future actions, such as the construction of major facilities, will require further environmental documentation.

1.2 Location

The Trinity River NWR is located in the floodplain of the lower Trinity River in Liberty County, Texas. The refuge consists of over 51 units and continues to emphasize acquisition opportunities throughout the floodplain of the Trinity River. The refuge is approximately 50 miles northeast of Houston and 40 miles west of Beaumont in southeast Texas. Although located in a rural setting, the refuge is within 65 miles of over 5,000,000 people (see Map 1-3 in the CCP).

1.3 Background

Trinity River NWR is currently composed of various units (50 plus) of land totaling 25,000 acres. The refuge was established January 4, 1994, by the Emergency Wetlands Resources Act of 1986 for the purpose of protecting a remnant of the bottomland hardwood forest ecosystem along the Trinity River. It is one of only 14 priority one bottomland sites identified for protection in the Texas Bottomland Protection Plan (USFWS 1985). Additionally, this refuge is highly valuable for a diversity of waterfowl species within the Central Flyway. The type of habitat found on this refuge is used during migration or nesting by nearly 50 percent of the Neotropical migratory bird species listed by the Service.

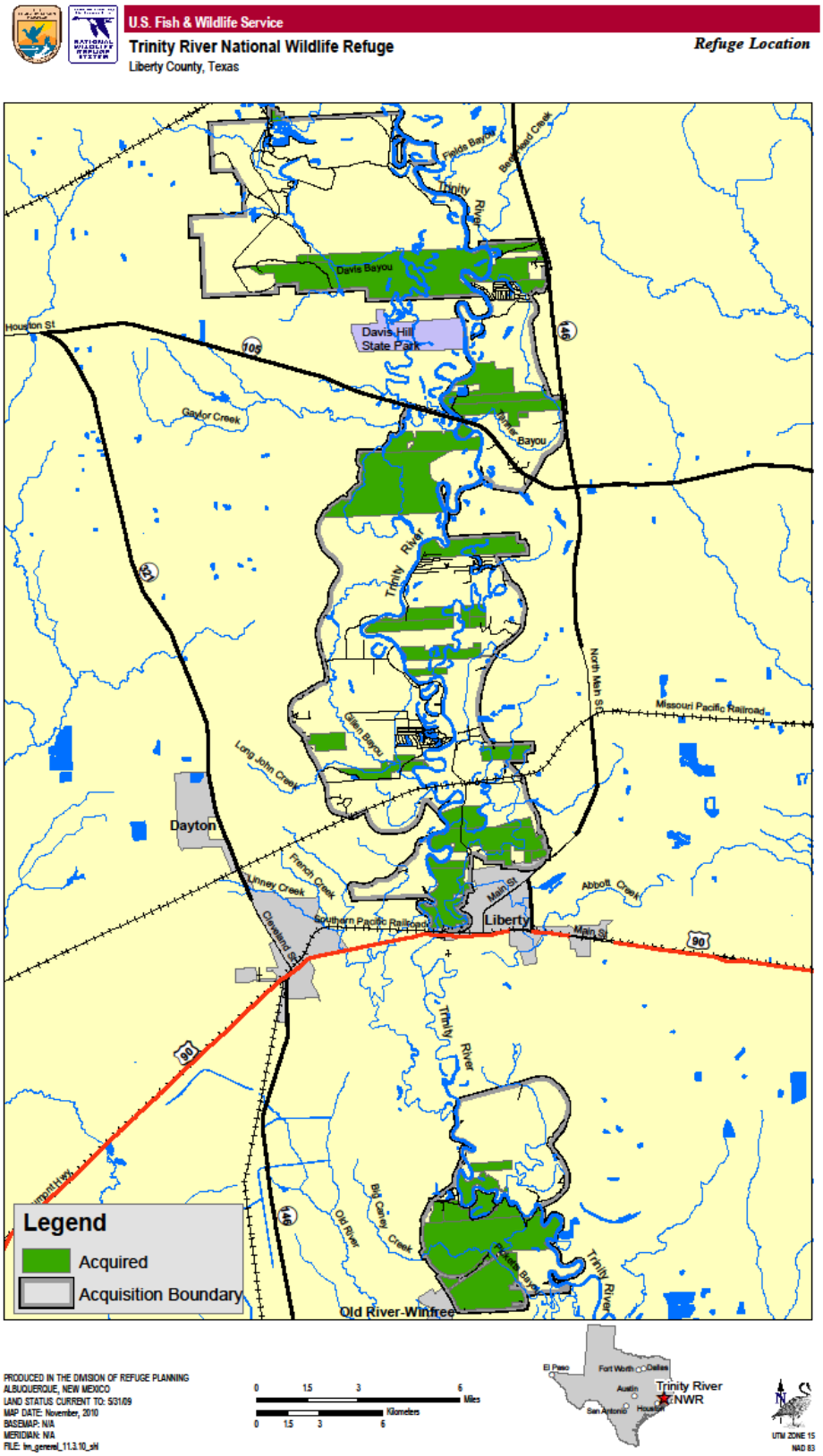
Since the refuge is relatively new, the Service is in an active acquisition phase for incorporating lands into the refuge. With total anticipated acquisition of nearly 80,000 acres, the principle value of refuge lies in its potential as an outstanding waterfowl wintering area and as a strategically located stopover, either migrating or nesting, for Neotropical migratory bird species.

The acquisition area is the remnant of what was once a much larger natural area but still consists of a broad, flat floodplain with numerous sloughs, oxbow lakes, cypress/tupelo swamps, artesian wells, and tributaries, with few modifications. Timber harvest, gravel mining, and residential and commercial development are imminent threats to the stability of this system, due to the proximity to Houston and other nearby metropolitan areas.

Lands in Liberty County, specifically those in the proposed acquisition area around the Trinity River, are primarily used for timber or agriculture. Along with many older bottomland hardwood areas, there are also tree (primarily pine) plantations on drier sites. It is evident that an increasing number of Texas landowners, typical of those in Liberty County, are thinking of forestry as an agricultural crop, rather than of harvesting and gathering the natural woods already in place. This may be an indication that some of the natural forests in Liberty and other similar bottomland counties will be replaced with tree plantations for easier and faster harvesting in the near future.

The following is the vision of the Trinity River NWR:

The Trinity River National Wildlife Refuge will preserve, protect, and restore the wildlife and habitat of the Lower Trinity River bottomland hardwood forest floodplain and associated habitats. Through persistent exotic species control, reforestation, and biological monitoring, the refuge will serve as an anchor for biodiversity, model for habitat restoration and enhancement, and advance climate change practices throughout southeast Texas. The refuge will serve as a resilient source of evolving habitats and ecosystem processes even as structure and composition are altered due to climate changes. The refuge will continue to seek partnerships with landowners, local and regional organizations, and State and Federal agencies to achieve national and regional conservation goals, for the benefit of present and future generations. The refuge will also continue to provide and develop high quality programs and facilities for hunting, fishing, wildlife observation, photography, interpretation, and environmental education. This will allow people to connect with nature while building support for the refuge and enhancing the local community.



Map C-1.1. Current Refuge Ownership (green) and Approved Acquisition Boundary (dark outline)

1.4 Purpose

The purpose of the Proposed Action is to specify a management direction for Trinity River NWR over the next 15 years. The purpose of the EA is to select a management direction for the refuge that best achieves the refuge's purposes, vision, and goals; contributes to the mission of the National Wildlife Refuge System; is consistent with principles of sound fish and wildlife management; and address relevant mandates and major issues during scoping. The proposed management direction is described in detail through a set of goals, objectives, and strategies in the Comprehensive Conservation Plan (CCP). The purpose of this EA is to assess the impacts of proposed management actions.

1.5 Need for Action

The action is needed because adequate long-term management direction does not currently exist for the refuge. Management is guided by various general policies and short-term plans that do not reflect current conditions or recent scientific knowledge. The action is also needed to address current management issues and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges in the United States.

1.6 Decision to be Made

The Regional Director for the Southwest Region (Region 2 of the U.S. Fish and Wildlife Service) will make two decisions based on this EA:

1. Select which alternative the refuge will implement, and
2. Determine if the selected alternative is a major Federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement (EIS), or whether the Proposed Action alternative can proceed.

The refuge's Proposed Action is Alternative C. Assuming no significant impact is found, the final Plan will include a Finding of No Significant Impact (FONSI), a statement explaining why the selected alternative will not have a significant effect on the quality of the human environment. This determination takes into consideration the Service and refuge System mission, the purpose(s) for which the refuges were established, and other legal mandates. Once the FONSI is signed, the CCP will be implemented, monitored annually, and revised when necessary.

1.7 Regulatory Compliance

National wildlife refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and the U.S. Fish and Wildlife Service Manual.

The CCP's overriding consideration is to carry out the purpose for which the refuge was established. Refuge purposes are stated in the laws that established the refuge and provided the funds for acquisition. Fish and wildlife management is the first priority in refuge management,

and the Service allows and encourages public use (wildlife-dependent recreation) as long as it is compatible with, or does not detract from, the refuge missions and purposes.

This EA was prepared by the Service and represents compliance with applicable Federal statutes, regulations, Executive orders, and other compliance documents. Appendix B of the CCP contains a list of the key laws, orders, and regulations that provide a framework for the Proposed Action.

Further, this EA reflects compliance with applicable State of Texas and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources. An Endangered Species Act (ESA) Section 7 Consultation will be completed for inclusion in the CCP (Appendix F).

Comprehensive Conservation Plans include a review of the appropriateness and compatibility of existing refuge uses and of any planned future public uses. If a use is determined to be an 'Appropriate Refuge Use' by a Refuge Manager, it is then taken through the 'Compatibility Determination' process. Compatibility determinations (CD) have been completed and are provided in Appendix D of the CCP. For more information on Appropriate Refuge Uses and Compatibility Determinations, including a list of CDs, see Chapter 5 of the CCP.

Scouts cleaning. USFWS

1.8 Scoping/Public Involvement and Issues Identified

Formal scoping began with publication of a notice of intent to prepare a CCP and EA in the *Federal Register* on August 10, 2007. In December 2008, a letter was sent to individuals at Texas Parks and Wildlife Department (TPWD) formally inviting them to participate in the development of the CCP. We received input from TPWD in January 2009. Planning Update #1, released to the public in December of 2009, announced the beginning of the planning process and asked the public to help identify issues that needed to be addressed in the CCP. Three public open house meetings were held in 2009 in Liberty (November 30), Beaumont (December 1), and Houston, Texas (December 2, 2009).

In addition to three open house public meetings, the refuge hosted a government-to-government meeting and invited regional representatives from both State and Federal government agencies on February 4, 2010. The meeting was held at the Liberty/Dayton Area Chamber of Commerce in Liberty, Texas, with representatives from the refuge, U.S. Fish and Wildlife Service Endangered Species Office in Houston, TPWD, and the National Park Service.

In addition to the scoping activities, one member of the Trinity River NWR staff participated in an ecoregion-wide coordination meeting with different agencies and organizations on December 9, 2009. This helped provide a better understanding of what issues are occurring within the Gulf Coast Prairies and Marshes ecoregion for the Texas Mid-coast Comprehensive Conservation Plan. This meeting utilized the Texas State Wildlife Action Plan and the Nature Conservancy's Ecoregion Assessment to describe the biological characteristics of the ecoregion and associated threats. This meeting was designed to determine where the conservation community collectively stands at addressing ecoregional threats and the role the refuge plays within the broader landscape. This meeting was also very beneficial to the Trinity River NWR since a portion of the refuge also falls within the Gulf Coast Prairies and Marshes Ecoregion.

Planning Update #2, released in February 2010, offered an opportunity to the public to review and comment on the issues identified during the public scoping process. This update announced the draft goal statements and the preliminary range of management alternatives developed by the planning team.

The feedback received at the conclusion of the public involvement period identified concerns from a variety of stakeholders. The issues and concerns provided the basis for developing the refuge's management direction and played a role in determining desired conditions for the refuge. The issues have been divided into three categories for the refuge to address:

1. Habitat and Wildlife Management
2. Visitor Services
3. Facilities

All the following issues are refuge management concerns unless otherwise specified.

1.8.1 Habitat and Wildlife Management

Whistling duck at Champion Lake. USFWS

Conservation/Enhancement of Bottomland Hardwood Forests

The majority of comments received on habitat and wildlife management issues were based on an aggressive acquisition program to expand the refuge with continuous units of land from willing sellers and land donors. Comments from all stakeholder groups on habitat management were based on preservation and reversing the trends of fragmentation and development. Many groups, including the refuge, had concerns over the increased spread of invasive and non-native flora throughout the refuge and preserving existing units while allowing them to develop and mature into old growth forests.

Native Flora/Faunal Conservation

Members of the public commented on numerous concerns, including the priority for managing wildlife and initiating management actions for public use opportunities. Concerns were expressed on restoring native flora and impacts of invasive species and damage initiated from feral hog rooting activities.

Invasive Flora/Fauna Management

Invasive, exotic, and nuisance species issues were raised by the public, State, and the refuge. All comments indicated the refuge needs to continue to treat invasive flora. The refuge also identified concerns of the red imported fire ant and the potential impacts to native wildlife.

Wetland Management

The refuge identified issues with existing water control structures and the need to maintain and improve existing levees, as well as developing a consistent program to conduct water sampling and fish surveys as indicators of quality wetlands.

Land Acquisition

Acquisition efforts are focused on the floodplain of the Trinity River with special emphasis on bottomland hardwood forests. The bottomland forests of the ecosystem have high wildlife and wetland values and provide quality habitat for a large variety of wildlife species. Many stakeholders identified acquisition efforts as the desired direction to offset the impacts of fragmentation; there were also general comments promoting refuge expansion.

Climate Change

Many concerns were discussed during our ecoregional planning meeting held for the Prairies and Marshes Ecoregional meeting on Brazoria National Wildlife Refuge in 2009. Many concerns were focused on the concerns of global climate change and the impacts warmer temperatures would have on the entire ecoregion. Issues included climate change and its potential for alterations to habitat components and wildlife migrations, and habitat fragmentation from the development of sprawling communities or other land use developments. As habitats change, the wildlife species that inhabit those habitats will also change. There is little the refuge can do to affect this issue, but it can realize that is occurring, document these changes through data collection, and adapt management as hydrology and plant communities change. Concerns regarding climate change focused on initiating baseline data to develop a better understanding of the immediate impacts of climate change and the long-term trends in habitat and wildlife species shifts.

Resource Protection

Many concerns were bought up by the public and the refuge on the increased need for law enforcement and patrols to better protect refuge resources and provide for visitor safety.

1.8.2 Visitor Services

Public Use Opportunities

The public expressed concerns for growing each of the big six wildlife-dependent recreational opportunities provided throughout the refuge (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation). Many comments were in favor of increased access to the various refuge units and additional canoe and kayak access points. Many constituents were in favor of the numerous special events such as Earth Day, Free Fishing Day, and National Public Lands Day. Overall, public comments reflected care

Employee's son holding a bullfrog. USFWS

in growing opportunities for increased conservation efforts and building upon the unique wildlife viewing and extraordinary wildlife-dependent recreational opportunities provided on the refuge.

1.8.3 Facilities

The planning team reviewed comments on public use facilities, administrative facilities, and refuge access issues. Members of the public commented on issues such as increasing interpretive signs and kiosks, establishing a visitor center, and creating and improving on "green" infrastructure.

Public Use Access

Members of the public would like to see additional areas of the refuge open for wildlife-dependent recreational opportunities. Some constituents commented on additional maps or web information indicating which areas of the refuge contain public access and the types of activities allowed on certain units. 54

Public use Facilities

Members of the general public expressed concern about having additional public use facilities throughout the refuge. Many members of the public requested a new visitor center.

Cultural Resources

Cultural resources include both archaeological and historic sites and other artifacts. Some comments were received during the public meetings to provide interpretive materials on cultural resources occurring throughout the refuge.

Oil and Gas Operations

Many members of the public would like to see no petroleum development on the refuge and many would like to see special mitigations incorporated to minimize negative impacts to wildlife.

2.0 DESCRIPTION OF ALTERNATIVES

2.1 Formulation of Alternatives

Alternatives are different approaches or combinations of management actions designed to achieve a refuge's purposes and vision, the goals identified in the CCP, the goals of the Refuge System, and the mission of the Service. Alternatives are developed to address the significant issues, concerns, and opportunities heard during the scoping process. The planning team developed three alternative management scenarios that represent a reasonable range of alternatives that could be used at Trinity River NWR.

This EA considers three alternatives in detail (see section 2.4), which cover a reasonable range of alternatives. In addition, three other alternatives were considered but eliminated from detailed analysis (see section 2.2). These alternatives represent different approaches or management scenarios for the future protection, restoration, and management of the refuge fish, wildlife, plants, habitats, and other resources, as well as compatible wildlife-dependent recreation. Refuge staff assessed the biological conditions of refuge habitats and analyzed the external relationships affecting each refuge unit. This information contributed to the development of refuge goals and, in turn, helped formulate the alternatives, summarized in

Table C-2.5. Based on input from the public and the initial interdisciplinary team meetings, these alternatives represent a full range of reasonable alternatives in refuge resources that will help guide management actions over the next 15 years on the refuge. Alternatives will be examined in three broad issue categories:

Habitat and Wildlife Management: How will the refuge address habitat management issues while ensuring the conservation, diversity, and enhancement of the bottomland hardwood forests?

Visitor Services: How will the refuge provide public use opportunities while ensuring the conservation, diversity, and enhancement of bottomland hardwood forests?

Facilities: How will the Refuge manage facilities while ensuring the conservation, diversity, and enhancement of bottomland hardwood forests?

2.2 Alternatives Considered But Dismissed From Detailed Analysis

During the public scoping period, many alternative actions for managing the refuge were suggested. Many of these suggestions were consistent with refuge purposes and the mission of the Refuge System and were incorporated into the action alternatives. Some of the public suggestions for refuge uses were found to be not appropriate, through an appropriate use determination, and were removed from further consideration. Actions and alternatives that are not feasible or may cause substantial harm to the environment are usually not considered in an EA. Similarly, an action (and therefore, an alternative containing that action) should generally not receive further consideration if:

- It is illegal (unless it is the No Action Alternative, which must be considered to provide a baseline for evaluation of other alternatives, even though it may not be capable of legal implementation).
- It does not fulfill the mission of the National Wildlife Refuge System.
- It does not relate to or help achieve one of the goals of the refuge.
- Its environmental impacts have already been evaluated in a previously approved NEPA document.

However, if such actions or alternatives address a controversial issue or an issue on which many public comments were received, they may be considered in detail in a NEPA document to demonstrate clearly why they are not feasible or would cause substantial harm to the environment.

During the alternatives development process, the planning team considered a wide variety of potential actions on the refuge. The following actions were ultimately rejected and excluded from the proposed alternatives because they did not achieve refuge purposes or were incompatible with one or more goals.

Some members of the public expressed concern over controlling the water levels of the Trinity River for the benefit of wildlife on the refuge and requested that the refuge establish agreements to mandate continuance of current cycle. Although the Trinity River is critical in waterfowl and wildlife habitat needs, the refuge does not own any water rights to the River.

The Trinity River Authority, with no contribution from the refuge, controls the river flow. This alternative, although desirable, is considered infeasible due to legal constraints and does not satisfy the purpose and need for which this EA is being prepared.

Some members of the public requested that the refuge purchase Davis Hills State Park and incorporate this land into the Trinity River NWR. Although the refuge is in an aggressive acquisition mode, all units are only purchased from willing sellers. This alternative is considered infeasible due to legal constraints with land ownership and does not satisfy the purpose and need for which this EA is being prepared.

Some members of the public expressed a concern against any entrance fees being implemented on refuge lands. The refuge currently does not charge any entrance fees and has no desire to initiate any entrance fees within the life of this CCP.

2.3 Management Direction Common to All Alternatives

Although the alternatives differ in many ways, there are similarities among them; several elements of refuge management are common to all alternatives. Listed below, these common management activities reduce the length and redundancy of the individual alternative descriptions.

Refuge flower. USFWS

Threatened and Endangered Species

The purpose of the Endangered Species Act (ESA) of 1973 (Endangered Species Act 1973) is to conserve "the ecosystems upon which endangered and threatened species depend" and to conserve and recover listed species. Under the law, species may be listed as either "endangered (E)" or "threatened (T)." Endangered means a species is in danger of extinction throughout all or a significant portion of its range; threatened means a species likely to become endangered within the foreseeable future. Proposed species means any species of fish, wildlife, or plant that is proposed in the *Federal Register* to be listed under section 4 of the ESA. Several endangered and threatened species have the potential occur on the refuge. No federally listed plant species are documented on the refuge.

The refuge will continue to provide resting habitat for piping plovers and interior least tern, as well as provide breeding habitat for American alligator and potential habitat for all species listed in Liberty County under the Endangered Species Act.

A total of eight federally listed species have been identified as potentially occurring in Liberty County and are identified on Table 3-3 of the CCP.

The Gulf Coast Bird Observatory surveyed the refuge for ivory-billed woodpeckers during 2007-2009 but did not find any signs. This species is believed to have been extirpated from the State of Texas, as well as other southeastern states (Hornaday 1913). J.T. Tanner's studies between 1937 and 1939 demonstrated that the ivory-billed woodpecker still existed but in only a fraction of its original range. By the time of Tanner's study (Tanner 1942), the ivory-billed woodpecker only survived in the Madison Parish region of Louisiana, the Santee Swamp of South Carolina, and the Suwanee River and Big Cypress regions of Florida (Tanner 1942). The last verified observation of an ivory-billed woodpecker in the United States was in 1969 (USFWS 1999).

None of the current or projected future lands within the acquisition boundary of the refuge has been designated critical habitat for any species listed as endangered under the ESA of 1973, as amended. The American alligator, brown pelican, and southern bald eagle occur on the refuge but are no longer designated as endangered.

Species of Special Management Concern

Species of special management concern are species for which further biological research and field study are needed to resolve their conservation status or are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional scientific societies. This includes State listed endangered or threatened species not included in the previous text. Actions are not currently being taken to manage for these species. A total of 22 species have been identified as species of special management concern and are identified in Table 3-5 of the CCP.

Cultural Resources

The refuge would continue to identify, protect, and manage all significant cultural resources in a spirit of stewardship for the benefit of future generations. The refuge would administer, preserve, and protect these resources in such a manner that sites, buildings, structures, and other objects of cultural value are preserved and maintained for scientific study and public appreciation and use. The refuge would ensure that during the appropriate stages of decision-making affecting these resources such as construction, land use, or resource planning, and land acquisition or disposal, full consideration is given to cultural resources. The refuge will ensure that prior to any ground disturbing activities, archeological surveys will be conducted according to State Historical Preservation Office (SHPO) standards. The refuge will also ensure that if new sites are discovered, they will be secured, recorded, and archived according to SHPO standards.

Oil and Gas Operations

The refuge does not own any mineral rights. The refuge does not currently have any active oil or gas well sites or production facilities, although the potential exists. There are currently over 16 miles of pipelines located through various refuge units. Except for pipeline construction projects within existing right-of-ways, the remaining pipelines were in place before the inception of the refuge. Although very rare, occasional spills or blow-outs could occur in pipes, causing damage to habitat and wildlife. Mitigation measures will be incorporated to all special use permits allowing any activities relating to oil and gas development and require operators to submit a "Development and Operations Plan" for approval by the Refuge Manager.

Service policy 612 FW 2 states that the objectives of oil and gas management on Service lands are to protect wildlife populations, habitats, and other resources and to provide for the exercise of non-Federal oil and gas rights while protecting Service resources to the maximum extent possible. In accordance with 50 CFR 29.32, persons holding mineral rights shall, to the greatest extent practicable, conduct all exploration, development, and production operations in such a manner as to prevent the damage, erosion, pollution, or contamination to the lands, waters, facilities, and vegetation of the area. Such operations must also be conducted without interference with the operation of the refuge or disturbance to wildlife and would be subject to prior approval by the Service. All operations would be required to operate under current local, State, and Federal regulations and policies.

Operators would be required to prevent, to the maximum extent possible, releases of hazardous materials and substances, crude oil, and produced water. Each operator and/or facility operator would have a current Oil Discharge Prevention and Contingency Plan, outlining procedures for securing and clean-up of accidental releases. Sampling, remediation, and restoration of contaminated sites would be the responsibility of the operator and/or facility operator and would occur in consultation with the Service and the appropriate State agency. All sites no longer being used by industry would be sampled for contaminants at the operator's expense to ensure proper disposal of material and that refuge staff and/or the visiting public are not exposed to contaminants.

All oil and gas activities conducted on the refuge require the use of "best management practices" as defined in the Operational Plan and/or Special Use Permit. Efforts to minimize environmental impacts in wetland habitats include special conditions such as timing of activity, types of equipment used, and use of on-site environmental monitors, as well as habitat restoration requirements, if needed. Best management practices and mitigation measures are discussed and agreed upon before the initiation of any seismic, drilling, or production activities.

The Service would request, on a case-by-case basis, that wells, roads, pipelines, and associated infrastructure and facilities not needed to support ongoing operations be removed and the sites restored to the satisfaction of the Refuge Manager.

Wildland Fire

All wildland fires will be suppressed. Suppression strategies range from monitoring the fire while allowing it to burn itself out (as in the case where no life, property, or resources are threatened and/or smoke management is not an issue of concern), to full suppression (if life, property, and resources are threatened and/or smoke management is an issue of concern).

The Trinity NWR will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risks, define implementation actions, and document decisions with corresponding rationale. When needed, the refuge would manage wildland fires for more than one objective, and objectives can change as the fire moves across the landscape. Objectives are affected by changes in fuels, weather, topography; varying social understanding and tolerance; and involvement of other governmental jurisdictions having different missions and objectives (National Interagency Fire Center 2009). Initial action on human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety. Fire management strategies will consider current landscape conditions and spatial and temporal components of the fire regime.

2.4 Alternatives Analyzed in Detail

The following alternatives were developed to comply with NEPA and to provide ways to represent a number of issues, concerns, and opportunities that were identified during the public and internal scoping process. Though the alternatives may have different emphases, habitat maintenance, restoration, and preservation are common elements of each alternative. Each alternative was intended to provide a range of public uses and access and respond to significant issues or concerns identified during the planning process.

2.4.1 Alternative A - No Action (Current Management)

Equipment Operator Rick Carroll L and Bio Tech Eric Angle. USFWS

2.4.1.2 Habitat and Wildlife Management

Native Flora/Fauna Conservation

The refuge would continue to acquire and conserve units within the approved acquisition boundary. The refuge would continue habitat management activities to restore and reintroduce native flora and fauna. Management tools will continue to be implemented to improve or maintain the integrity of bottomland hardwood forests such as treating non-native flora and planting trees. Management of native nuisance flora includes limited control by herbicides of cattail and frogbit along various ponds covered in those plants. The use of herbicides would continue at approximately 200 acres per year.

The refuge has planted over 12 species of native trees since 1995. Plantings primarily occurred in 1995–1996 with 10,000 bare-root seedlings, while another 50,000 plus seedlings were planted in 2006.

Management of potentially native nuisance fauna includes hunting white-tailed deer and trapping beaver that could potentially affect adjacent landowners.

The refuge would continue to maintain three artificial roosting structures specifically for cavity-roosting bats: one abandoned farmhouse and two cinderblock towers. Artificial bat towers were erected to provide maternity roosts. The population has been showing a small but steady growth from 2005 to 2011. Surveys of artificial roosting structures over five years have shown that this particular species of bat is increasing. It has increased by approximately 10 percent each year from 2005 to 2011. Information regarding bat roost selection was collected as a part of a three-year study funded by U.S. Geological Survey (USGS).

The refuge will continue to work with TPWD to establish and record deer browse line surveys to ensure that deer population numbers in and around the refuge are within the unit's carrying capacity.

The refuge will continue to record colonial nesting bird activity in our major rookeries.

Invasive Flora/Fauna Management

Invasive Species (flora)

The refuge would continue to concentrate its efforts on controlling Chinese tallow, trifoliate orange, McCartney rose, Chinaberry, water hyacinth, alligatorweed, and giant salvinia and other invasive species on a case-by-case basis to preserve the integrity of the bottomland hardwood ecosystem. Herbicidal treatments would be the primary tools used to implement this management direction, while biological control methods may be used on approved species such as weevils for alligatorweed, salvinia, and water hyacinth.

For exotic/nuisance plants, herbicides approved by use at the Washington, D.C. level would be applied either by basal bark treatment or foliar application. Basal bark treatment uses a hand-held or backpack 1-3 gallon container using herbicides appropriate for the species being treated. Herbicide is sprayed around the entire base of the plant to a height of about 12 inches. Foliar application uses a battery powered spray rig with a wand capable of distributing a mist all the way to a straight stream that can reach about 25 feet. This rig can be mounted on boats, all-terrain vehicles (ATVs), or utility vehicles.

Herbicide treatment would continue on 100-200 acres on average annually. This average is based on regular annual funding and does not include special circumstances where additional budget allocations have been available in individual years to treat additional acres. For example, in fiscal year 2008 a special contract was awarded to aerially treat approximately 300 acres of water hyacinth and 300 acres of alligatorweed. These occasional budget allocations are infrequent and unpredictable and therefore are not included in our annual averages. Treatments to date are focused on problem areas rather than systematic control that the refuge can achieve given its limited budget and resources.

Table C-2.1. Chemical Treatments on the Trinity River NWR

Active Ingredient	Brand Name	Target Species	Application	Purpose
Imazapyr	Habitat, Imazapyr E-pro 2	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Foliar	Eradicate invasive flora in bottomland forest and waterways
Imazamox	Clearcast	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Aerial, Foliar	Eradicate invasive flora in bottomland forest and waterways
Glyphosate	Rodeo, Glyphos Aquatic	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Foliar	Eradicate invasive flora in bottomland forest and waterways
Triclopyr	Garlon 4	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Foliar, basal bark	Eradicate invasive flora in bottomland forest and waterways
Metsulfuron methyl + aminopyralid	Chaparral	McCartney Rose	Foliar	Eradicate invasive flora in bottomland forest and waterways

Floral (woody) Species

Chinese tallow: Most control efforts involve basal bark application of herbicide to each individual tree. In areas of dense infestation, high volume foliar application of the entire tree is conducted. Control of this species has averaged approximately 75 acres per year over the past 15 years.

Chinaberry tree: Herbicides are applied using a basal bark application method on each individual tree. In areas of dense infestation, high volume foliar application with a 25-gallon sprayer mounted on ATV is used. Control of this species has averaged approximately five acres per year over the past 15 years.

Trifoliate orange: Herbicides are applied using basal bark application method on each individual shrub. In areas of dense infestation, high volume foliar application with a 25-gallon sprayer mounted on an ATV is used. Control of this species has averaged approximately 15 acres per year over the past three years.

McCartney rose: Foliar spraying of individual bushes has removed most of this shrub, but constant monitoring is necessary. In areas of dense infestation, high volume foliar application with a 25-gallon sprayer mounted on an ATV is used. Control of this species has averaged approximately 10 acres per year over the past three years.

Floral (aquatic) Species

Water hyacinth: Approximately 300 acres are targeted for eradication and monitored yearly. The refuge is currently controlling this species through helicopter spraying on large sites with a combination of hand removal and hand spraying used on smaller sites (less than five acres).

Alligatorweed: Is found in similar ponds and waterways as hyacinth, but more prevalent. The refuge is currently controlling this species through helicopter spraying on large sites.

Giant salvinia: The refuge has done very limited spraying with herbicides since 2006 with a 25-gallon spray tank mounted on a boat. Most areas do not support boating operations, making it difficult to access. TPWD has used a biological control method by releasing salvinia weevils to help control giant salvinia in small ponds throughout the refuge.

Faunal Species

The refuge would continue limited control on feral hogs and nutria on a continuous basis. Removal of feral hogs will be by hunting, removal by staff, and trapping, while nutria removal will be by trapping and removal by staff. Current eradication efforts are focused on problem areas rather than systematic control.

Nutria: There is limited nutria trapping by refuge staff in the Palmetto Unit and Ander's Pond.

Feral hogs: The refuge has a few large corral type traps on Mann and Champion Lake units and allows hunting at Brierwood, Page, McGuire, Butler, Hirsch, Boar's Den, and Silver Lake units during a limited hunt season.

Wetland Management

Water Management: There are no pumping structures to add water to the 800-acre Champion Lake (average, normal size) during times of drought. There are no plans or need for any additional water control structures or pumps on any of the current units within the refuge. Rebuilding of the levee along the southern border of Champion Lake was completed by contract in 2003 and is maintained by refuge staff.

Water Quality Sampling: Sampling consists of monthly testing for salinity, dissolved oxygen, temperature, conductivity, and pH. The refuge is in the early phases of baseline data collection.

Fish Surveys: Results of surveys include species, frequency, and size. Surveys on Champion Lake have been conducted by university staff and students three times since 2003. There is no stocking of fish in any of the refuge ponds.

Land Acquisition

The refuge would continue to implement the actions outlined in the 1999 Lower Trinity River Floodplain Habitat Stewardship Program. The refuge would continue to acquire lands from willing sellers as they become available. This would be on a case-by-case basis with available funding. Since 2000, yearly acquisition has averaged nearly 1,900 acres.

Climate Change

The refuge will continue to plant native bare-rooted tree seedlings in an attempt to sequester carbon. As opportunities arise, units that were previously pastureland before Service acquisition may be restored with native tree species. The refuge would use green infrastructure and related technologies when opportunities and funding permits to reduce its carbon footprint and contribution to climate change as well as reduce, reuse and recycle used materials to the extent possible and maximize "green" technologies. In addition to traditional

recycling activities, the refuge participates in local city recycling days for tires and document shredding. Refuge controlled structures such as trailers and Die House have converted most incandescent light bulbs to compact fluorescent light bulbs. The 12-volt generator batteries are trickled charged by a solar panel. Vehicle fleet includes a hybrid Chevy Malibu. The refuge strives to minimize its carbon footprint on a daily basis.

Refuge officer. USFWS

Resource Protection

Currently, the refuge has one law enforcement officer to cover 25,000 acres on over 50 units, located 45 miles from north to south on two sides of a river. The law enforcement officer (LEO) averages about four physical arrests, 20 notices of violation, and 50 verbal warnings per year. Most contacts involve illegal fishing/boating activities, but there are also considerable trespassing and outstanding warrant violations.

Champion Lake. USFWS

2.4.2 Visitor Services

The refuge receives over 22,000 visitors annually and provides opportunities for the public to hunt waterfowl, big game, and upland game; fish; and observe, photograph, and learn about bottomland hardwood forests. However, there are currently limited opportunities for visitor education and interpretation.

Hunting

The refuge would continue to allow hunting by permit only for big game, upland game, and waterfowl in eight units. Approximately 700 annual visitor use days for hunting occur on the refuge.

Big Game Hunting
The refuge currently allows two nine-day "mini-seasons" for big game hunting (deer and hog) by permit only within the Butler, Brierwood, Page, McGuire, Hirsch, Boars Den, and Silver Lake units. There is also a "mini-season" for muzzleloader and archery (See Table C-2.2). A "mini season" is a hunt season specific to the refuge, which is shorter than the hunting season allowed by the State outside of refuge managed lands. Each drawn hunter is allowed to bring one guest and one youth, between 12 and 17 years old, or two youths. There are no standby hunters.

Upland Game Hunting
The refuge currently allows a 23-day "mini-season" for upland game hunting (squirrel and rabbit) by permit only within the Brierwood, McGuire, and Boar's Den units. Permits are issued on a first-come, first-serve basis. Each permitted hunter is allowed to bring two youths, aged 12-17. There are no standby hunters.

Waterfowl Hunting
The refuge currently allows waterfowl hunting by permit only on the 800-acre Champion Lake Unit on weekends. This two day per week hunt is a limited drawing of 20 participants. Hunters are selected in groups of 20, and then allowed to hunt for a designated two weekends only. Each drawn hunter is allowed to bring one guest and one youth, aged 17 or younger, or two youths. There are no standby hunters.

Table C-2.2. Current Hunt Program

Units Currently Open/Acres	Type of Hunt (Number Of Permits Issued)	Species
Page - 2,200	**BIG GAME** • archery (22) • general gun (16)	deer, feral hog
Brierwood -1,800	**BIG GAME** • general gun (14) • muzzleloader (25) **UPLAND GAME** (30)	deer, feral hog squirrel, rabbit
McGuire - 550	**BIG GAME** • general gun (10) • muzzleloader (15) **UPLAND GAME** (20)	deer, feral hog squirrel, rabbit
Butler – 250	**BIG GAME** • archery (8)	deer, feral hog
Hirsch – 890	**BIG GAME** • archery (14) • general gun (8) • muzzleloader (10)	deer, feral hog
Boar's Den - 2,000	**BIG GAME** • general gun (18) • muzzleloader (30) **UPLAND GAME** (35)	deer, feral hog squirrel, rabbit
Silver Lake - 260	**BIG GAME** • general gun (5)	deer, feral hog
Champion Lake - 800	**WATERFOWL** (120)	ducks

Fishing

Approximately 18,000 visitor use days come for fishing opportunities. The refuge currently allows fishing at the 800-acre Champion Lake and along Pickett's Bayou. Seasons, creel, and size limits are within the guidelines established by TPWD. The refuge's fishing program is more restrictive than the State guidelines to assure compatibility with other refuge objectives. Additional restrictions include area closures to minimize disturbance near colonial rookeries; no gigs, trotlines, bow fishing, or nets are allowed; and all fishing is limited to daylight hours.

Wildlife Observation

Current wildlife observation opportunities would continue by walking or boating access only. There are no auto tour routes on the refuge. The eight units currently open to wildlife observation are shown in Table C-2.3.

Table C-2.3. Wildlife Observation Trails

Unit Name	Unit #	Acres	Type	Miles of Trails
Butler	10	500	Hiking	0.5
Brierwood	47	2,983	Hiking	7.3
Page	21	877	Hiking	4.5
Hirsch	64	892	Hiking	2.2
McGuire	31	521	Hiking	7.1
Silver Lake	47a	259	Hiking	0.1
Boar's Den	46, 46a, 47	4,471	Hiking	7.5
Champion Lake Public Use Area	27	2,850	Hiking Boating	2.3 7.1

Wildlife Photography

Current wildlife photography opportunities would continue at the same units listed for wildlife observation. Wildlife photography opportunities are conducted by walking or boating. Auto tour routes are not present on the refuge.

Environmental Education

State recognized environmental education (EE) programs do not occur on the refuge.

Interpretation

Current interpretative programs would continue on the refuge. They include two "on-refuge" annual events and approximately six "off-refuge" annual events.

In 2004 the Friends of Trinity River Refuge design, fund, and planted the butterfly garden. USFWS

2.4.3 Facilities

Facilities for administrative and public uses would remain at current numbers and would be routinely maintained. The office for the refuge consists of a single field station administrative headquarters office and a storage/maintenance building. The office is approximately 3,200 square feet and includes eight offices, storage space, conference room, kitchenette, and visitor and staff parking areas. The storage/maintenance building encompasses 2,250 square feet and is adjacent to the headquarters. The entire footprint of both buildings is approximately 2.5 acres. Other "on-refuge" facilities are listed below.

Public Use Access

The refuge currently contains two miles of government maintained, public use roads. These are all dirt roads leading to parking areas. Most other roads that lead to refuge parking areas come off county maintained roads, which may be either dirt or paved. Auto tours routes are not present on the refuge. Current public access would continue on approximately 25 percent of the refuge. Vehicular access to parking lots is on designated roads to all public use areas listed previously in the Visitor Services section. From the parking lot, entry is by walk-in only or boating. Boat motor size is limited to 10-horse power or less for Champion Lake and 40-horsepower or less for Pickett's Bayou.

Table C-2.4. Current Facilities on Trinity River NWR

Facility Type	Condition
Public Use Facilities	
Champion Lake Public Use Area	This area contains fully accessible T-shaped 150' fishing/observation pier; 5,000-square-foot butterfly garden with walkway and parking; portable toilet; and two boat ramps.
Silver Lake photo/hunt blind	10' x 10' accessible blind at end of a boardwalk
Kiosk	Located at trail head of Brierwood unit
Parking lots	Located at Champion Lake, Brierwood, Page, Hirsch, Silver Lake, McGuire, and Butler units
Trails	See Chapter 3 of the CCP for more information on trails
Administrative Facilities	
Headquarters Office	Built in 2011 on refuge unit with 8 offices
Storage/maintenance (adjacent to headquarters)	Built 2011 on refuge unit with 4 bays
Champion Lake - Enclosed Storage Shed	Heavy equipment storage, ATV, herbicides, tools
Champion Lake - Open Storage Shed	Pipe and heavy equipment storage
Champion Lake - Freight Containers	Two, 8' x 40' ft containers storing equipment
Champion Lake - Mobile Home	Houses interns, 3 bedrooms
Champion Lake - RV pads	Pads with water and electricity for 3 RVs used for volunteers
Champion Lake - Wooden Storage Building	Houses washer, dryer, and recycling bins
Champion Lake - Septic System	For mobile home and RV pads
Champion Lake - Water Well	For mobile home, RV pads, and butterfly garden
Champion Lake - Above Ground Storage Tanks	1,500 gallons diesel and 1,500 gallons gas storage
Champion Lake - Stand-by Generator	Diesel– handles all operations for Champion Lake
Champion Lake - Log Cabin (not currently usable)	1950s-era log cabin with 2 small rooms
Champion Lake - Lodge (not currently usable)	1940s-era large log cabin with 5 large rooms
Die House - Residence	Houses volunteers and researchers, 2 bedrooms
Die House - Butler Building	Enclosed 30' x 30' storage for mowers and tools
Die House - Water Well/Storage Building	Supplies water to the Die House
Die House - Herbicide/Oil/Paint Storage Building	Store various herbicides, paints, oils, etc
Die House - Above Ground Storage Tanks	1,000 gallons diesel, 500 gallons diesel, and 500 gallons gas
Die House - Travel Trailer	Used by researchers, temporary volunteers
Die House - Open Pole Shed	Pipe and heavy equipment storage
Die House - Stand-by Generator	Diesel– handles all operations for Diesel
Radio Tower Building (off-refuge)	Houses two-way radio components

Staffing and Budget

Base funding and staffing would continue at current levels, maintaining five full-time staff. Since 2008, the refuge has been able to fund two temporary employees working on an intermittent basis. Budget breakdown is approximately 75 percent for staff salaries and benefits with the remainder used for all other costs.

Armadillo babies. USFWS

2.4.4 Alternative B

2.4.4.1 Habitat and Wildlife Management

Native Flora/Fauna Conservation

Management of these resources would be the same as Alternative A plus initiating a prescribed fire program on four units (Die, Wirt Davis, Champion Lake South, and 47a), burning approximately 200 acres to benefit nesting habit for Henslow's sparrow and other grassland nesting and migratory birds. Prescribed fire would be used on the refuge as a management tool to enhance or restore habitat, reduce hazardous fuels, and maintain small isolated pockets of grasslands.

The refuge would continue to monitor the artificial roost structure use for Rafinesque's bats on an annual basis. If these structures continue to provide habitat, their use is expected to decline because the refuge is managing for old growth bottomland hardwood forests;

therefore, as protected units begin to provide older growth trees, more natural roosting sites for bats will be available, theoretically decreasing the use of artificial sites.

Invasive Flora/Fauna Management

Management of these resources would be the same as Alternative A plus develop an invasive species strike team program. This would also include mapping "hotspots" to prioritize eradication efforts.

Wetland Management

Management of these resources would be the same as Alternative A plus plan a small-scale restoration of hydrological flow on Champion Lake South Unit using better management of culverts, ditch restoration, or ditch removal.

Land Acquisition

Management of these resources would be the same as Alternative A plus updating the 1999 Lower Trinity River Floodplain Habitat Stewardship Plan to add approximately 20,000 acres to acquisition and conservation easement efforts. This updated acquisition area will take a biological approach following the floodplain of the Trinity River. This would require updating of the refuge's original land protection plan and NEPA documentation.

Climate Change

In addition to the actions identified under Alternative A, the refuge will gather baseline inventory and monitoring data of refuge resources at 40 surveys points within a 1,500-acre parcel, representing approximately 60 percent of the refuge's overall habitat, to determine the effects on refuge resources (long-term), as this may relate to changes in climate. The refuge would continue to monitor bottomland hardwood forest habitat and condition to determine the effects of climate change by conducting groundwater modeling, water quality/water quantity analyses to fully understand the refuge's water resources, and utilize the best available science to minimize the anticipated impacts associated with climate change. The refuge would use green infrastructure and related technologies when opportunities and funding permits to reduce its carbon footprint minimizing its contribution to climate change.

Resource Protection

Management of these resources would be the same as Alternative A plus planning for additional patrols as the refuge continues to grow. This could be accomplished using law enforcement officers from other refuges.

2.4.4.2 Public Use Opportunities

Hunting

Management of these activities would be the same as Alternative A plus opening one additional unit and potentially more units within the acquisition boundary as the refuge continues to expand. The new unit added to the hunting program would be Champion Lake South, which is a 1,500-acre unit that would allow hunting for big game. This new unit would have same seasons for big game as those listed in the Table C-2.2. Opening of additional units of the refuge to hunting throughout the acquisition boundary is contingent on avoidance of conflicts with other users, availability of suitable habitat, adequate species populations, and sufficient staff and budget to administer the program.

Fishing

Management of these activities would be the same as Alternative A plus directing visitors to two additional units. After piers and trails are developed, anglers could fish at the McGuire and Silver Lake units.

Wildlife Observation

Management of these activities would be the same as Alternative A plus open an additional unit. After trails are developed, visitors could enter the Champion Lake South Unit.

Wildlife Photography

Management of these activities would be the same as Alternative A plus the construction of a photo blind at Brierwood Unit.

Environmental Education

Develop and implement off-refuge EE program, striving to meet State of Texas education standards for students and teachers.

Interpretation

Management of these activities would be the same as Alternative A plus hosting approximately 10 additional off-refuge presentations. The presentations would include schools and some non-traditional user groups. Develop and provide self-guided interpretive materials at Champion Lake and Brierwood units.

2.4.4.3 Facilities

Youth Conservation Corps take part in construction projects on the refuge. USFWS

Public Use Access

Management of these facilities would be the same as Alternative A plus increase access to additional units. After the dirt road is improved, vehicular access to McGuire pond area could occur. Boating access would be increased by establishing a canoe/kayak launch site at the Brierwood Unit.

Public Use Facilities

Management of these facilities would be similar to Alternative A with the addition of rehabilitating the 1940s-era lodge at the Champion Lake Public Use Area to be used as an environmental education center. Additional construction activities would be a fishing pier at McGuire unit and paving the one-mile dirt road to Champion Lake Public Use Area.

Administrative Facilities

Management of these facilities would be the same as Alternative A plus the construction of additional facilities. This would include constructing a maintenance shop at Champion Lake with an equipment storage area.

Staffing and Budget

Base funding and staffing would increase as determined by the CCP in order to fully implement this alternative. The refuge would hire an additional maintenance worker to handle increased maintenance of additional trails, boundary lines, and structures. We would also hire a visitor services specialist to initiate an environmental education program, increase interpretive opportunities, and manage volunteer program.

2.4.5 Alternative C – Proposed Action

2.4.5.1 Habitat and Wildlife Management

Native Flora/Fauna/habitat Conservation

Management of these resources would be the same as Alternative B.

Invasive Flora/Fauna Management

Management of these resources would be the same as Alternative B.

Wetland Management

Management of these resources would be the same as Alternative B.

Land Acquisition

Management of these resources would be the same as Alternative B.

Climate Change

Management of these resources would be the same as Alternative B.

Resource Protection

Management of these resources would be the same as Alternative B plus add full-time refuge officer to assist existing officer as refuge grows to 80,000 acres.

2.4.5.2 Public Use Opportunities

Hunting

Management of these activities would be the same as Alternative B plus opening one additional unit (Palmetto) for big game and upland game. This new 330-acre unit would have same seasons for big game and upland game as those listed in the Table C-2.2.

Fishing

Management of these activities would be the same as Alternative B plus directing visitors to an additional unit. Anglers would be allowed to fish at the Brierwood Unit after piers and trails are developed.

Wildlife Observation

Management of these activities would be the same as Alternative B plus one additional area would be opened at Palmetto Unit.

Wildlife Photography

Management of these activities would be the same as Alternative B plus the construction of photo blind at the McGuire unit.

Environmental Education

Management of these activities would be the same as Alternative B plus the development of on-refuge EE programs in conjunction with the rehabilitation of the lodge as an educational facility at the Champion Lake Public Use Area.

Interpretation

Management of these activities would be the same as Alternative B plus the development of on-refuge interpretive programs at the Visitor Center once it is constructed. Additionally, provide kiosks at six remaining public use areas.

2.4.5.3 Facilities

Public Use Access

Management of these facilities would be the same as Alternative B plus opening a trail system for Champion Lake South.

Public Use Facilities

Management of these facilities would be the same as Alternative B plus the construction of an on-refuge visitor center along FM 1011 adjacent to administrative headquarters. This alternative would also include constructing a fishing pier at Brierwood Unit and full-service bathroom at Champion Lake Public Use Area.

Administrative Facilities

Management of these facilities would be the same as Alternative B plus the rehabilitation of the two-room log cabin at Champion Lake. This would be used for additional staff or volunteers offices.

Staffing and Budget

Base funding and staffing would increase in addition to Alternative B in order to meet the needs of increased habitat management and public use opportunities. New construction and maintenance would be increased over levels provided for under Alternative B. Additional facilities for administrative uses (and for public uses) would be upgraded or newly built to accommodate increased staffing and public use. The expanded staff would include additions of one law enforcement officer, one biologist, and one assistant Refuge Manager.

Table C-2.5. Comparison of Alternatives

Issues	Preliminary Range of Alternatives Alternative A No Action Current Management	Alternative B	Alternative C Proposed Action
Issue 1: How will the refuge address habitat and wildlife management issues to ensure the conservation, diversity, and enhancement of the bottomland hardwood forests?			
Native Flora/Fauna Conservation	Conservation/restoration of bottomland hardwood forests; restore native flora; reintroduce native fauna; manage native nuisance flora/fauna	Same as Alternative A plus use prescribed fire for resource management and initiate baseline monitoring for flora and fauna	Same as Alternative B
Invasive Flora/Fauna Management	Removal of exotic and invasive flora/fauna as resources permit; Prevent reintroduction of exotic and invasive flora/fauna as resources permit	Same as Alternative A plus develop invasive species strike team and map "hotspots" to prioritize management efforts	Same as Alternative B
Wetland Management	Maintain the integrity of water control structures/levees; conduct water quality sampling and fish surveys	Same as Alternative A plus small-scale restoration of hydrological flow at Champion Lake South Unit	Same as Alternative B
Land Acquisition	Acquire lands from willing sellers within the approved acquisition boundary on a case-by-case basis	Update Trinity River Floodplain Habitat Stewardship Program and Land Protection Plan to update the acquisition boundary; assign Realty Specialist to office	Same as Alternative B
Climate Change	Planting trees to sequester carbon, use "green" technologies wherever possible, and recycle	Same as Alternative A plus gather baseline inventory and monitoring data	Same as Alternative B
Resource Protection	LEO patrols and opportunistic observations by other refuge staff conducted on 25,000 acres	Same as Alternative A plus add patrols using other refuge's officers	Same as Alternative B plus add an additional refuge officer to patrol up to 80,000 acres

Issues	Preliminary Range of Alternatives Alternative A No Action Current Management	Alternative B	Alternative C Proposed Action
Issue 2: How will the refuge provide public use opportunities while ensuring the conservation, diversity, and enhancement of the bottomland hardwood forests?			
Hunting	Designated units open to hunting by permit only for big game, upland game, and waterfowl currently in 8 units	Same as Alternative A plus open 1 additional unit for big game at Champion Lake South Unit	Same as Alternative B plus open 1 additional unit for big game and upland game at Palmetto Unit
Fishing	Visitors are directed to Champion Lake and Pickett's Bayou	Same as Alternative A plus direct visitors to McGuire and Silver Lake units when piers are developed	Same as Alternative B plus direct visitors to Brierwood Unit once pier is developed
Wildlife Observation	Refuge open to wildlife observation; Visitors directed to 8 public use areas	Same as Alternative A plus open 1 additional area at Champion Lake South Unit	Same as Alternative B plus open 1 additional area at Palmetto Unit
Wildlife Photography	Refuge open to photography; visitors directed to 8 public use areas	Same as Alternative A plus construct photo blind at Brierwood Unit	Same as Alternative B plus construct photo blind at McGuire Unit.
Environmental Education	No EE programs occur on the refuge	Develop off-refuge EE curricula working with local schools to meet State requirements	Same as Alternative B plus develop on-refuge program with the completion of the educational facility at Champion Lake Public Use Area
Interpretation	Host two on-refuge annual festivals on Earth Day and on fishing day; host approximately 6 off-refuge annual events such as county jubilee and various public speaking events	Same as Alternative A plus host approximately 10 additional off- refuge events as requested; develop and provide self-guided interpretative materials at Champion Lake and Brierwood units	Same as Alternative B plus develop interpretive programs at visitor center; develop and provide kiosks in all areas with public use facilities

Issues	Preliminary Range of Alternatives Alternative A No Action Current Management	Alternative B	Alternative C Proposed Action
Issue 3: How will the refuge manage facilities while ensuring the conservation, diversity, and enhancement of bottomland hardwood forests?			
Public Use Access	Vehicular access allowed on designated unpaved roads; walk-in only access allowed on 8 designated units; boating access allowed on Pickett's Bayou and Champion Lake	Same as Alternative A plus improve road to McGuire Pond; establish canoe/kayak launch site at Brierwood Unit	Same as Alternative B plus open trail at Champion Lake South Unit
Public Use Facilities	Limited facilities at Champion Lake Public Use Area include: fishing pier, butterfly garden, parking, and portable toilet; 7 other public use areas have parking lot only and 1 photo blind	Rehabilitate lodge at Champion Lake Public Use Area plus pave road at Champion Lake Public Use Area and construct fishing pier at McGuire Unit	Construct visitor center adjacent to headquarters plus construct fishing piers at Brierwood Unit and full-service bathroom at Champion Lake Public Use Area
Administrative Facilities	Refuge owned headquarters and storage facility along FM 1011	Construct a maintenance shop at Champion Lake equipment storage area	Rehabilitation of 2-room log cabin at Champion Lake for staff and volunteer offices
Budget Needs to Implement Alternative (based on FY 2011 dollars)	**$660,000*** ***Currently includes:* Refuge base operational budget; annual maintenance; Youth Conservation Corps; volunteers; Exotic Control Program; Student Conservation Association Interns; and annual vehicle/equipment replacement**	**$2,862,000**** ****Same as Alternative A PLUS 2 more full-time staff (maintenance worker, recreation planner); research programs; deferred maintenance Projects; and increased funding for annual repair and replacement of major equipment**	**$4,330,000***** *****Same as Alternative B PLUS 3 more full-time staff (bio tech, law enforcement officer, deputy manager), 2 seasonal staff, construction of Visitor Center, and other deferred maintenance projects (road, trail, piers, parking lot maintenance)**
Staff Needs to Implement Alternative	(Current Staff) 5	7	10

Table C-2.6. Mitigation Measures and Monitoring

Mitigation Measure and Monitoring Description	Alternatives
General	
Gather updated resource baseline data to form a current analytical base from which to judge future management impacts and effects.	A, B, C
Develop and implement an extensive and ongoing monitoring program to judge management action effectiveness and provide alternative solutions that would lessen any short-term or long-term negative impacts on fish and wildlife resources and other environmental elements.	B, C
Regulate management actions to adequately address any potential impacts. For example, activities would be conducted during times of the year and in areas where breeding and nesting activities are at a minimum.	A, B, C
Prohibit or restrict activities in areas where listed species occur. The potential effects of CCP implementation on federally listed species has been reviewed per an Intra-Service Section 7 Consultation (See Appendix F).	A, B, C
Seek public input in future planning for any management actions that are considered major Federal actions, as per NEPA requirements.	A, B, C
Air Quality	
For prescribed burning, the following precautions would be in place: habitat management involving prescribed burning will occur only under ideal weather conditions, and smoke management practices will be implemented during all burning events; an approved prescribed Burn Plan, favorable weather conditions, and adequate firefighting resources all work together to prevent pervasive air pollution and prevent adverse effects to air quality.	A, B, C
Blowing dust is abated by performing work during times of low to no wind.	A, B, C
Water Management and Quality	
Avoid spraying during or immediately before a rainfall event to reduce the chances of run-off and herbicide delivery to water resources.	A, B, C
Agency-approved application practices and guidelines will be implemented during all herbicide treatments and prescribed fire events and under an approved plan to prevent or minimize effects to water quality.	A, B, C
Conduct water quality analysis, throughout the refuge as needed.	A, B, C
Spraying will not occur after a moderate/heavy rain or if significant precipitation is forecasted within six hours to reduce the chances of run-off and herbicide delivery to water resources.	A, B, C
Soils	
Erosion fences will be established on construction sites when erosion is a concern.	A, B, C
Habitat and Wildlife	
Take a proactive approach to working with information provided through biological surveys, inventories, and monitoring to assess needs and results of carbon sequestration efforts, hunting program, bat research, bottomland hardwood restoration projects, and exotic pest plant and animal control programs.	A, B C
Refuge management activities would not result in direct take of any federally listed species.	A, B, C
No fishing is allowed within 200 yards of any documented colonial waterbird rookeries from March 1 through August 31 to minimize disturbances to nesting birds.	
Oil and Gas Activities	
The refuge will work with oil and gas companies to ensure that to the greatest extent practicable, all exploration, development, and production operations are conducted in such a manner as to minimize the damage, erosion, pollution, or contamination to the lands, waters, facilities, and vegetation of the area.	A, B, C

3.0 AFFECTED ENVIRONMENT

Refer to Chapter 3 of the Comprehensive Conservation Plan.

Trinity River adjacent to Tract 61. USFWS

4.0 ENVIRONMENTAL CONSEQUENCES

This section analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each of the three alternatives described in Chapter 2 of this EA. For each alternative, the expected outcomes are portrayed through the 15-year life of the CCP.

This chapter identifies, describes, and compares the impacts of implementing the three alternatives proposed in this EA on the refuge's physical, biological, and socio-economic environment. Current management (Alternative A, the No Action Alternative) provides the basis for comparing the effects of the action alternatives (Alternatives B and C). The direct, indirect, and cumulative effects of each alternative are analyzed in this chapter, as defined in section 4.1.

An analysis of the effects of management actions on the physical environment has been conducted for air quality, water resources, and soils. Analysis of the effects of management actions on the biological environment have been conducted for vegetation/habitat, wildlife, and

species of special concern (e.g., threatened and endangered species). Although all plant, animal, and fish species on the refuge are important, many species are not expected to experience any change as a result of implementing any of the alternatives. Therefore, the only species discussed are those that will be impacted. An analysis of the effects of management actions on the socio-economic environment were conducted for cultural resources, local populations and economy, public use opportunities, aesthetic/visual resources, and visitor use facilities.

Potential impacts are described in terms of type, duration, intensity, and context (scale). General definitions are as follows.

4.1 Definition of Terms

Effects:
Direct effects are the impacts that would be caused by the alternative at the same time and place as the action.

Indirect effects are impacts that occur later in time or distance from the triggering action.

Cumulative effects are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by Federal and non-Federal agencies, as well as undertaken by private individuals. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time.

Impact Type:
Beneficial impacts are those resulting from management actions that maintain or enhance the quality and/or quality of identified refuge resources or recreational opportunities.

Adverse impacts are those resulting from management actions that degrade the quality and/or quantity of identified refuge resources or recreational opportunities.

Duration of Impacts:
Short-term impacts affect identified refuge resources or recreational opportunities; they occur during implementation of the management action but last no longer.

Medium-term impacts affect identified refuge resources or recreational opportunities that occur during implementation of the management action; they are expected to persist for some time into the future though not throughout the life of the CCP.

Long-term impacts affect identified refuge resources or recreation opportunities; they occur during implementation of the management action and are expected to persist throughout the life of the CCP and possibly longer.

Intensity of Impact:
Negligible impacts result from management actions that cannot be reasonably expected to affect identified refuge resources or recreational opportunities at the identified scale. Impacts are so small that they would not be measurable.

Minor impacts result from a specified management action that can be reasonably expected to have detectable though limited effect on identified refuge resources or recreation opportunities at the identified scale. Impacts are detectable but would only affect a small area.

Moderate impacts result from a specified management action that can be reasonably expected to have apparent and detectable effects on identified refuge resources or recreation opportunities at the identified scale. Effects would be readily apparent and would occur over a relatively large area but are extreme or excessive.

Major impacts result from a specified management action that can be reasonably expected to have readily apparent and substantial effects on identified refuge resources and recreation opportunities at the identified scale. Effects would be readily apparent and would substantially change the characteristics of the resource.

Scale of Impact:
Site-specific effects are those impacts that occur solely within the project area (i.e. construction site or treatment unit).

Local impacts are those that would occur within and immediately surrounding the project area.

Refuge-wide impacts are those that would occur across the entire refuge landscape.

Widespread impacts are those that would occur beyond the refuge landscape.

4.2 Effects Common to all Alternatives

Several potential effects will be very similar under each alternative, as summarized in this section.

Climate Change

Carbon sequestration is climate-related impact to be considered in planning. Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and acting as biological "scrubber" of atmospheric CO_2 (U.S. Department of Energy 1999).

Conserving the Trinity River corridor and sustaining the bottomland hardwood forest is the main management focus for this CCP. The actions proposed in this CCP would conserve or restore land and habitat, and would thus retain existing carbon sequestration efforts on the refuge and help mitigate human-induced global climate change.

One potential refuge activity in particular, prescribed burning, releases CO2 directly into the atmosphere from the biomass consumed during combustion. The refuge prescribed fire program is primarily limited to small, isolated islands of early successional grasslands to promote wintering habitat for Henslow's sparrow and promoting about 200 acres of fire resistant isolated pine stands. Overall, there should be little or no net change in the amount of carbon sequestered at the refuge from any of the proposed management alternatives. The use of green technology and products would reduce the refuge's carbon footprint.

Predicted long-term climate-change-related impacts would occur regardless of which of the management alternatives under consideration here is ultimately selected by the Service. Over the 15-year life of the CCP, impacts associated with climate change are likely to be adverse, minor to moderate, and widespread.

Impacts from Herbicide Application

Chemical herbicides are one of the main methods the Service uses to control invasive plants on national wildlife refuges. Herbicides can efficiently and effectively suppress or kill unwanted plants and used in such a manner as to minimize adverse effects on non-target resources. An herbicide suppresses or kills plants by decreasing their growth, seed production, and competitiveness (USFWS 2009).

The benefits of herbicides in controlling invasive plants must be weighed against the potential for exposure and impacts to human health, non-target organisms, and the environment. The Federal and State governments regulate herbicides to ensure that they do not pose unreasonable risks. The Environmental Protection Agency (EPA) requires extensive test data from herbicide producers to show that their products can be used safely. EPA scientists and analysts carefully review these data to determine whether to register (license) an herbicide and whether certain restrictions on use are needed (USFWS 2009). More information about EPA registration and re-registration of chemicals can be found at: http://www.epa.gov/pesticides.

EPA evaluates both exposure and toxicity to determine the risk associated with use of a given herbicide. People, non-target flora and fauna, water, and soil may all be exposed directly or indirectly to herbicides during applications and subsequent movement; this exposure can be minimized or avoided by following proper instructions and labels. For wildlife and humans, herbicides may enter the body through the skin, by swallowing, and by breathing. Once herbicides have been applied, the potential for exposure is further influenced by the many biotic (living) and abiotic (non-living) processes that affect the fate of herbicides in the environment.

Herbicide use on national wildlife refuges must be in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and other Federal laws and authorities. The use of herbicides and other pesticides on refuges is governed by the U.S. Department of Interior Integrated Pest Management Policy (517 DM 1), the Service's Pest Management Policy and Responsibilities (30 AM 12), and the Service's Refuge Manual (7 RM 14).

Service policies and the Refuge Manual state that we will use herbicides only after full consideration of management alternatives, including chemical, biological, physical, and no action. If, after considering all of these factors, managers determine that we must use herbicides to meet invasive plant management objectives, then we will use the least hazardous, most effective herbicides to meet those objectives (USFWS 2009).

Refuge staff must complete a Pesticide Use Proposal (PUP) whenever an herbicide on a refuge is used, including applications by staff, volunteers, contractors, or in association with a right-of-way easement or Special Use Permit. Individuals with duties related to plant management and knowledge and experience with herbicides typically complete and submit the PUP. An online PUPS database enables staff to complete and submit PUPS electronically at https://systems.fws.gov/PUPS/. Depending on the pesticide and other conditions listed in the PUP, the PUP may need regional office review and approval, and under some circumstances,

the regional office may need to submit the PUP for Washington Office review and approval. PUPS that are part of an approved integrated pest management plan may receive five-year approvals. The Director periodically issues specific guidance that includes details about PUP approval authority and which herbicides and application scenarios require review beyond the field station.

As outlined in 569 FW 1.9 J (USFWS 2010), Refuge Managers or project leaders must ensure that:

- Pest management decisions are consistent with all applicable policies, laws and regulations;
- Anyone applying pesticides, releasing biological control agents, and conducting other Integrated Pest Management (IPM) activities has the appropriate training and equipment necessary to protect their safety and health;
- The refuge will apply pesticides only after the appropriate reviewer approves the PUP;
- The refuge will establish threshold levels of damage or pest populations according to Service or field station goals and objectives and applicable laws;
- Staff store, handle, and dispose of pesticides and pesticide containers in accordance with the label and in a manner that safeguards human, fish, and wildlife health and prevents soil and water contamination; and
- Submit annual reports documenting pesticide use and efficacy into the online PUPS database (USFWS 2009).

In addition to Service policy, the approved PUPs include measures to minimize environmental impacts through the following best management practices:

- Calibrate application equipment
- Application must be in accordance with chemical label
- Field scouting/monitoring before pesticide application
- Use pesticide application buffers around sensitive areas
- Use lowest effective application rate
- Herbicides will not be applied within 100 feet of wetlands
- Foliar applications will not be made if wind speeds are in excess of 10 mph
- Pesticides will not be applied after a rain or if any precipitation is in the forecast within 48 hours.

Each of the alternatives would follow the procedures and each would use the same herbicides and have approximately similar rates of application. Alternative B would develop an invasive species strike team and map hotspots to prioritize efforts and attempting to increase from approximately 200 acres treated per year to up to 600 acres treated per year. Environmental impacts associated with herbicide use throughout the refuge would be both adverse and beneficial. Adverse impacts may occur from localized toxicity of non-target organisms (plant and animal) and would be short-term to long-term (short-term for any given application, but long-term if the applications are repeated regularly). Herbicides would also have negligible, short-term adverse impacts on water quality. They may potentially leach into and pollute groundwater and may be flushed into surface water if improperly applied. However, proper application under conditions specified on product labels and the use of best management practices minimizes movement of herbicides from their intended targets.

Beneficial impacts from herbicide application would also occur under each alternative. Benefits would result from control of invasive plants that threaten to infest large areas, displacing native species of flora and fauna; these beneficial effects would be long-term, refuge-wide, and of moderate intensity.

Table C-4.1 contains a list of approved chemical herbicides that are used on the refuge to control invasive plants. Each alternative would continue to allow for the use of these herbicides.

Table C-4.1. Herbicides Used on Trinity River NWR

Active Ingredient	Brand Name	Target Species	Application	Purpose
Imazapyr	Habitat, Imazapyr E-pro 2	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Foliar	Eradicate invasive flora in bottomland forest and waterways
Imazamox	Clearcast	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Aerial, Foliar	Eradicate invasive flora in bottomland forest and waterways
Glyphosate	Rodeo, Glyphos Aquatic	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Foliar	Eradicate invasive flora in bottomland forest and waterways
Triclopyr	Garlon 4	Chinese tallow, Japanese mimosa, Chinaberry, trifoliate orange, water hyacinth, alligatorweed	Foliar, basal bark	Eradicate invasive flora in bottomland forest and waterways
Metsulfuron methyl + aminopyralid	Chaparral	McCartney Rose	Foliar	Eradicate invasive flora along pastures and levees

Impacts from Biological Control Agents

Releasing approved biological control agents such as insects (i.e. salvinia weevils, *Cyrtobagous salviniae*) are an important component of an Integrated Pest Management (IPM) approach to effectively controlling and managing populations of invasive exotic plant species. The effects of biological control agents are often subtle, but when combined with other control techniques such as herbicides, physical controls, public awareness, and mechanical controls, they can effectively limit the further spread and establishment of unwanted exotic plant species. Biological control is the intentional manipulation of natural enemies by humans for controlling pests. Biological control of aquatic weeds is especially attractive because rivers and lakes are sensitive ecosystems important to wildlife and human health (Jackman 1999).

Invasive aquatic vegetation such as giant salvinia (*Salvinia molesta*) is one of the greatest threats to the aquatic resources of Texas. Salvinia was most likely transported from South America to the U.S. through the aquatic garden or aquarium trade. It was first discovered in the Houston area in 1998 and has been reported on 18 Texas reservoirs. Given ideal growing conditions, giant salvinia can double the area it covers in 7-10 days, forming thick mats that

disrupt water chemistry, make aquatic habitat unsuitable for native species, and interfere with boating access (Moret 2011).

Salvinia molesta is a free-floating aquatic fern. In its native range in southeastern Brazil, giant salvinia is a component of the floating and emergent plant communities, supports a variety of natural enemies (Forno and Bourne 1984), and normally does not form the extensive mats prevalent in its exotic range.

The family Salviniaceae includes only one genus, Salvinia. The genus Salvinia is composed of 10 species that occur naturally in South America, Africa, and Asia. There are no native members of the Salviniaceae in the United States. However, two other families are taxonomically related to the Salviniaceae: the Azollaceae and Marsileaceae. These plant families contain species native to the United States (Lumpkin 1993).

The Azollaceae consists of the single genus Azolla. Three species of Azolla, Azolla caroliniana Willdenow, Azolla mexicana C. Presl, and Azolla filiculoides Lam. are native to North America (Lumpkin 1993).

The Marsileaceae includes two North American genera, Marsilea and Pilularia. Six species of Marsilea are in the North American flora. They are Marsilea quadrifolia Linnaeus, Marsilea ancylopoda A. Braun, Marsilea oligospora Gooding, Marsilea mollis B. L. Robinson and Fernald, Marsilea macropoda Engelmann, and Marsilea vestita Hooker and Greville (Johnson 1993).

Numerous studies have shown that the release of salvinia weevil are host specific. A total of 53 plants from 33 families were tested to determine if weevils would utilize these species once host plant was eliminated. Results showed that in host specificity tests, only two non-target plants showed slight indication of feeding but no development or reproduction of the weevils took place on those plants (USDA APHIS, 2001).

The salvinia weevil has proven highly effective in controlling salvinia in equatorial regions and areas with climates similar to their native range in South America (Moret 2011). Current control agents consisting of salvinia weevils are used in conjunction with representatives from TPWD. TPWD raises the weevils and assists refuge staff in stocking various ponds located throughout the refuge. They also assist in monitoring results of the stocking program.

In 2004, TPWD initiated large-scale releases of salvinia weevils in Toledo Bend area of eastern Texas approximately 100 miles from the refuge. Since that time, weevils have been collected from the environment and distributed by Aquatic Habitat Enhancement (AHE) office of TPWD on Toledo Bend, Caddo Lake, B.A. Steinhagen, and the refuge. Weevils are transported with infested salvinia and distributed on salvinia mats where weevil populations are low or nonexistent. Introduction of weevils are introduced into areas that are not easily accessible and difficult to treat with herbicides (Moret 2011).

Research has shown weevils over-winter in east Texas, although a significant reduction of adult weevils occurs every year due to cold temperatures. Weevil populations may not fully recover from cold weather until late spring or early summer. In the meantime, giant salvinia continues to expand until the weevil population reaches effective levels. Therefore, to provide maximum biological control it will be necessary to raise weevils and release them to the environment in early spring and throughout the growing season (Moret 2011).

In Texas, raising and harvesting salvinia weevils under controlled conditions has been practiced by the U.S. Army Corps of Engineers at the Lewisville Aquatic Environmental Research Facility and the USDA Animal and Plant Health Inspection Service (APHIS). APHIS has also published extensive guidelines on raising and harvesting weevils for controlling giant salvinia (Moret 2011).

With financing from the Service, AHE constructed a large-scale weevil rearing facility at the Jasper Fish Hatchery in May 2010. Additional funding from the Service and a grant from Senator Kay Bailey Hutchison provided the materials for a similar weevil rearing facility to be built at the Caddo Lake National Wildlife Refuge in Karnack, Texas. The Caddo facility was built by the cooperative efforts of TPWD and the Texas AgriLife Extension Service and now operates as the Center for Invasive Species Eradication (CISE).

Since 2004, Texas AgriLife personnel have released over 70,000 adult weevils from the CISE facility to supplement populations on Caddo Lake. AHE has released 42,000 to 46,000 adult salvinia weevils in less than two months from the facility at the Jasper State Fish Hatchery. Research suggests that for every adult weevil there may be three or four times as many weevil present in earlier life stages within the infested material (Moret 2011).

Despite the early success of the weevil rearing projects and Caddo Lake and the Jasper Fish Hatchery, it is important to remember that biological control is a long-term option. It may take years of research and focused management for the weevils to reach their full potential.

The successful biological control of a giant salvinia will result in reduction, not eradication, of the target weed. Therefore, biological control agents are unlikely to eliminate the plant, except perhaps in isolated locations. In cases of local eradication, the weevils will disperse to find new salvinia or starve. Overall, as the population of the weed declines, so will the population of the insect. The result is equilibrium between weed and insect where no further weed controls are necessary. Although giant salvinia will remain as part of the flora of the United States, it will no longer dominate and damage the local ecosystems as it once did (USDA 2002).

Beneficial impacts may occur from localized introduction of weevils controlling populations of salvinia, and since literature shows the weevil is host specific and no other negative impacts have been identified in over eight years of treatments, no adverse impacts are anticipated. Impacts would be short-term to long-term (short-term for any given application, but long-term if the applications are repeated regularly). Best management practices, along with coordination with TPWD and field observations of treated areas, will dictate rates and applications of biological control agents under each alternative.

Each of the alternatives would allow similar rates of application in conjunction with TPWD and the latest scientific literature to support treatment areas. Beneficial impacts from biological control agents would also occur under each alternative. Benefits would result from control of invasive plants that threaten to infest large areas, displacing native species of flora and fauna; these beneficial effects would be long-term, refuge-wide, and of moderate intensity.

Petroleum Development Impacts

Oil and gas drilling or production is not currently occurring on the refuge. On the refuge, 3-D seismic activities do occur and require a Plan of Operations produced at the operator's expense. If and when drilling/extraction seems likely to occur on the refuge, the companies

involved will be required to present the Refuge Manager with a Plan of Operations for those activities. Each operator and/or facility operator must have a current Oil Discharge Prevention and Contingency Plan outlining procedures for accidental releases. Sampling, remediation, and restoration of contaminated sites would be the responsibility of the operator and/or facility operator and would occur in consultation with the Service and the appropriate State agency. All sites no longer in use must be sampled for contaminants at the operator's expense to ensure proper disposal of material and that refuge staff and/or the visiting public are not exposed to contaminants. The Service may request that wells, roads, pipelines, and associated infrastructure and facilities not needed to support ongoing operations be removed and the sites restored to the satisfaction of the Refuge Manager.

Reasonable restrictions include restriction on time of year for operations designed to minimize wildlife disturbance during certain months and restriction on equipment to include low-pressure tired vehicles and small drilling equipment in the bottomlands. The locations of production lines and temporary and permanent storage of equipment and facilities are negotiated prior to drilling. Only closed loop drilling operations would be permitted. All oil and gas operations must hire an environmental monitor at operator's expense, who reports to the Refuge Manager and monitors all operations and ensures habitat damage is minimized. In Texas, refuges may accept payment for restoration work required after the operations are completed. The refuge will then conduct restoration and monitoring efforts utilizing those funds.

Petroleum exploration, extraction, and facilities operations would affect each alternative equally if initiated on the refuge. These impacts would be adverse, long-term, site-specific, and of negligible to minor intensity.

Cultural Resources

The Service is responsible for managing archeological and historic sites found on national wildlife refuges. Undertakings initiated on the refuge, as well as any ground disturbing activities, have the potential to impact cultural resources. The consequences for cultural resources would be the same under each management alternative. All refuge undertakings and ground disturbing activities to occur on the refuge are subject to Section 106 of the National Historic Preservation Act and must include consent from the State Historical Preservation Office (SHPO).

The Refuge Manager, during early planning, will provide the Regional Historic Preservation Officer (RHPO) with:

1. a description and location of all projects, activities, routine maintenance, and operations that affect ground and structures;
2. requests for permitted uses; and
3. alternatives being considered.

The RHPO analyzes these undertakings for potential to affect historic properties and enters into consultation with the SHPO and other parties as appropriate.

The Refuge Manager will ask the public and local government officials to identify concerns about impacts caused by the undertaking in a notification that is at least equal to, and preferably with, the public notification carried out for NEPA and compatibility.

None of the alternatives would 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.

Impacts on cultural resources associated with each alternative would at most be negligible to minor, site-specific, and long-term.

Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations; February 11, 1994) was designed to focus the attention of Federal agencies on the environmental and human health conditions of minority and low-income populations, with the goal of achieving environmental protection for all communities. The order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations. The order intends to promote nondiscrimination in Federal programs substantially affecting human health and the environment and to provide minority and low-income communities with access to public information and opportunities for participation in matters related to human health and the environment.

None of the three management alternatives described in this EA would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. Implementation of any alternative that includes public use and environmental education is anticipated to provide a benefit to the residents residing in the surrounding communities.

Indian Trust Assets

No Indian Trust Assets have been identified in the proposed acquisition boundary of the refuge. There are no reservations or ceded lands present. Because resources are not believed to be present, no impacts are anticipated to result from implementation of either alternative described in the EA.

Other Common Effects

None of the alternatives would have more than negligible or, at most minor, effects on topography, noise levels, transportation, waste management, human health and safety, or visual resources.

4.3 Physical Environment

4.3.1 Impacts on Air Quality

Each of the alternatives would implement the following mitigation measure to protect air quality:

- For prescribed burning, the following precautions would be in place: habitat management involving prescribed burning will occur only under ideal weather conditions, and smoke management practices will be implemented during all burning events; an approved prescribed Burn Plan, favorable weather conditions, and adequate

firefighting resources all work together to prevent pervasive air pollution and prevent adverse effects to air quality.
- Foliar applications of all herbicides will not be made in wind speeds greater than 10 miles per hour.

The following analysis assumes implementation of this mitigation measure to protect air quality.

Alternative A - No Action (Current Management)

Actions and activities associated with Alternative A that could potentially affect air quality include equipment and vehicle operation, and landscape conservation.

Dust and emissions produced by equipment and vehicle operation associated with construction such as road maintenance would be minor and localized. Performing work during times of low to no wind would abate blowing dust. Most construction occurs as maintenance to already existing facilities or infrastructure that is small scale and localized.

Herbicides are an important management tool used to gain an upper hand on the invasion of aggressive non-native flora. The refuge would continue to treat up to 200 acres annually with approved herbicides such as Rodeo and Chaparral (see Table C-4.1). There is the potential for spray drift resulting from chemical control of invasive species, especially concerning aerial spraying. Herbicide applications are primarily dispersed through backpack sprayers for basal applications, sprayed off of all terrain vehicles (ATV) or from a boat mounted sprayer targeting species such as Chinese tallow, Chinaberry, trifoliate orange McCartney rose and water hyacinth.

Occasionally, under special budget allocations, opportunities exist for aerial (helicopter) spraying of larger units from 300-600 acre treatments targeting water hyacinth and alligatorweed. Herbicides and target species are identified in Table C-4.1.

Dust and emissions produced by equipment and vehicle operation associated with maintenance would be minor and localized. Performing work during times of low to no wind would abate blowing dust. Furthermore, most construction occurs as maintenance to already existing facilities or infrastructure that is small scale and localized.

Continuation of management activities in Alternative A would produce adverse air quality effects that would be short-term, direct, negligible, and occur at the local scale. Vehicle use in parking areas would be negligible.

No other refuge management activities and public uses are expected to adversely affect air quality to any measurable degree.

Important beneficial impacts from Alternative A on regional air quality would accrue from the refuge's continuing management of tens of thousands of acres of bottomland hardwood forest. The extensive forests throughout the refuge serve as air filters, filtering out particulates, aerosols, and other pollutants, thus improving air quality in the region.

In summary, Alternative A would entail both adverse and beneficial impacts on air quality on the Trinity River NWR. Impacts from vehicular operation would be adverse, short-term,

negligible, and localized. The beneficial impact of Alternative A on air quality would be minor, direct/indirect, long-term, and widespread.

Alternative B

Alternative B will initiate a small prescribed fire program burning up to 400 acres throughout the refuge. Prescribed fire would have generally minor, sometimes moderate, adverse impacts that are short-term in duration at the local to widespread scales due to smoke emitted from burning vegetation. Prescribed fire would be used on the refuge as a management tool to enhance or restore habitat, reduce hazardous fuels, and maintain small isolated pockets of grasslands. Smoke consists of particulate matter, aerosols, soot, and a variety of gases, all of which degrade air quality. Prescribed burns will be conducted according to stipulations identified in Fire Management Plans where suitable weather conditions exist to dissipate smoke where air masses are not stagnant, and smoke will rise and disperse, minimizing impacts on ground level air quality, visibility, and human health.

An increase of the annual average use of herbicides on invasive species would occur from 200 acres to up to 600 acres depending on available budget and resources. A strike team will be developed to help target, map, and treat invasive species hotspots to improve efficiency and long-term impacts of invasive species.

Under this alternative, the amount of inventory and monitoring would also increase, along with visitor services increasing the amount of vehicular traffic on the refuge. Paving the road to Champion Lake, rehabilitation of the lodge, and construction of a maintenance shop and equipment storage area at Champion Lake would be initiated.

Under this alternative, additional units will be opened for wildlife-dependent public use activities such as improving the road to McGuire Pond and establishing canoe/kayak launches at Brierwood unit.

These activities may have a greater adverse impact on air quality. Impacts would be due to increased dust and emissions produced by equipment, particulate matter from prescribed burning, vehicle operations associated with more public uses, maintenance of more trails and parking areas, and larger scale construction projects. Although the adverse impacts would be slightly greater, those impacts would be considered direct, short-term, minor, and occur at the local scale.

Alternative B would conserve and restore additional habitat acreage, with a focus on bottomland hardwood forests and associated wetlands. By providing for additional habitat and filtering foliage, this alternative would be slightly more beneficial for air quality than Alternative A.

Alternative C - Proposed Action

The effects of Alternative C are expected to be similar to Alternative B; however, the construction of a new visitor center, opening of additional units for wildlife-dependent public use activities, and increased maintenance requirements may have a greater adverse impact on air quality. Impacts would be due to increased dust and emissions produced by construction activities, as well as equipment and vehicle operations associated with more public uses. Although the adverse impacts would be slightly greater, those impacts would still be considered direct, short-term, minor, and occur at the local scale but would be offset by the

addition of bottomland hardwood forest with additional opportunities of filtering foliage. Although the adverse impacts would be slightly greater than Alternative A and B, those impacts would be considered direct, short-term, minor, and occur at the local scale.

Due to the greater amount of habitat conserved under Alternative C, the beneficial impacts on air quality from habitat conservation, management, and restoration would be greater than Alternatives A and B. These benefits would be long-term, moderate, and widespread.

4.3.2 Impacts on Water Resources

Each of the alternatives benefits water resources, both in terms of quality and quantity, simply by maintaining and conserving large areas of healthy, vegetated habitats that protect soils and waters. These vegetated habitats filter out contaminants; minimize erosion, turbidity, and sedimentation; and regulate water flows by serving as "sponges" that soak up rainfall and slowly release moisture back into the system.

Each of the alternatives would implement the following mitigation measures to further protect water quality:

- Spraying will not occur after a moderate/heavy rain or if significant precipitation is forecasted within six hours to reduce the chances of run-off and herbicide delivery to water resources;
- Agency-approved application practices and guidelines will be implemented during all prescribed burn events and under an approved plan to prevent or minimize effects to water quality; and
- Conduct water sampling throughout the refuge.

The analysis below assumes implementation of these mitigation measures to protect water quality.

Alternative A - No Action (Current Management)

The following activities that would continue under Alternative A could potentially have impacts on water quality include invasive species control, herbicide use, and oil and gas operations. Herbicide use and oil and gas operations were discussed previously in Section 4.2, Effects Common to All Alternatives.

Herbicides have the potential of leaching into and polluting groundwater and getting flushed into surface water if improperly applied. Proper application under conditions specified on product labels as well as refuge-specific mitigation measures with the use of best management practices minimizes movement of herbicides from their intended targets. Therefore, impacts on water quality are expected to be negligible to minor, localized, and short-term. Habitat conservation efforts throughout the refuge would have beneficial, moderate, long-term, and widespread effects on water quality (extending beyond the boundaries of the refuge).

Alternative B

Under Alternative B, a small prescribed fire program would be initiated on the refuge targeting approximately 200 acres in four refuge units. This alternative will also update the acquisition boundary and protect additional bottomland hardwood forests that have beneficial

effects on both water quality and quantity. The effects of Alternative B are expected to be similar to Alternative A with additional undisturbed protected acres.

This alternative will initiate a small-burn prescribed fire program but only up to 400 acres are targeted for prescribed burning under the CCP in four separate units. These small burns will reduce herbaceous vegetation and have short-term impacts on hydrological flows that might be more vulnerable after rainfall events delivering additional sediments into hydrological systems. These effects would be adverse, medium-term, minor, and localized.

Since Alternative B would eventually protect more riparian lands and conserve their bottomland hardwood forests than Alternative A, its long-term beneficial impacts on water quality and resources would be somewhat greater than Alternative A.

Overall, Alternative B, like Alternative A, would cause both adverse and beneficial impacts. Its adverse impacts would be slight greater than Alternative A. Its beneficial impacts would be somewhat greater than Alternative A.

Alternative C - Proposed Action

Under Alternative C, impacts on water resources would be the same as Alternative B.

4.3.3 Impacts on Soils

Each of the alternatives would implement the following mitigation measure to protect soils:

- Erosion fences will be established on construction sites when erosion is a concern.

The analysis below assumes implementation of this mitigation measure to protect soils.

Alternative A - No Action (Current Management)

The following activities that would continue under Alternative A could potentially impact refuge soils: maintenance activities, road and trail maintenance, prescribed fire and fire suppression, public use facilities, feral hog rooting, and habitat conservation. All of these activities, with the exception of habitat conservation, would have adverse effects on soils; habitat conservation would have a beneficial effect.

Construction activities (including excavation), road maintenance, and some fire suppression and prescribed fire activities all have the potential to disturb, compact, or disrupt and move soils. Soil movement can occur through bulldozer blades, front-end loaders, tractor discs, hand held tools from fire fighters, or by means of treads or tires. These activities remove vegetation and expose soils to potential wind and water erosion; however, the flat topography of the refuge minimizes the risk of erosion and soil loss. When protective vegetation is stripped away and even more when soils are altered, they are then exposed to the erosive forces of wind and water. However, the constant flooding of the bottomland hardwood forest offsets the potential for erosion that is more likely to cause additional sedimentation. On nearly flat slope, water will have little or no velocity and will tend to pond rather than flow. Thus, the various cited activities would probably result in minimal actual erosion and soil loss.

The high feral hog population foraging across the refuge causes widespread soil disturbance due to their particular feeding habits, namely their aggressive rooting behavior, which rips up

extensive areas removing existing vegetation and creating a seed bed for noxious weeds. While this is certainly damaging to vegetation and native plants and serves as one of the biggest threats of noxious weed invasions, the amount of soil damage it causes is unclear, since the area's flat topography does not facilitate soils erosion and transport offsite. The refuge's ongoing efforts to control feral hog populations helps reduce potential damage.

Impacts from habitat conservation, including conserving ground cover, which protects the soil surface and minimizes erosion, would be largely beneficial, long-term, negligible to minor, and refuge-wide. Over considerable time, conserving the protective cover provided by vegetation gives soils a chance to develop, improving stability, fertility, and depth.

Overall, Alternative A would lead to both adverse and beneficial effects on the refuges' soils. Adverse effects would tend to be direct, minor, short-term, and localized. The beneficial impact of Alternative A on soil would be direct, minor, direct/indirect, long-term, and localized.

Alternative B

The following activities proposed under Alternative B could potentially have additional impacts on the refuge soils: the establishment of a prescribed fire program, public use facilities, additional road maintenance and development, additional construction activities such as rehabilitating the lodge at Champion Lake Public Use Area, and constructing a maintenance shop at Champion Lake with an equipment storage facility.

The prescribed fire program is designed to treat approximately 400 acres throughout the life of the CCP, maintaining nesting habit for Henslow's sparrow and other grassland nesting and migratory birds.

Under this alternative, the Land Protection Plan will be updated and the acquisition boundary will be focused on protecting more of the floodplain of the Trinity River, protecting additional bottomland hardwood forests and will have a beneficial, long-term, moderate and widespread affect on soils.

Impacts from Alternative B would be similar to Alternative A with the same type of impacts, along with additional opportunities to potentially affect soils. The types of impacts would be the same with varying degrees of soil disturbance depending on the amount and location of management.

Alternative B would lead to both adverse and beneficial effects on soils. Adverse effects would tend to be direct, minor, short-term, and localized. The beneficial impact of Alternative B on soil would be direct, minor, direct/indirect, long-term, and localized.

Alternative C - Proposed Action

Impacts from implementing Alternative C would be similar but not identical to Alternative B.

Some additional public use facilities and wildlife recreational activities are proposed under this alternative, as well as additional construction activities such as the construction of a visitor center and rehabilitation of a two-room log cabin at Champion Lake to facilitate additional offices.

In general, under Alternative C, adverse effects (from additional facilities, activities and construction) would be more than Alternatives A and B, and beneficial effects (from habitat conservation) would be the same as Alternative B.

4.4 Biological Environment

Low water at Ander's Pond. USFWS

4.4.1 Impacts on Habitat/Wildlife

Alternative A - No Action (Current Management)

Under Alternative A, the current levels and type of management activities for bottomland hardwood forests and native wildlife would continue. Current management includes planting of native hardwood species (allowing natural regeneration) and controlling invasive species, including feral hog and nutria. These activities support native wildlife populations and diversity. Planting of native hardwood species would emphasize the benefits of native species that offer compensation to wildlife. Natural regeneration would continue to allowing stands to mature into old growth forests. Invasive species would also be controlled to prevent them from displacing and out-competing natives. Controlling feral hogs and nutria will help minimize the effects on both native wildlife and habitat.

The refuge would continue to concentrate its efforts on controlling Chinese tallow, trifoliate orange, McCartney rose, Chinaberry, water hyacinth, alligatorweed, and giant salvinia and other invasive species on a case-by-case basis to preserve the integrity of the bottomland hardwood ecosystem. Herbicidal treatments would be the primary tools used to implement this management direction, while biological control methods maybe used on approved species.

Herbicide treatment would be used on 200-300 acres on average annually. Removal of feral hogs will be by hunting, removal by staff, and trapping, while nutria removal will be by trapping and removal by staff. Treatments to date focus on problem areas rather than systematic control.

The refuge would continue to prohibit grazing and continue to use chemical treatments to control Chinese tallow, deep-rooted sedge, trifoliate orange and Japanese mimosa, and any additional invasive species on an as-needed basis. A full list of chemicals and target species are identified on Table C-4.1.

The refuge maintains thousands of acres of bottomland hardwood forests, a disappearing habitat along the Trinity River due to extensive water diversion; sand and gravel extraction; and suburban, industrial, and agricultural development. Currently, the refuge's emphasis in land acquisition focuses on bottomland hardwood forest and associated wetlands along the floodplain of the Trinity River.

Existing visitor use facilities and management/administrative infrastructure such as buildings, parking lots, roads, trails, pipelines, and power lines contribute to habitat fragmentation and wildlife disturbance potential. Although these developed lands represent a small fraction of the total area of the refuge, this is still land that could have been natural habitat if not occupied by artificial structures. Habitat fragmentation is detrimental because it interferes with proper ecosystem functions in a variety of ways. The refuge attempts to minimize the continuation of fragmentation through its acquisition and restoration program, which provides undisturbed parcels of wildlife habitat.

Implementation of these management actions can result in minor short-term adverse impacts, such as temporary disturbance and displacement of native wildlife; however, these actions are specifically designed to improve habitat conditions for the benefit of wildlife. Controlling invasive flora and fauna precludes or minimizes the displacement of native species. None of the alternatives are likely to adversely affect threatened or endangered species, or their habitats.

Under Alternative A, no appreciable changes in populations or species diversity are expected. Wildlife population and habitat management on the refuge already renders considerable benefits for resident indigenous wildlife, and these benefits would continue under this alternative. The adverse impacts from disturbance associated with public use programs such as hunting, fishing, wildlife observation, wildlife photography, and interpretation, all of which bring people into relatively close proximity to wildlife, which would be negligible to minor, short-term to long-term, localized to widespread.

Overall effects from Alternative A on habitat and wildlife on the refuge would be both adverse and beneficial. However, the beneficial effects exceed the adverse effects by providing undisturbed habitat. Adverse effects from controlling invasive flora and fauna (including the use of herbicides and biological control agents), increase in visitor use facilities (including the effects of fragmentation) would be moderate, long-term, and localized to refuge-wide. Beneficial effects of planting native hardwood species, allowing natural regeneration, and land acquisition efforts would be moderate, long-term, and refuge-wide.

Alternative B

Under Alternative B, both adverse and beneficial impacts on habitat and wildlife would occur from the same actions and activities as under Alternative A. However, Alternative B would be more beneficial than Alternative A due to the additional actions described here.

Under Alternative B, the effects are expected to be the similar but not identical to Alternative A; however, Alternative B is expected to have minor, adverse impacts due to construction projects and disturbance through habitat management but would result in direct, moderate, beneficial impacts and would be refuge-wide. There would be moderate, beneficial impacts due to greater emphasis on research, land acquisition, exotic species control, small-prescribed fire units, law enforcement, and habitat restoration.

A prescribed fire program is designed to treat approximately 400 acres throughout the life of the CCP, maintaining nesting habitat for Henslow's sparrow and other grassland nesting and migratory birds. Since only small islands of grasslands have been identified on four separate units, the prescribed fire program will not have a drastic affect on non-target wildlife species or on non-target habitat. Impacts on wildlife will only be in the immediate vicinity of the burn and will only temporarily displace wildlife onto nearby available habitat.

The construction of a new visitor center facility and increase in wildlife-dependent recreational opportunities is expected to have a minor adverse impact in the short-term at site-specific/local scale with minimal clearing of vegetation, wildlife disturbance, and fragmentation.

Currently, the refuge's emphasis in land acquisition focuses on bottomland hardwood forest and associated wetlands. Alternative B would continue and expand upon this acquisition emphasis on bottomland hardwoods, especially along riparian corridors. Alternative B's benefits for bottomland hardwood forests would exceed those of Alternative A's due to the additional acreage protected.

As a result of these additional actions and activities, the beneficial effects of Alternative B would outweigh the negative impacts and overall will be more beneficial for habitat and wildlife than Alternative A. Overall effects from Alternative B on habitat and wildlife would be both adverse and beneficial. Adverse effects from implementing a small-burn prescribed fire program, additional visitor service facilities and construction activities related to the development a new visitor center would be moderate, long-term, and localized to refuge-wide. Beneficial effects of an updated acquisition boundary, initiating a prescribed fire program, additional acres of noxious weed control, and increased efforts in exotic fauna control would be moderate, long-term and refuge-wide.

Alternative C - Proposed Action

The effects of Alternative C are expected to be similar to Alternative B; however, the addition of more wildlife-dependent recreational opportunities and a new visitor center are expected to result in a corresponding increase in wildlife and habit disturbance. Habitat loss/fragmentation will be minor (less than 5 acres will be impacted by construction of a new visitors center) at a site specific local scale. Disturbance to wildlife will be short term during construction activities, and disturbance from increased visitor use would be local and could potentially be longer lasting. Beneficial effects of this alternative are the additional wildlife-

dependent recreational opportunities that will improve the image of the refuge and increased public appreciation for management actions that benefit habitat and wildlife.

4.4.2 Impacts on Species of Special Concern (e.g., Threatened and Endangered Species, etc)

Alternative A - No Action (Current Management)

Table 1-2 of the CCP is a list of Federal and State threatened and endangered species, as well as species of concern, that are expected to occur on the refuge and within Liberty County. Within the refuge, the only known species to occur are the piping plover and the interior least tern. Both of these birds have been known to migrate along sandy banks within the refuge but are very rare. The refuge will continue to provide habitat and implement the recovery plans of each of these species.

All the federally listed species would continue to be protected under the Endangered Species Act, and any projects that could potentially affect listed species would undergo Section 7 consultation prior to any ground disturbing activities. Appendix F is the Intra-Service Section 7 Biological Evaluation Form for this Plan.

Alternative A would manage a variety of habitats for resting, feeding, and reproductive purposes for the benefit of listed species, migratory birds, and species of special management concern. Under Alternative A, the current levels and type of management activities for bottomland hardwood forests would continue to have beneficial and adverse impacts on listed species. Current management includes continue habitat management activities to restore and reintroduce native flora and fauna to the refuge. Management of native nuisance flora includes limited control by herbicides of cattail and frogbit along various ponds covered in those plants.

Under Alternative A, no impacts to threatened, endangered, or special status species are expected from continuation of current management. Controlling invasive flora and fauna precludes or minimizes the displacement of native species and increases the possibility of providing additional suitable habitat for listed species and species of special management concern. No effects to endangered piping plovers and interior least terns that migrate along the Trinity River are expected under this alternative. No other federally listed species occur on the refuge.

Overall, Alternative A would result in both adverse and beneficial impacts on species of special concern. Adverse effects of maintaining wildlife-dependent recreational opportunities would be minor, long-term, and localized to refuge-wide. Beneficial effects from the actions described above would be moderate, long-term, and refuge-wide to widespread.

Alternative B

Under Alternative B, impacts would be similar but not identical to Alternative A; however, with additional land acquisition, the possibility of protecting larger undisturbed acreage increases the potential of providing habitat for listed species and species of special management concern. There is also the chance that candidate species (Rafinesque's big-eared bat) may be listed in the future.

Tools and techniques used on behalf of these species would include increases in invasive species control, research, and land acquisition. Each of these would be used explicitly to

maintain and restore habitats that would benefit listed species, migratory waterfowl, Neotropical migrants, and other migratory birds.

Additional adverse impacts from disturbances associated with public use programs identified under Alternative A would be expected with additional wildlife-dependent recreational opportunities, including additional hunting proposed under Alternative B.

As a result of these additional actions and activities, the beneficial effects of Alternative B would outweigh the negative impacts and overall will be more beneficial for species of special management concern than Alternative A. Overall, the impacts are not identical to Alternative A but will still result in both adverse and beneficial impacts on species of special management concern. Adverse effects of increasing wildlife-dependent recreational opportunities would be minor, long-term, and localized to refuge-wide. Beneficial effects from additional invasive species control and an increased acquisition program would be moderate, long-term, and refuge-wide to widespread.

Alternative C - Proposed Action

Under Alternative C, impacts would be similar to Alternative B with an additional unit open for big game hunting, additional area open for wildlife observation, an additional photo blind, and an additional trail and fishing pier. With these additional activities, adverse impacts will be slightly greater than Alternative B but would remain minor, long-term, and localized to refuge-wide. The beneficial impacts would be the same as Alternative B.

Rat snake in wood duck box on Champion Lake. USFWS

4.5 Human Environment

4.5.1 Impacts on Socio-economics

Alternative A - No Action (Current Management)

The economic and social condition of the area would remain the same having beneficial impacts on surrounding areas. The presence and operation of the refuge provides a variety of economic benefits to the surrounding communities within a 30-mile radius. The refuge attracts local, national, and international visitors to the area, generating revenue for the local economy. Hunting, fishing, and wildlife observation opportunities account for around 22,000 visitor use days. Much of the refuge's annual budget is recycled into local businesses through refuge staff, as well as purchases of equipment and supplies. The refuge provides full-time employment for five individuals that live in nearby communities.

Under Alternative A, the economic benefits would continue at current levels. The impact of refuge operation and visitation on the local economy would be beneficial, minor, long-term, and widespread.

Alternative B

The effects of Alternative B are expected to be more beneficial than Alternative A with additional construction activities such as a new visitor center. It is expected to have a minor, short-term benefit to local contractors. Additionally, the construction of more piers, restoring old trails, and opening additional units to wildlife-dependent public uses are expected to have long-term benefits by attracting additional visitors under controlled circumstances. Under this alternative, an increase in refuge programs, actions, staffing, budget, and spending would occur. In addition, the populations of east Texas and Houston metro areas are projected to continue growing in the near future. This would likely result in an increase in visitation to the refuge and associated visitor spending, which is a stimulus for the local economy, contributing jobs, income, and tax revenues. Relative to the enormous local economy, these socio-economic benefits would be small but still tangible and appreciated around the refuge.

Alternative C - Proposed Action

Economic impacts of Alternative C would also be beneficial and would also exceed those of Alternative B, due to the proposed increase in refuge programs, actions, staffing, budget, and spending under this alternative and the addition of a couple more units opened for wildlife-dependent public use activities. Overall, the net effect of Alternative C on the local economy would be would be beneficial, negligible to minor, long-term, and widespread under this alternative.

4.5.2 Impacts on Aesthetic and/or Visual Resources

Alternative A - No Action (Current Management)

Under Alternative A, the impacts of refuge facilities, operations, and visitation on aesthetic and visual resources would be minor, beneficial, long-term, and local. The refuge would continue to protect thousands of acres of scenic bottomland hardwood forests, lakes, bayous and associated wetlands. In an area of the State that is developing rapidly and already has substantial industrial, commercial, and residential footprints, the maintenance of this

aesthetically pleasing open space is a great benefit to the refuge and surrounding area. Oil and gas operations, if initiated, would detract from the visual quality of the refuge.

Proposed maintenance (no new construction planned) of infrastructure under Alternative A is on a small scale and would not have more than negligible, short-term, or localized adverse effects on visual resources within the refuge. Overall, the impacts of refuge facilities, operations, and visitation on aesthetic and visual resources are expected to be beneficial, moderate, long-term, and widespread.

Alternative B

Alternative B would have both adverse and beneficial impacts on visual resources on the refuge. During the construction phase of the new visitor center, there would be minor, adverse visual effects occurring from construction equipment, dust, and the loss of vegetative cover. In the long term, visitors may experience improved visual quality of the site and its surroundings consistent with natural native vegetation.

Alternative C - Proposed Action

The effects of Alternative C would be the same as B.

4.5.3 Impacts Public Use Opportunities

Alternative A - No Action (Current Management)

Under Alternative A, current opportunities for hunting, fishing, wildlife observation and photography, and interpretation on the refuge would all remain approximately as they are.

Existing hunting opportunities would be maintained under Alternative A. Big game, upland game, and waterfowl hunting will be open in designated units by permit only. Hunting is one of the big six wildlife-dependent public uses identified in the National Wildlife Refuge System Improvement Act of 1997 as being generally compatible with the purposes of national wildlife refuges. The beneficial impact of Alternative A on hunting opportunities would be minor, direct/indirect, beneficial, long-term, and localized.

Alternative A will continue to direct fishing opportunities to Champion Lake and Pickets Bayou. Fishing opportunities would be minor, direct/indirect, beneficial, long-term, and localized.

Alternative A will maintain current wildlife observation and photography opportunities and facilities. Visitors will continue to be directed to eight public use areas on the refuge. Wildlife observation and photography are two of the big six wildlife-dependent public uses identified in the National Wildlife Refuge System Improvement Act of 1997 as being generally compatible with the purposes of national wildlife refuges. The beneficial impacts of Alternative A on wildlife observation and photography would be beneficial, minor, long-term, and refuge-wide.

Under Alternative A, there is currently no State-recognized environmental education program on the refuge.

Alternative A would maintain existing opportunities for interpretation on the refuge. The refuge would continue to host two on-refuge annual festivals on Earth Day and on Free Fishing Day with additional off-refuge events such as a county jubilee and various public

speaking events. Other interpretive opportunities are present and would continue along trails and at public use areas.

The refuge would continue to tailor messages and delivery methods to specific audiences and present them at the various interpretation events. Interpretation enhances opportunities for a quality visitor experience on the refuge and promotes visitor understanding for America's natural resources. Visitors would continue to make their own connection with natural resources through talks, publications, brochures, fact sheets, species lists, signs, and interpretive panels.

Interpretation is one of the big six wildlife-dependent public uses identified in the National Wildlife Refuge System Improvement Act of 1997 as being generally compatible with the purposes of national wildlife refuges. Alternative A would maintain existing interpretive facilities and opportunities on the refuge, which would be a benefit. The beneficial impacts of Alternative A on interpretation would be minor, long-term, and widespread.

Under this alternative, there would also be certain adverse impacts from disturbance associated with public use programs, including hunting. The presence of hunters and other humans participating in visitor service opportunities may agitate and disturb flocks of birds, placing them under energetic and psychological stress. Even wildlife watchers may inadvertently scare off large flocks of ducks and other water associated birds, causing them to use energy unnecessarily when they need to be feeding, resting, adding weight, and building strength in preparation for migration. These adverse impacts would be short-term to long-term, negligible to minor, and localized but also potentially widespread because they have the potential to affect waterfowl populations throughout the flyway.

Alternative B

In general, under Alternative B, the refuge would enhance wildlife-dependent recreation opportunities.

In regards to hunting, Alternative B would be slightly more beneficial than Alternative A with the opening of one additional big game and upland game unit at Champion Lake South Unit and potentially other areas within the acquisition boundary. Other areas open to hunting could occur as the refuge continues to expand and would be contingent on availability of suitable habitat, adequate species populations, and sufficient staff and budget to administer the program.

Refuges are specifically closed to hunting unless open through the Code of Federal Regulations (CFRs). The Refuge will have to go through the process of opening any additional units (Champion Lake South, Palmetto, or any additional units) to hunting in the future. Prior to any new units being open, those new hunting opportunities will be detailed in a separate environmental assessment, which when complete will be included in a Hunt Opening Package that is submitted to the Washington Office and published in the *Federal Register*. Expected minor impacts include additional trail maintenance, construction of a parking lot, and increased visitor use.

Under Alternative B, fishing opportunities would be slightly more beneficial and expanded by directing visitors to McGuire and Silver Lake units upon completion of the piers. Additionally, Alternative B would open an area for wildlife observation on Champion Lake South as well as allow for constructing a photo blind for wildlife observation and wildlife photography on the

McGuire unit. Because of these new facilities for both wildlife observation and photography, Alternative B would be slightly more beneficial than Alternative A. The beneficial impacts of Alternative B on fishing would be moderate, long-term, and localized.

Under Alternative B, wildlife observation and wildlife photography would be slightly more beneficial than Alternative A with an additional open area for wildlife observation on Champion Lake South Unit. Expected minor impacts include additional trail maintenance, construction of a parking lot, and increased visitor use. The beneficial impacts of Alternative B on wildlife observation and photography would be moderate, long-term, and refuge-wide.

Alternative B would develop an environmental education program with local schools.

The environmental education program on the refuge would provide opportunities for both children and adults to learn about the refuge and natural habitats of the bottomland hardwood forests. The educational programs improve the quality of visitors' experiences and provide them with a better understanding of the benefits, issues, and challenges of natural resource conservation in the bottomland hardwood forest. The program will meet local and State of Texas education standards, allow professional development for teachers, provide community-based service organization programs, meet youth group merit badge requirements, and instill a sense of stewardship and understand of conservation issues.

Environmental education is one of the big six wildlife-dependent public uses identified in the National Wildlife Refuge System Improvement Act of 1997 as being generally compatible with the purposes of national wildlife refuges. Alternative B would develop an environmental education program on the refuge, which would benefit all surrounding counties. The beneficial impacts of Alternative B on environmental education would be moderate, long-term, and widespread.

Alternative B would expand the interpretive program at a variety of refuge venues while including additional off-refuge events and developing and providing self-guided interpretive materials at Champion Lake and Brierwood units. Due to this expanded program, Alternative B would be slightly more beneficial than Alternative A. The beneficial impacts of Alternative B on interpretation would be moderate, long-term, and widespread.

Alternative C - Proposed Action

In general, wildlife-dependent public uses under Alternative C would be somewhat more expansive than Alternative B.

In regards to hunting, Alternative C would be slightly more beneficial than Alternative B with the opening of one additional unit for big game and upland game at the Palmetto unit. Expected minor impacts include additional trail maintenance, construction of a parking lot, and increased visitor use. The beneficial impacts of Alternative C on hunting would be moderate, long-term, and local.

Under Alternative C, fishing would be slightly more beneficial than Alternative B with the opening of one additional waterway at the Brierwood Unit. The beneficial impacts of Alternative C on fishing would be moderate, long-term, and local.

Wildlife observation and wildlife photography under Alternative C would be slightly greater that Alternative B with an additional open area for wildlife observation on Palmetto unit and an additional photo blind at Brierwood Unit. Minor impacts are expected with trail maintenance, construction of a photo blind, and increased visitor use. The beneficial impacts of Alternative C on wildlife observation and photography would be moderate, long-term, and refuge-wide.

Under Alternative C, environmental education benefits would be greater than Alternative B with the addition of an educational facility at the Champion Lake Unit. The impact of Alternative C would be minor, direct/indirect, beneficial, long-term, and refuge-wide. Minor impacts are expected with trail maintenance and increased visitor use. The beneficial impacts of Alternative C on environmental education would be moderate, long-term, and widespread.

Overall, under Alternative C, the benefits of these additional wildlife-dependent public use opportunities would outweigh the minor adverse impacts of Alternative B.

4.5.4 Impacts on Visitor Use Facilities

Alternative A - No Action (Current Management)

The impacts of Alternative A would be minor, direct, beneficial, long-term, and site specific. All visitor use facilities and related infrastructure, including roads, parking lots, fishing pier, kiosks, and the butterfly garden, would be maintained.

Alternative B

Alternative B would be slightly more beneficial than Alternative A by expanding visitor use facilities such as signs, trails, canoe/kayak launch sites, kiosks, and fishing pier. Minor impacts are expected with trail maintenance, construction projects, and increased visitor use. The impacts of Alternative B would be minor, direct, beneficial, long-term, and site specific.

Alternative C - Proposed Action

Alternative C would be slightly more beneficial than Alternative B by constructing a Visitor Center, fishing pier, kiosks, and developing a trail at Champion Lake South Unit. Minor impacts are expected with trail maintenance, construction of Visitor Center and kiosks, and increased visitor use. The impacts of Alternative C would be minor, direct, beneficial, long-term, and site specific.

4.6 Assessment of Cumulative Impacts

A cumulative impact is defined as an impact on the environment that results from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future action regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can “accumulate” spatially, when different actions affect different areas of the same resource. They can also accumulate over the course of time from actions in the past, present, and future. Occasionally, different actions counterbalance one another, partially cancelling out each other’s effects on a resource. But more typically, multiple effects add up, with each

additional action contributing an incremental impact on the resource. Accurately summarizing cumulative effects is difficult in that while one action increases or improves a resource in an area, other unrelated actions may decrease or degrade that resource in another area.

As stated in the Service Manual (550 FW 1 and 2), in an EA, a cumulative impact assessment should be conducted if it is determined necessary through scoping to make a determination of significance of the Proposed Action. When a cumulative effects analysis is included in an EA, the analysis need only be sufficient for the decision maker to reach a conclusion on the significance of the impact in order to determine if the preparation of an EIS is required.

Trinity River NWR exists within a matrix of surrounding land uses, including urbanization, which is expanding from Houston, with a population estimated at 5.9 million people (Texas Comptroller's Office 2009), as well as expansion from Beaumont. The refuge is surrounded mainly by cattle ranches and fragmented forests. Historically, much this area was contained within large ranches or prospected and developed for oil and gas drilling and extraction. Now the trend is toward subdivision of the large ranches for residential development, yet the oil and gas industry still has as strong presence. However, much of the land within the region is still used for agricultural purposes such as grazing, logging, or crop production.

The following section addresses the potential cumulative effects for all the alternatives and is intended to consider the activities on the refuge in the context of other actions on a larger spatial and temporal scale. The impacts of past and present actions that have taken place on the refuge are reflected in the current resource conditions (Affected Environment) as described in Chapter 3 of the CCP. The impacts of proposed future actions (for all alternatives) are discussed in earlier parts of this EA. The adverse direct and indirect effects of current refuge management and the proposed actions (all alternatives) on air, water, soil, habitat, wildlife, the local economy and population, and aesthetic/visual resources are expected to be mostly negligible to moderate and short-term to long-term. The benefits to habitat, wildlife, and public use that the Proposed Action would achieve greatly outweigh any of the adverse impacts discussed in this document. The Service also considered past, present, and future planned actions on other State, Federal, and private lands surrounding the refuge. The Service is not aware of any refuge management actions that—when added to other past, present or future proposed actions—would result in significant cumulative impacts. The analysis area for potential cumulative effects on each resource and a summary of those potential impacts is provided below.

Cumulative Impacts on Physical Resources

Air Quality

Air quality is always a concern on the refuge and within Liberty County, which is located within 65 miles of one of the most industrialized and populated areas in the U.S. Hundreds of refineries and chemical plants occur in surrounding counties, including Harris, Chambers, Jefferson, and Galveston (see Appendix I). Approximately 60 natural gas and coal power plants; some of the nation's largest shipping ports; and two major airports, several regional airports, and one military base also surround the refuge. No air quality monitoring stations are located in Liberty County. The closest station is in Harris County, 30 miles southwest from the City of Liberty, the county seat of Liberty County.

The Houston area is populated by nearly five million people and is a sprawling urban commuter population in one of the largest industrial complexes in the country. The affects if

these sprawling communities can readily observed in the smaller communities surrounding the refuge. For example, the city of Dayton has continuously increased in population over the past decade and continues to grow. The affects of urban sprawling and continuous growth in the Houston metro will have increased impacts on air quality.

The climate in and around the refuge is hot and humid, with the breeze driven over land and sea by the Gulf of Mexico. Air pollution is created from pollutants such as carbon monoxide, sulfur dioxide, oxides of nitrogen, and highly reactive volatile organic compounds emitted by cars, power plants, refineries, chemical plants, and other sources that react to sunlight, which are the leading ozone precursors.

Projects on the refuge that affect air quality would be consistent with the minimal effects produced in the past (as described earlier in this EA), with ongoing refuge activities consisting of negligible impacts in comparison to the industrialization occurring in the surrounding counties. Even with the addition of the prescribed fire program, which is designed to burn under 200 acres over the course of the CCP (15 years), impacts will still be considered negligible. Refuge actions will have minimal effects on air quality based primarily on weather and wind conditions. All alternatives would essentially have the same effects to refuge air quality, even with the prescribed burning program, construction activities, and increased visitor use. Continued refuge acquisition and preservation of native bottomland hardwood habitat would be a long-term benefit to air quality by reducing local development and increasing carbon sequestration. These adverse and beneficial impacts, however, would not be cumulatively significant.

Water Management and Quality

Over the past century, the waters of the Trinity River have become increasingly polluted. Run-off containing pesticides and herbicides and dumping of industrial and human waste—particularly in the Dallas-Fort Worth metro-plex—have combined to cause serious deterioration of water quality (TRA 2010). The most severely affected area is the 250-mile-long stretch that extends from Dallas-Fort Worth to the headwaters of Lake Livingston. By the early 1960s, the river below Dallas for 100 miles was so polluted that the United States Public Health Service described it as "septic." Since that time, there were efforts made to clean up the river. A Water Quality Management Plan was adopted in the 1970s (TDWR 1984, Gard 2010); however, pollution problems continued (TRA 2010). For decades, pollutants have been banned, yet legacy pollutants are still found in the environment in concentrations deemed detrimental to humans. The sources of these are typically unknown and continue to contribute to contaminated sediment that, were it to be removed, could cause greater harm and possibly alter the entire hydrology of a system.

The majority of water quality impacts are influenced by natural flooding events of the Trinity River that can cover over 90 percent of the refuge. As experienced over the past decade, the refuge is generally near the extremes of the rainfall charts, either suffering extreme drought or excessive rains. Rarely does annual rainfall occur near the annual average. Managing the refuge at climatic extremes is difficult. Effects of severe droughts and floods affect they hydrology of the entire Trinity River floodplain, which in turn affects water quality. Concerns of population increases and urbanization may contribute to additional water removed from the Trinity River. Decreased water flows may increase salinity levels, altering species composition, survivability, and overall water quality. Continued refuge acquisition and preservation of native bottomland hardwood habitat would be a long-term benefit to water management and quality by acting as a natural filtration system.

The Port of Liberty shipped commodities to the Gulf Coast via steamboat along the Trinity River from 1838-1940. Portions of the Trinity River were channeled and dredged, which may have had an impact on hydrology in the area.

Road and trail maintenance and herbicide spraying are some past, present, and reasonable foreseeable future refuge activities that may affect water quality. Water is also affected by local landowner use of fertilizer and herbicide; however, the amount contributed by the refuge under Alternatives A is negligible. Alternative B and C would allow for additional construction and potentially more herbicide spraying and therefore more of a cumulative impact. Even with the additional spraying under Alternative B and C, the impact would still be negligible in comparison to contaminants surrounding the refuge.

Luce Bayou Interbasin Transfer Project

The Luce Bayou Interbasin Transfer Project (LBITP) in conjunction with the Coastal Water Authority and the City of Houston is currently proposing to withdraw approximately 500 million gallons per day(gpd) (half a billion gpd) of water at Capers Ridge. The project would transfer raw water from the Trinity River Basin to Lake Houston, a major water supply reservoir for the City of Houston. Capers Ridge is located between the northern and southern portion of the refuge. The US Army Core of Engineers is currently preparing a Draft Environmental Impact Statement (EIS) for this project. The following analysis was prepared in attempt to address potential cumulative impacts the project would have on the CCP.

The proposed LBITP will alter Trinity River flow below the diversion point at Capers Ridge. Refuge lands located upstream of the diversion point are not likely to be affected by this project. This analysis applies to the downstream portions of the refuge. For this analysis, the Service assumed that approximately half of refuge lands are upstream and half are downstream of Capers Ridge. To estimate the magnitude of the decrease in river flows attributable to the LBITP, the Service analyzed the measured mean daily flow at the US Geological Survey (USGS) Gaging Station Number 08066500 Trinity River at Romayor, TX, for the 40-year period from 10/1/1971 to 9/30/2011 (USGS 2012a). We selected this period of record in part because Livingston Dam was completed in the late 1960s. Portions of the Romayor gage record prior to and after the completion of the dam are suspect in terms of being representative of typical flows because the new reservoir was filling. It is possible less water than normal was being released below the reservoir. Figure C-4.1 illustrates the measured mean daily flow in cubic feet per second (cfs) at the Romayor gauging station during this period, which corresponds to water years (WY) 1972 through 2011. Each water year begins on October 1 and ends the following year on September 30. For example, water year 2011 started on October 1, 2010 and ended on September 30, 2011. Figure C-4.2 shows the recorded daily storage values at midnight in Livingston Reservoir (USGS Gaging Station Number 08066190 Livingston Reservoir near Goodrich, TX) between 10/1/1968 and 9/30/1975 (WY 1969 through WY 1975) (USGS 2012b). The figure shows how full the reservoir was in terms of the total conservation storage of 1,741,312 acre-feet. Percentages above 100% indicate the reservoir had more water in storage than the total conservation storage. The reservoir was filling between October 1968 and October 1971.

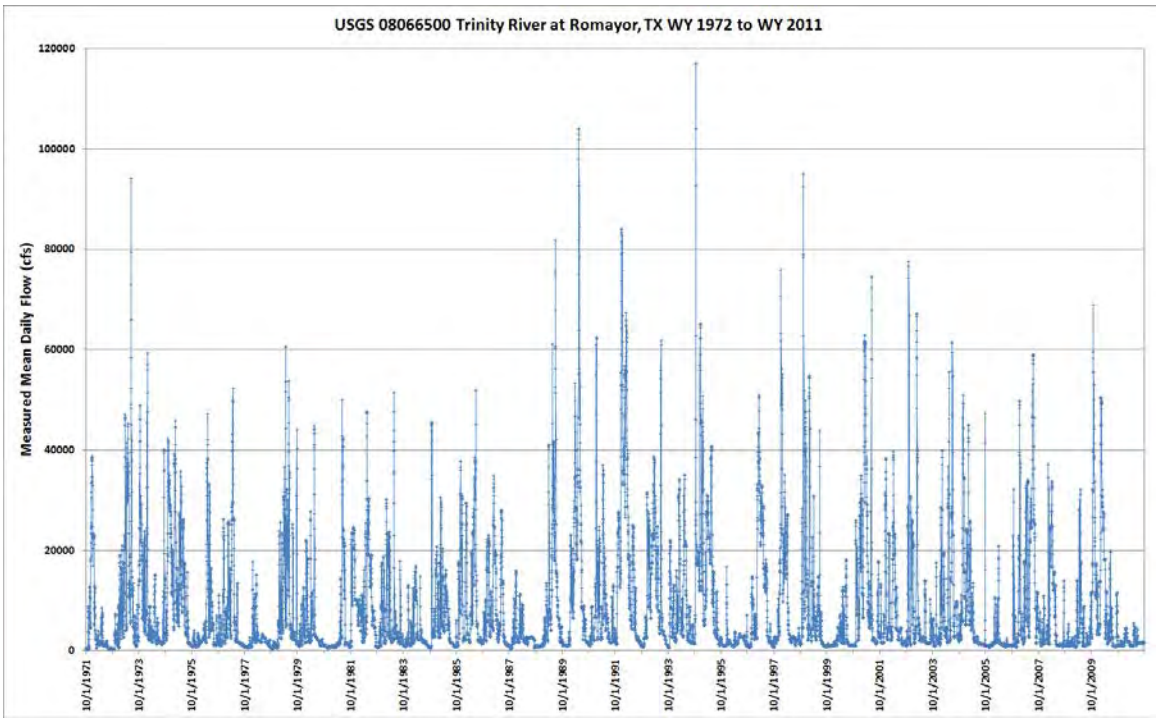


Figure C-4.1. Measured Mean Daily Flow at the US Geological Survey Gaging Station Number 08066500 Trinity River at Romayor, Texas, Between 10/1/1971 and 9/30/2011 (WY 1972 to WY 2011)

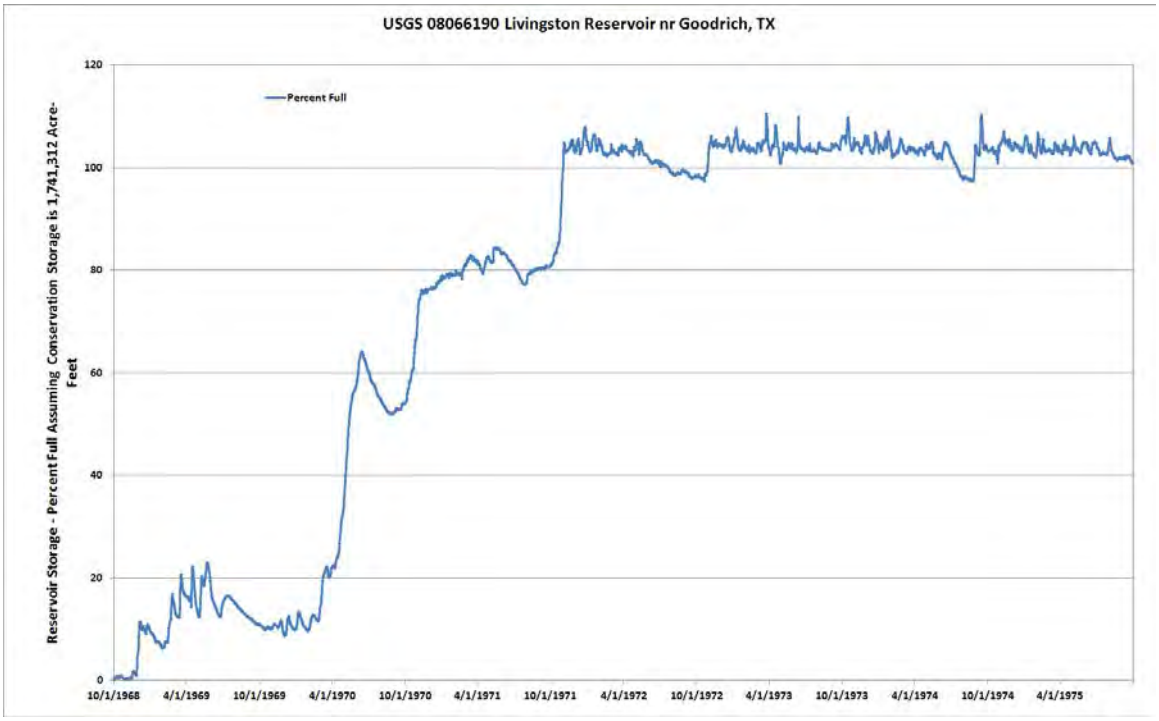


Figure C-4.2. Livingston Reservoir Daily Storage – Percent Full Assuming Conservation Storage is 1,741,312 Acre-Feet

The Service compared the measured mean daily flow at the Romayor gage to the calculated mean daily flow that would have occurred assuming the LBITP had diverted 775 cfs daily from the river. Specifically, the calculated mean daily flow is equal to the measured mean daily flow minus the 775 cfs the LBITP would have removed each day from the river. Table C-4.2 summarizes the results of this comparison. The table shows the measured and calculated minimum, median, average, and maximum river flows.

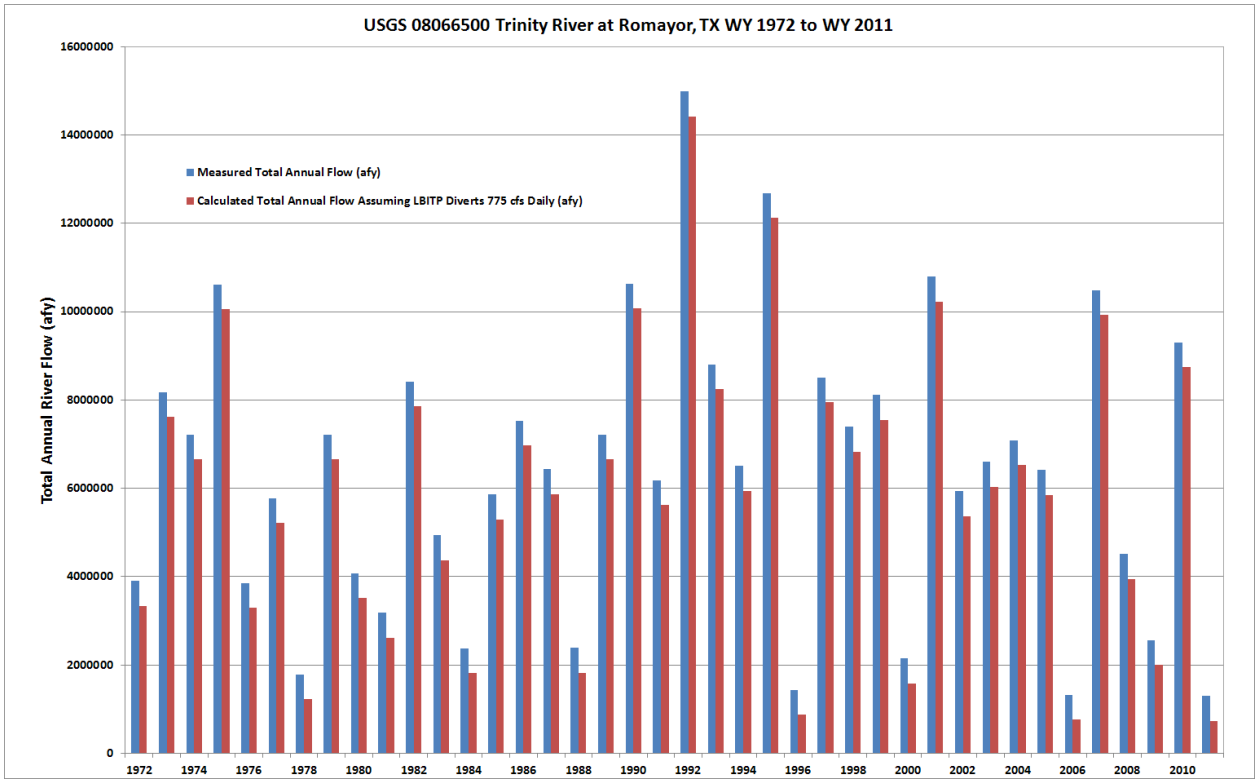


Figure C-4.3. Measured Total Annual Flow Compared to Calculated Total Annual Flow Assuming the LBITP Diverted 775 cfs Daily at the US Geological Survey Gaging Station Number 08066500 Trinity River at Romayor, Texas, Between 10/1/1971 and 9/30/2011 (WY 1972 to WY 2011)

During water years when water is abundant and river flows are high, the reduction in river flow is relatively small. For instance in WY 1992, the proposed LBITP reduced river flow by about 4%. Of particular concern from a hydrologic perspective, however, is when water is scarce. During water years with low river flows, the additional diversion of water by the proposed LBITP will remove a relatively large percentage of the total flow in the river. For example, during WY 2011, which was a particularly dry year, probably equaling or even surpassing the previous drought of record, river flow was reduced by about 43%. Table C-4.2 summarizes the calculated reductions in river flow as a percent at the Romayor, TX gage on a water year basis.

Table C-4.2. Calculated Reductions in River Flow at the Romayor, TX, Gage on a Water Year Basis

Minimum Reduction in Flow on a Water Year Basis (in WY 1992)	3.75%
Median Reduction in Flow on a Water Year Basis	8.68%
Average Reduction in Flow on a Water Year Basis	13.1%
Maximum Reduction in Flow on a Water Year Basis (in WY 2011)	43.3%

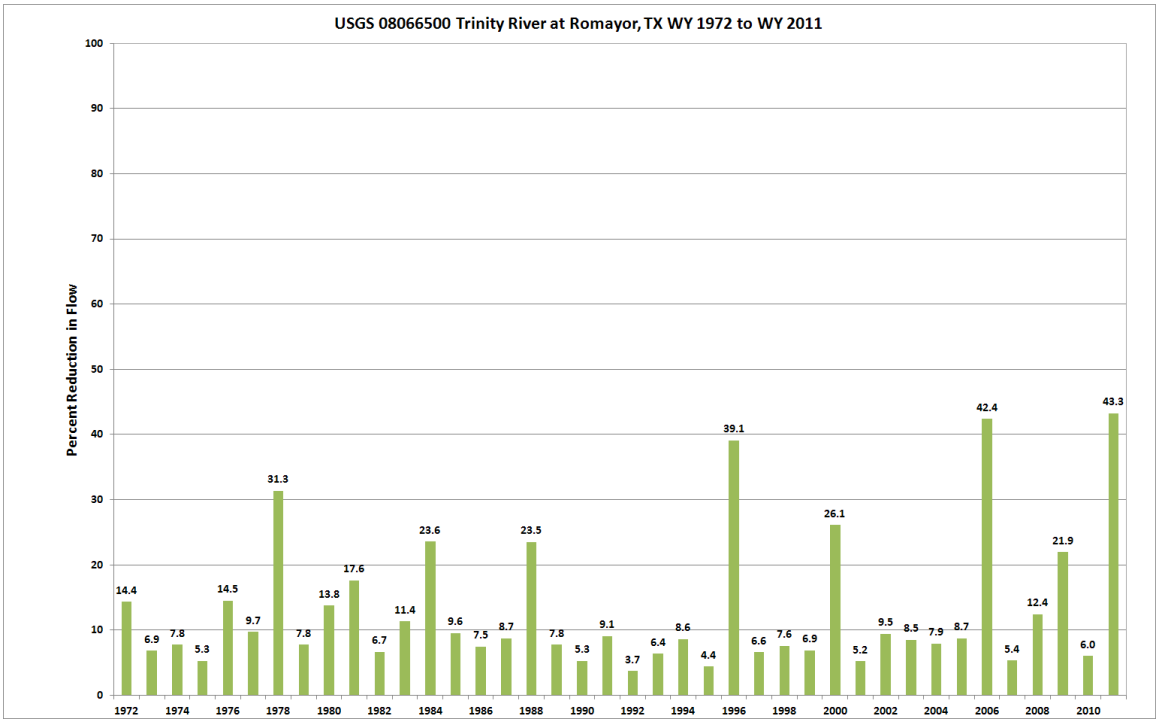


Figure C-4.4. Percent Reduction in Flow at Trinity River at Romayor, TX, for WY 1972 to WY 2011

Figure C-4.4 shows the percent reduction in flow for each water year between WY 1972 to WY2011.

Based on an examination of the mean daily flows and corresponding gage heights at the USGS Gaging Station Number 0806700 Trinity River at Liberty, TX, for the 15-year period from 10/1/1996 to 9/30/2011 (this record contains gaps), the proposed LBITP will reduce the flood frequency on the Trinity River (USGS 2012c). During this period, the measured gage height was at or above the flood stage of 26 feet designated by the National Weather Service (NWS 2012) on 259 days. Reducing the daily flow at the gage by the 775 cfs that would have been diverted by the LBITP resulted in calculated gage heights at or above the flood stage on 248 days, a decrease of 11 days or about 4%. The largest decrease in the number of days of flooding in a water year was 2 days. Table C-4.3 lists the annual results of the analysis. Table C-4.4 summarizes the minimum and maximum values observed in the analysis.

Table C-4.3. Trinity River Flood Analysis at USGS Gaging Station at Liberty, TX

Water Year	Number of Days Measured Gage Height Was at or Above Flood Stage	Number of Days Calculated Gage Height Was at or Above Flood Stage Assuming Lbitp Reduced Daily Flow By 775 Cfs	Number of Days Calculated Flooding Was Reduced	Percent Reduction Between Measured and Calculated Days at or Above Flood Stage
1997	29	28	1	3
1998	23	21	2	9
1999	35	34	1	3
2000	0	0	0	(NA)
2001	43	41	2	5
2002	3	3	0	No Reduction
2003	16	16	0	No Reduction
2004	16	15	1	6
2005	21	20	1	5
2006	0	0	0	(NA)
2007	34	33	1	3
2008	0	0	0	(NA)
2009	0	0	0	(NA)
2010	39	37	2	5
2011	0	0	0	(NA)
TOTAL	259	248	11	4

NA = not applicable because there was no flooding during the water year

Table C-4.4. Summary of Trinity River Flood Analysis at USGS Gaging Station at Liberty, TX

Minimum Percent Reduction between Measured and Calculated Days at or Above Flood Stage on a Water Year Basis (in WY 2002 and WY 2003)	No Reduction
Maximum Percent Reduction between Measured and Calculated Days at or Above Flood Stage on a Water Year Basis (in WY 1998)	9%

Two-thirds of the flooding at the Liberty, TX, gage occurs between the months of November and March, inclusive. February was the month with the most flooding events. More than 20% of the floods occurred in February. During the period examined, no flooding events occurred in the month of August. Table C-4.5 gives the number and percentage of flooding occurrences by month of the year.

Table C-4.5. Flooding Occurrences by Month of the Year

Month	Number of Occurrences	Percent of Occurrences
Jan	3	10.7
Feb	6	21.4
Mar	4	14.3
Apr	1	3.6
May	1	3.6
Jun	2	7.1
Jul	2	7.1
Aug	0	0
Sep	1	3.6
Oct	1	3.6
Nov	4	14.3
Dec	3	10.7
TOTAL	28	100

The US Army Corps of Engineers (USACE) is preparing an Environmental Impact Statement (EIS) for this project. According to USACE staff, the draft is expected to be ready for the 60-day public comment period in August 2012 (Personal Communication 2012).

All of the described activities, actions, and trends have had adverse implications for water quality and quantity in the area. These large detrimental influences work against and offset the refuge's largely beneficial impacts on water quality and quantity, from conserving over 25,000 of natural vegetative cover, riparian and bottomland hardwood forest habitats. In view of these increasing adverse pressures on water quality and quantity, which are likely to continue to increase in the foreseeable future, the refuge's positive effects on water resources become even more important. However, the net cumulative effect on water resources in the coming decades would probably be more negative than positive considering the amount of industrialization continuing to expand around the refuge. Overall, at the close of the planning period (15 years), the overall condition of water resources on the refuge as a result of cumulative effects is likely to be somewhat less than at present, with less water and lower water quality. These impacts have the potential to become cumulatively significant if all the water anticipated by the LBDP is withdrawn from the Trinity River. However, the proposed action (implementation of the CCP) will not add to those impacts.

Soils

Past, present, and foreseeable future area impacts to soils include ground disturbance, which can result in erosion, sedimentation, and nutrient loss. Impacts are caused by activities such as construction, farming, livestock grazing, feral hogs, and oil and gas development both on and off the refuge.

Historically, the forest and forest soils were seen as major marketable commodities that were not in short supply. Logging severely altered the bottomlands by the 1900s (Bray 1906). The cypress swamps were modified the most severely. Minimal old growth forest were left in the county, as it had mostly been harvested. Areas in the uplands were planted with loblolly pine, a more desired pine species. Most of the older growth hardwoods could be found in the bottoms

where the soil was too moist for equipment to enter. However, during dry periods, even this timber became vulnerable and was eventually harvested. Most of the major swamps were logged by 1915 (Tanner 1942). In 1980, forest products were well-recognized county assets.

Prospecting for oil began in 1901. Oil fields were placed around much of the southern half of the county. Oil and natural gas pipelines were installed to move the vast amounts of products through the county (Kleiner 2010). Disturbances from oil and natural gas productions may have included pollution, seismic surveys affecting ground integrity, and the creation of roads and oil well pads. The refuge has no active well pads or pump jacks, although there are a number of facilities and pipelines right outside the refuge boundaries. The refuge does not own any mineral rights; therefore, the potential for additional oil and gas operations, including pipelines, is always possible. There could be potential long-term cumulative effects on soil quality if oil and gas operations increase in the future.

In the 1940s, mining became an important industry as a result of World War II. Sulfur was mined in the southern part of the county. As many as 52 firms opened during the decade, further impacting soil and hydrology to the area. By 1958, 40 manufacturing plants operated along with 165 mineral companies, resulting in further impacts to soil and hydrology.

Additionally, frequent flooding of the Trinity River contributes to both deposition and sedimentation throughout the floodplain. Floods accrete new sand along the shoreline, erode the shoreline, scour/flush bayous or channels, or deposit sediment along vast areas of the refuge.

Soil impacts under Alternative A are negligible. Alternatives B and C would allow for additional site-specific land use activities, such as construction, small prescribed fire program, and parking lot and trail maintenance with more impacts, however; it would still be negligible. Continued refuge acquisition and preservation of native bottomland hardwood habitat would be a long-term benefit to soils, as previously disturbed areas are allowed to progress back into old growth hardwood forests with increased soil holding capabilities.

Alternative B proposes similar amounts of construction and other management activities and would have similar effects to soils. Alternative C proposes much more construction and intensive management activities than the other alternatives; therefore, it would likely have a larger contribution to cumulative impacts.

Overall, cumulative effects on soils (from all alternatives) would be a mix of minor adverse and minor to moderate, beneficial effects. Adverse cumulative effects would probably occur to those soils that are regularly or continually subjected to some form of disturbance. These adverse effects are not anticipated to be major.

Minor to moderate, beneficial effects on soils would be expected to occur at those sites constituting the great majority of the area of the refuge, whereupon undisturbed soils would continue to develop (slowly increasing in depth as well as fertility) as a result of nearly continuous vegetative cover. These adverse and beneficial impacts, however, would not be cumulatively significant.

Cumulative Impacts on Biological Resources

Wildlife/Habitats

Farm practices have lead to the introduction of non-native domestic animal species. The cattle industry was introduced in 1840 starting with 14,058 head. Cattle production was still quite popular a century later. The practice of grazing cattle in the bottomland forest has contributed to the spread of invasive flora species and possible changes in understory forest composition. Liberty County was the swine production capital of the State in the 1930s. Ironically, feral hogs are a leading invasive species in Liberty County in the present era. By the 1980s, 52 percent of land in Liberty County was in farms and ranches and 36 percent was under cultivation (Kleiner 2010).

Agriculture has impacted the relatively non-fragmented forest by the creation of open spaces to cultivate, introduction of seeds, alteration of soil properties, and changes in hydrology. Grazing of livestock has impacted flora and fauna species in the understory of the forests, the creation of open pastures, and introduction of feral hogs. The timber industry drove the harvest of native trees and the introduction of loblolly pine trees, while also influencing stand ages of trees, and impacting flora and fauna species that depend upon a mature forest. Mining practices and industrial facilities greatly impacted the soils and hydrology in areas where mining minerals were located further creating possible pollution issues. Oil and gas pipelines, railroad, human transportation, and even the introduction of electricity via power lines, all have contributed to right-of-ways that have further impacted the continuity of the relatively non-fragmented Big Thicket forest prior to Antebellum Liberty County (Cozine 2004, Abernethy 2010).

The cumulative effects of the LBITP on habitat and wildlife are not completely understood at this time but based on the hydrological analysis, the Trinity River below the diversion point at Capers Ridge, (the lower portion of the refuge) will result on an average reduction in flow of approximately 13.1 percent (Table C-4.2 above). How this 13 percent average reduction, reduced flooding frequency and saturation affects seed production, dispersal and reproduction of bottomland hardwood forests throughout the life of the plan has not been analyzed as part of this CCP. Currently, the US Army Core of Engineers is producing the Draft EIS which should analyze the impacts the reduction in flow will have on resources throughout the Trinity River watershed.

Long-term beneficial cumulative impacts from the refuge's proposed management on bottomland hardwood forests would be direct/indirect, long-term, minor to major, and local to refuge-wide. There would also be cumulative adverse impacts on wildlife/habitat due to maintenance or construction of roads, trails, buildings, piers, blinds, and oil and gas facilities. Additionally, increased visitation could adversely affect wildlife/habitat. These adverse impacts would be direct, short to medium-term, negligible to moderate, and site-specific to local.

There are at least 25 other Federal, State, county, city, and privately managed conservation, wildlife-dependent recreation land, and/or mitigation banks consisting of at least 567,000 acres within the seven counties that surround Liberty County (Harris, Chambers, San Jacinto, Jefferson, Hardin, Polk, and Montgomery) that contribute to wildlife/habitat conservation efforts in the area.

In combination, these and other initiatives will have a generally beneficial, cumulative effect on restoration of bottomland hardwood forests on a landscape level. The refuge would be contributing to these positive impacts under any of the alternatives of this CCP.

Migratory Birds

Under each of the alternatives, beneficial effects on migratory birds from proposed management actions would be direct/indirect, long-term, moderate to major, and widespread. Under the Proposed Action, there would also be some adverse impacts from disturbance associated with all public use programs. Adverse impacts from the disturbance of visitor use activities would be direct, short-term, negligible to minor, and site-specific to local. None of these impacts would be cumulatively significant.

These actions on the refuge are a small part of a number of integrated efforts to manage migratory birds on the flyway, continental, and hemispheric scales. The refuge contributes to and collaborates with waterfowl management efforts by the Service and a number of states and Canadian provinces in the Central Flyway. The North American Waterfowl Management Plan (NAWMP) seeks to restore waterfowl populations in Canada, the United States, and Mexico to levels recorded in the 1970s.

The North American Bird Conservation Initiative (NABCI) seeks to ensure the long-term health of North America's native bird populations by increasing the effectiveness of existing and new bird conservation initiatives, enhancing coordination among the initiatives, and fostering greater cooperation among the continent's three national governments and their people. In 1999, the NABCI approved a framework for delineating ecologically-based planning, implementation, and evaluation units for cooperative bird conservation in the U.S. and Canada known as Bird Conservation Regions (BCRs). BCRs are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues.

Partners in Flight (PIF) is a cooperative effort involving partnerships among numerous governments and non-governmental organizations (NGOs) concerned about Neotropical migrants and other birds. PIF was created in 1990 in response to growing concerns about declining populations of many land bird species and to emphasize the conservation of birds not covered by existing conservation initiatives. Bird conservation plans are developed in each region to identify species and habitats most in need of conservation, to establish objectives and strategies to provide needed conservation, to establish objectives and strategies to provide needed conservation activities, and to implement and monitor progress on the plans. This North American Landbird Conservation Plan (Rich et al. 2004) summarizes the conservation status of landbirds across North America, illustrating broad patterns based on a comprehensive, biologically-based species assessment~~.~~

At the State level, a number of initiatives in Texas have positive cumulative consequences for migratory birds, including the Texas Parks and Wildlife Texas Wildlife Action Plan (2005), Land and Water Resources Conservation and Recreation Plan (2005), and Texas Wetlands Conservation Plan (1997). While these are not focused on migratory birds per se, their implementation would still provide long-term, cumulative benefits for them.

In combination, all of the foregoing efforts should improve the prospects for many migratory birds species at all scales, from local to widespread. However, these efforts confront a wide variety of threats to migratory birds at all scales. Most of these are threats to habitats where

the birds breed in the spring and summer months (in more northerly areas) and where they winter (in more southerly areas), as well as crucial stopover habitats that migratory birds need when they are in transit between summer and winter ranges. Habitat conversion, degradation, and fragmentation from diverse human activities, including urbanization, agriculture, logging and forestry, mining, and hydroelectric development, all on a vast scale, threaten populations of migratory birds species.

Cumulative Impacts on the Human Environment

Beneficial cumulative impacts from the refuge's socio-economic environment would be direct, long-term, minor to moderate, and local. As the refuge grows, it is becoming a better-known eco-tourism destination, which is a plus to the local community. Additionally, refuge staff and management operations directly purchase numerous supplies in the area. There would also be cumulative adverse impacts due to a slight increase in road traffic where public use facilities are located. These adverse impacts would be direct, short-term, negligible, and site-specific. Based on the analysis presented earlier in this chapter, the Service has concluded that there would be no significant cumulative impacts on the human environment from proposed refuge management actions, when considered in context with other State, Federal, and private actions (as summarized in subsequent text). All management alternatives have similar impacts and conclusions.

Local Population and/or Economy

As a result of projected population and economic growth in the region over the coming 15 years, overall cumulative economic impacts would continue to be beneficial. The refuge would continue to contribute positive, relatively minor, economic effects on the region.

Aesthetic and Visual Resources

In combination, the long-term, overall effects to aesthetic and visual resources from the refuge's proposed management actions under all three alternatives would be moderately beneficial and widespread. The refuge has an overall beneficial effect on aesthetic and visual resource in this area where open space and natural beauty are diminishing and the refuge continues to acquire, manage, and maintain large units of land.

Visitor Service/Recreation Opportunities

Hunting

As in most states, there is a long-term, generalized decline in hunting participation in Texas, even as the State's population (and thus the number of potential hunters) continues to grow very rapidly. While a number of factors undoubtedly contribute to this, the rising cost of hunting on private land may be growing prohibitively expensive for many hunters to participate. Under these circumstances, the importance of public lands and wildlife habitat to hunters, such as those available on the refuge, will be in high demand by the hunting public. However, if hunting demand or participation on the refuge were to increase greatly as a result of declining opportunities elsewhere, this excessive competition could eventually decrease the quality of the hunting experience available on the refuge.

Wildlife Observation and Wildlife Photography

There are a growing number of other formal and informal opportunities for wildlife observation and photography in the region. There is over one-half million acres of public property in the surrounding counties that offer some type of wildlife observation and

photography opportunities. The refuge will contribute to these long-term, cumulatively beneficial effects related to wildlife observation and photography in the region by expanding upon current opportunities.

However, even as these formal facilities and opportunities increase, an expected decrease in the amount of overall wildlife habitat present due to the area's continuing growth and development (and associated habitat conversion) may reduce the amount of wildlife actually available for viewing and photography.

Environmental Education
Except for some limited activities in local schools, there are no other formal education programs for children or adults in the local community. The refuge would contribute to a beneficial cumulative effect by promoting refuge resources as well as the mission of Service through formal EE programs throughout the surrounding counties.

Interpretation
The refuge would to play an integral role in growing opportunities for nature and wildlife interpretation opportunities around the region with the proposed expansions. Formal interpretation opportunities are not available for children or adults in local communities surrounding the refuge.

Visitor Use Facilities
No outside forces or factors would cause or contribute to cumulative effects on any of the refuge facilities.

Land Acquisition
Beneficial cumulative impacts from the refuge's acquisition program under all alternatives would be direct/indirect, long-term, moderate to major, and local to refuge-wide. The refuge would likely acquire more lands for wildlife/habitat protection under any alternative. Alternative C would take a more active approach to secure additional lands. Landscape level acquisition of rapidly disappearing bottomland hardwood forests is a priority. Over one-half million acres of public property is present in the surrounding counties, much of it consisting of bottomland hardwoods and associated wetlands. The refuge contributes to these landscapes by creating beneficial effects related to protection and conservation efforts in the region.

The acquisition program will create cumulative adverse impacts. These adverse impacts would be direct/indirect, long-term, moderate to major, and local to refuge-wide. Acquisition will remove land from the private sector such that housing development, logging, mining, or agricultural practices will cease to exist. All acquisition is from willing sellers only. Private landowners still can use or sell their property as they see fit. Under current U.S. congressional actions implemented in 2011, refuge-owned lands would no longer pay the county in lieu of taxes based on property values.

Climate Change
The refuge's acquisition program, habitat management, and green infrastructure building guidelines will create beneficial impacts to assist with climate change. Under all alternatives, these impacts would be direct/indirect, long-term, minor to moderate, and local to widespread. Continuing with acquisition and managing lands for long-term tree growth will benefit carbon sequestration efforts. The office and maintenance/storage shop built in 2011-2012 met

Leadership in Energy and Environmental Design (LEED) standards. A visitor center, when built, will also meet LEED standards.

Except for an increase in visitor use, thus more vehicles (negligible), there would be no other adverse cumulative impacts from refuge programs and acquisition.

As the refuge begins experiencing greater effects from climate change, the need for adaptive management will increase. More scientific data on when and where these changes may occur, along with what changes may entail, is necessary before determining how to counteract or adapt to them.

4.7 Short-Term Uses Versus Long-Term Productivity:

The habitat protection and management actions under the Proposed Action are dedicated to maintaining the long-term productivity of refuge habitats. The benefits of this plan for long-term productivity far outweigh any impacts from short-term actions, such as the construction of a visitor center or creation of new trails. While these activities would cause short-term negative impacts, the educational values and associated public support gained from the improved visitor experience would produce long-term benefits for the refuge's entire ecosystem.

The key to protecting and ensuring the refuge's long-term productivity is to find the threshold where public uses do not degrade or interfere with the refuge's natural resources. The plans proposed have been carefully conceived to achieve that threshold. Therefore, implementing the Proposed Action would lead to long-term benefits for wildlife protection and land conservation that far outweigh any short-term impacts.

4.8 Unavoidable Adverse Effects and Mitigation Measures

Flooding at Champion Lake. USFWS

All action alternatives may have some unavoidable adverse impacts. Most impacts are minor and/or short-term in duration. The refuge would attempt to minimize these impacts wherever possible. The following sections describe the measures the refuge would employ to mitigate and minimize the potential impacts that could result from implementation of the Proposed Action.

Water Quality from Soil Disturbance and Use of Herbicides

Foot traffic on new and existing trails will have a negligible impact on soil erosion. To minimize the impacts from public use, the refuge would include informational signs that request trail users to remain on the trails to avoid causing potential erosion problems.

Long-term herbicide use for exotic plant control could result in a slight decrease in water quality in areas prone to exotic plant infestation. Through the proper application of herbicides, however, this will have a minor impact on the environment, with a greater over all benefit of reducing or eliminating exotic plant infestations.

Wildlife/Habitat Disturbance

Disturbance to wildlife is an unavoidable consequence of any public use program, regardless of the activity involved. Planning and monitoring would be used to avoid unacceptable levels of impact from public use activities or construction. The refuge would minimize these impacts by installing informational signs that request users to stay on trails. This is expected to be a minor, short-term impact. All of the public use activities proposed under Proposed Action would be designed to minimize levels of impact

Other Unavoidable and Adverse Impacts

Adverse impacts from development of buildings, parking lots, trails, and other improvements would be direct, short-term, minor, and site-specific to local to habitat, soils, and some wildlife species. All construction activities would comply with the requirements of Section 404 of the Clean Water Act; the National Historic Preservation Act; Executive Order 11988, Floodplain Management; and other applicable regulatory requirements.

4.9 Irreversible and Irretrievable Commitment of Resources:

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that this use could have on future generations. Irreversible effects primarily result from the use or destruction of specific resources that cannot be replaced within a reasonable time frame, such as energy or minerals. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored from this action, such as extinction of a threatened or endangered species or the disturbance of a cultural resource.

None of the alternatives would result in a large commitment of nonrenewable resources.

Project implementation would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by heavy equipment and vehicles during construction activities. Maintaining new trails, parking lots, buildings, and piers and increasing law enforcement activities would become necessary. Management actions in this CCP will require a commitment of funds that would then be unavailable for use on any other Service projects. At some point, commitment of funds to these projects would be irreversible, and once used, these funds would be irretrievable. The Proposed Action would result in some unavoidable harm or harassment to some wildlife. The Service would implement best management practices to minimize potential impacts.

The Propose Action alternative will require additional staffing and funding for full implementation.

None of the alternatives described in this EA will disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. It is anticipated that implementation of the Proposed Action would benefit the environment and people in the surrounding communities.

Table C-4.6. Summary of Environmental Effects by Alternative

Environmental Resource	Alternative A: No Action/Current Management	Alternative B:	Alternative C: Proposed Action
Air Quality	*Effects/Impacts from prescribed fire:* Direct/Adverse & Beneficial; Short-term; Minor; Site-specific *Effects/Impacts from land acquisition & habitat management:* Direct-Indirect/Beneficial; Long-term; Moderate; Local *Effects/Impacts from increasing visitor use days and public use programs:* Direct/Adverse; Short-term; Minor; Site-specific	Same as Alternative A plus more benefit as acquisition increases.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase.
Water Resources	*Effects/Impacts from land acquisition & restoring hydrology:* Direct-Indirect/Beneficial; Long-term; Minor; Local	Same as Alternative A plus more benefit as acquisition increases.	Same as Alternative B plus minor beneficial cumulative effects would increase.

Environmental Resource	Alternative A: No Action/Current Management	Alternative B:	Alternative C: Proposed Action
Bottomland Hardwood Forests (and Associated Habitats)	*Effects/Impacts from controlling invasive species, land acquisition, research, planting native hardwood species, and restoring hydrology:* Direct-Indirect/Beneficial; Long-term; Minor; Local *Effects/Impacts from increasing visitor use days and public use programs:* Direct/Adverse; Long-term; Minor; Site-specific	Same as Alternative A plus moderate benefit as acquisition increases along with habitat management. Minor increase in adverse impacts as more public use programs are developed increasing visitors.	Same as Alternative B plus cumulative effects, both moderate beneficial and adverse impacts, would increase.
Resident, Native Wildlife (Including Threatened and Endangered Species)	*Effects/Impacts from controlling invasive species, land acquisition, research, planting native hardwood species, and restoring hydrology:* Direct/Beneficial; Long-term; Minor; Local *Effects/Impacts from increasing visitor use days and public use programs:* Direct/Adverse; Medium-term; Minor; Site-specific	Same as Alternative A plus moderate benefit as acquisition increases along with habitat management. Minor increase in adverse impacts as more public use programs are developed increasing amount of visitors.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase.
Cultural Resources	*Effects/Impacts from land acquisition, law enforcement, and contact with preservation officers:* Direct/Beneficial; Long-term; Major; Site-specific	Same as Alternative A.	Same as Alternative A.

Environmental Resource	Alternative A: No Action/Current Management	Alternative B:	Alternative C: Proposed Action
Socio-economic	*Effects/Impacts from land acquisition and "big six" recreational opportunities:* Direct-Indirect/Beneficial; Long-term; Moderate; Local	Same as Alternative A plus increase in benefits as more compatible wildlife-dependent recreational opportunities become available.	Same as Alternative B plus moderate beneficial cumulative effects would increase.
Hunting	*Effects/Impacts from hunting:* Direct-Indirect/Adverse & Beneficial; Long-term; Minor; Local	Same as Alternative A plus increases benefits to hunters as more compatible hunting opportunities become available. Minor impacts when used as management tool for population management of deer and feral hog and increase in visitor use.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase.
Fishing	*Effects/Impacts from fishing:* Direct-Indirect/Adverse & Beneficial; Long-term; Minor; Local	Same as Alternative A plus increases benefits to anglers as more compatible fishing opportunities become available. Minor adverse impacts to habitat with pier construction and increase in visitor use.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase.
Wildlife Observation	*Effects/Impacts from wildlife observation:* Direct-Indirect/Adverse & Beneficial; Long-term; Minor; refuge-wide	Same as Alternative A plus increases benefits to wildlife observers as more compatible observation opportunities become available. Minor adverse impacts to habitat with parking lot and trail maintenance and increase in visitor use.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase.
Wildlife Photography	*Effects/Impacts from wildlife photography:* Direct-Indirect/Adverse & Beneficial; Long-term; Minor; refuge-wide	Same as Alternative A plus increases benefits to photographers as more compatible photographic opportunities become available. Minor adverse impacts to habitat with parking lot and trail maintenance, photo blind construction, and increase in visitor use.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase.

Environmental Resource	Alternative A: No Action/Current Management	Alternative B:	Alternative C: Proposed Action
Environmental Education	None	*Effects/Impacts from initiating EE program:* Direct-Indirect/Adverse & Beneficial; Long-term; Minor; refuge-wide	Same as Alternative B plus increases benefits to students and teachers as more compatible EE opportunities become available. Minor adverse impacts to habitat with parking lot and trail maintenance, visitor center construction, and increase in visitor use.
Interpretation	*Effects/Impacts from interpretation:* Direct-Indirect/Adverse & Beneficial; Long-term; Minor; refuge-wide	Same as Alternative A plus increases benefits to visitors as more compatible interpretive opportunities become available. Minor adverse impacts to habitat with parking lot and trail maintenance and increase in visitor use.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase, especially after construction of a visitor center.
Visitor Use Facilities	*Effects/Impacts from visitor use facilities:* Direct/Adverse & Beneficial; Long-term; Minor; Site-specific	Same as Alternative A plus increases benefits to visitors as more compatible facilities become available. Minor adverse impacts to habitat with construction projects and increase in visitor use.	Same as Alternative B plus cumulative effects, both minor beneficial and adverse impacts, would increase.

5.0 CONSULTATION, COORDINATION, AND DOCUMENT PREPARATION

5.1 Document prepared by:

Please refer to Appendix H in the Plan

5.2 References

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Finding of No Significant Impact

Trinity River NWR Comprehensive Conservation Plan

June 29, 2012

FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT OF THE TRINITY RIVER NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service (Service) has developed a Comprehensive Conservation Plan (Plan, CCP) and Environmental Assessment (EA) for the Trinity River National Wildlife Refuge (NWR) located in Liberty County, Texas. The CCP provides management direction to present and future Refuge managers for the next 15 years. It will achieve the Refuge's vision for the future and the purposes for which the Refuge was originally established. The CCP describes management activities that occur on the Refuge and provides management goals, measurable objectives, and specific management strategies designed to protect and restore wildlife habitat, conserve "trust resources" such as migratory birds and threatened and endangered species, enhance compatible wildlife-dependent recreation opportunities, and related facilities.

An EA was completed to fulfill the requirements of the National Environmental Policy Act (NEPA) of 1969 and to inform the public of the possible environmental consequences of implementing the CCP. A total of three alternatives were evaluated and analyzed for potential impacts on the human environment. The EA was prepared to provide a decision-making framework that 1) explores a reasonable range of alternatives to meet project objectives, 2) evaluates potential issues and impacts to the Refuge, resources and values, and 3) identifies mitigation measures to minimize the degree or extent of these impacts.

ALTERNATIVES CONSIDERED AND ANALYZED

Alternative A: Current Management (No Action Alternative)

Alternative A, the No Action Alternative, assumes no change from management programs that have been in place, and/or have been initiated over time, since the Refuge's establishment. Alternative A is considered the baseline to compare other alternatives against. Under this alternative, the primary management of the Refuge would continue to preserve bottomland hardwood forests and associated wildlife. The Refuge would continue to provide existing levels of public use, visitor services, ecological enhancements and overall improvements. Current management efforts would continue to focus on land acquisition, planting trees to sequester carbon and exotic fauna control, prescribed fire, and herbicides to restore bottomland hardwood forests.

The Refuge wildlife program consists of providing habitat for bottomland hardwood forest dependent species and conducting a limited amount of monitoring. Current habitat management practices would continue, including the conservation and restoration of bottomland hardwood froests, restoring native flora and managing native nuisance flora and fauna.

The Refuge would maintain the current level of wildlife dependent recreational opportunities (hunting, fishing, wildlife observation, wildlife photography, and interpretation). Recreational opportunities would continue to be limited to traditional programs under existing approved

hunting and fishing plans. The refuge would continue to allow hunting on 8 units, fishing would be concentrated on Champion Lake and Pickett's Bayou, wildlife observation and photography would be directed to the existing 8 public use areas and the refuge would continue to host two annual events on Earth Day on the State Free Fishing Day to participate on interpretation opportunities

Under this alternative no improvements would be initiated at the Champion Lake public use area, and no maintenance shop would be build. Viewing opportunities for wildlife would be limited to the existing roads and trails that are open to the public. Improvements to roads and administrative facilities would continue according to current capabilities; however, no new improvement or expansion efforts would take place.

Alternative B

Under Alternative B, the Refuge would initiate expansion of habitat management and restoration activities, combined with expanded public use and infrastructure. Under Alternative B, management direction would generally be the same as described in Alternative A with the addition of expanded habitat management activities, improvements and creation bottomland hardwood forests, expand visitor services programs and public use facilities, and the use of adaptive management strategies to contribute to ongoing monitoring. Existing areas of bottomland hardwood forest would be further protected and enhanced through planned management strategies such as plantings, and the use of herbicides to control non native flora.

Under this alternative, the Refuge's wildlife program would include comprehensive inventories of wildlife species and habitat conditions, which would improve the Refuge's baseline biological information. This would allow staff to better evaluate habitat management decisions in the future and adjust management actions to benefit wildlife using adaptive management strategies throughout the life of the CCP. The Refuge would expand active habitat management practices such as chemical removal of exotic flora. The Refuge would initiate a prescribed fire program to control the rapidly spreading noxious weeds. These management strategies will accelerate restoration of native bottomland hardwood forest habitat.

This alternative would improve and develop additional visitor service programs on the Refuge by initiating an environmental education program and expanding interpretation and outreach efforts to meet the increasing visitation and interest in Refuge resources. An additional hunt unit would be open on the refuge at the Champion Lake South Unit. Fishing regulations and access points would also remain the same with the addition of two fishing piers at McGuire and Silver Lake. Hunting and fishing programs would be reviewed for opportunities to improve the quality of these public uses while remaining compatible with the purpose of the Refuge. Management strategies would continue to be implemented to control the population of feral hogs.

Improvements to public use access would be to establish a canoe/kayak launch site at Brierwood unit and improve road to McGuire Pond. Public use facilities would include rehabilitating the Lodge at Champion Lake Public Use Area, pave road at Champion Lake public use area, and construct an additional fishing pier at McGuire Unit. Existing roads

would be expanded as necessary to accommodate increased recreational use including development of new parking areas, pull-outs, and placement of additional educational signs.

Alternative C: Proposed Action

Under Alternative C, the Refuge would adopt and implement the management direction presented in the CCP. The refuge would continue the expansion of habitat management and restoration activities, combined with expanded public use programs.

This alternative would incorporate the habitat and wildlife management direction called for in Alternative B; however, this alternative would also include an additional refuge patrol officer to increase resource protection on additional acres acquired under the aggressive acquisition program.

This alternative would incorporate the visitor's service direction described under Alternative B, plus develop an additional unit for big game and upland game hunting at Palmetto Unit. An additional pier would be built in Brierwood Unit to promote additional fishing opportunities, and an additional area at Palmetto Unit for wildlife observation opportunities as well as an additional photo blind at McGuire Unit for wildlife photography opportunities. In addition to initiating environmental education program as defined in Alternative B, Alternative C would develop an on-refuge program with the completion of the educational facility at Champion Lake Public Use Area. Additional interpretive programs at the new visitor center and develop and provide kiosks in all areas with public use facilities.

This alternative would improve or expand public use facilities on the Refuge by implementing the recommendations under Alternative B plus expand and improve existing roads and trails which would include a hiking trial at Champion Lake South. This alternative will construct a visitor center, an additional fishing pier at Brierwood Unit and a full service bathroom at Champion Lake Public Use Area. In addition the refuge will also rehabilitate the 2-room log cabin at Champion Lake for staff and volunteer offices.

DECISION: THE SELECTED ALTERNATIVE

Alternative C was selected over the other alternatives because it best meets the Refuge's vision for the future, the purposes for which the Refuge was established, and the habitat, wildlife, and visitor service goals identified in the CCP. This alternative is the basis for the CCP and describes how habitat objectives will be accomplished through a combination of management activities to encourage ecological integrity, promote restoration of bottomland hardwood forest habitat along the Trinity River, and control invasive species. This alternative will not adversely impact trust resources, including threatened and endangered species, or their habitat. Opportunities for wildlife-dependent recreation activities, such as hunting, fishing, observation, photography, environmental education, and interpretation will be enhanced. Future management actions will have a neutral or positive impact on the local economy and the recommendations in the CCP will ensure that refuge management is consistent with the mission of the National Wildlife Refuge System.

SUMMARY OF EFFECTS

Implementation of the Service's decision would be expected to result in environmental, social, and economic effects as described in the CCP/EA and summarized here. The CCP describes habitat management, population management, and land conservation objectives that would result in additional acreage of bottomland hardwood forests; increased protection of threatened and endangered species; enhanced wildlife populations; and improved habitat conditions. The proposed visitor service management activities would result in enhanced prospects for wildlife dependent recreational opportunities.

Refuge management activities (prescribed burning, invasive species control, etc.) would result in short-term, minor, negative impacts to soils, air, water, habitat, and wildlife as described in the EA; however, the long-term impacts are expected to be beneficial. These habitat management activities would result in the creation and improvement of bottomland hardwood forests, improvements in the biological program would focus management efforts on local and regional threats to the ecosystem.

Opportunities for wildlife-dependent activities such as hunting, fishing, wildlife observation, photography, environmental education, and interpretation would be enhanced. There would be a permanent loss of a small amount of habitat through the establishment of a visitor center, additional hiking trails and associated parking and pull out areas. This would also result in short-term disturbance to wildlife, but we have determined that these impacts are minimal and will eventually be outweighed by the benefits provided by improved visitor service programs.

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 minimize unavoidable levels of impact. As currently proposed, the known and anticipated levels of disturbance associated with management actions are considered minimal and well within the tolerance levels of know wildlife species and populations present in the area. Implementation of the visitor services program would take place through carefully controlled time and space zoning and placement of trail and other facilities would avoid direct contact with sensitive areas, such as nesting habitat. All hunting activities (season lengths, bag limits, number of hunters) would 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 visitor use programs would be adjusted as needed to limit disturbance.

The increased opportunities for wildlife dependent recreational opportunities on the Refuge would also have beneficial impacts on the local economy through increased visitation and revenue. Partnerships with county, state, and federal agencies, private landowners, and conservation groups would enable the Refuge to achieve goals and objectives, minimize costs, and strengthen relationships.

Implementing the Service's management action is not expected to have any significant adverse effects on wetlands and floodplains, pursuant to Executive Order 11990 and 11988, because there would be no development of refuge facilities within wetlands or floodplains. There would

be no effect on threatened, endangered, proposed or candidate species and/or critical habitat, as documented in the intra-service Section 7 (Endangered Species) Consultation completed with the Ecological Services Field Office in Clear Lake, TX and signed on September 8, 2011. In addition, archeological and/or historical resources would not be impacted.

Although outside the scope of this document, the Luce Bayou Interbasin Transfer Project is the only other past, present or reasonably foreseeable future planned actions that could result in a significant cumulative impact when added to the Refuges proposed action, as outlined in Alternative C. This project is proposing to withdraw up to 500 million gallons of water per day from the Trinity River to Houston and its impacts will be evaluated in an EIS currently being prepared by the US Army Core of Engineers. The adverse direct and indirect effect of the proposed action on air, water, soil, habitat, wildlife and aesthetic/ visual resource values are expected to be minor and short-term. The benefits to long-term ecosystem health that the proposed action will accomplish will outweigh any of the short-term impacts discussed in this document.

PUBLIC OUTREACH, REVIEW, AND COMMENT

Development of the Trinity River NWR Comprehensive Conservation Plan has been thoroughly coordinated with all interested and/or affected parties. Public scoping was initiated when a Notice of Intent to prepare a Comprehensive Conservation Plan was published in the Federal Register (Volume 72, Number 154, pp 45059-45060) on August 10, 2007. This was followed by a Notice of Availability in the Federal Register (77 FR 18853; March 28, 2012) that the Draft Plan/EA was available for 30 days of public review. Subsequently, the Draft Plan/EA was made available for public review starting on March 28, 2012 through May 4, 2012, at the Refuge, at the Liberty Municipal Library, Dayton Library, Austin Memorial Library, Tarkington Community Library, and at the Regional Office in Albuquerque, New Mexico. The refuge hosted an open house public meeting on April 10, 2012 to review the Draft CCP and EA with members of the public at the refuge headquarters office. A total of five (5) individuals signed the attendance rosters at the open house meeting and a total of eighty-nine (89) written comments were submitted to the Refuge/Regional Office. All comments were considered and addressed in Appendix J of the CCP.

FINDINGS

Based on the analysis documented in the environmental assessment and with due consideration given to comments from the public and through consultation with the State of Texas, it is my determination that the proposed action does not constitute a major Federal action that will have a significant effect on 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, it is my conclusion that an environmental impact statement is not required for this plan and the selected alternative may be implemented as soon as practicable. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the attached Environmental Assessment, which is attached.

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the environment. (Environmental Assessment, pages 11-27)

2. The actions will not have a significant effect on public health and safety. (Environmental Assessment, pages 36–41)

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, pages 39)

4. The effects on the quality of the human environment are not likely to be highly controversial. (Environmental Assessment, pages 38–39)

5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Environmental Assessment, pages 35–41)

6. The actions do not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Environmental Assessment, pages 33–49).

7. There will be no cumulatively significant impacts on the environment based on any of the alternatives. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Environmental Assessment, pages 52–64).

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, pages 35).

9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Environmental Assessment, pages 42; Appendix C).

10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment. (Environmental Assessment, pages 29–39).

It is the intent of the Service to revisit questions of significant environmental consequences in accordance with NEPA upon consideration of the implementation of site specific proposals call for and discussed in the CCP.

SUPPORTING REFERENCES

U.S. Fish and Wildlife Service, 2012. Draft Comprehensive Conservation Plan and Environmental Assessment for the Trinity River National Wildlife Refuge, Liberty County, Texas. U.S Department of the Interior, Fish and Wildlife Service, Southwest Region.

U.S. Fish and Wildlife Service, 2012. Comprehensive Conservation Plan and Environmental Assessment for the Tishomingo National Wildlife Refuge, Liberty County, Texas. U.S Department of the Interior, Fish and Wildlife Service, Southwest Region.

Recommended: 9-17-2012

Stuart Marcus, Refuge Manager
Trinity River NWR

Date

Approved: 10/3/12

Dr. Benjamin N. Tuggle, Regional Director
U.S. Fish and Wildlife Service, Region 2

Date

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